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EDITORIAL

International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE) is an open access international peer-reviewed, open-access journal, which provides a platform for highlighting and discussing various cognitive science issues dealing with the problems of cognition (and its evolution) within some specific subject field - philosophical, psychological, linguistic, mathematical, psychogenetic, pedagogical, ergonomic. Editorial Board strives to provide a possibility for the scientists of different fields to publish the results of their research, technical and theoretical studies. IJCRSEE is multidisciplinary in approach, and will publish a great range of papers: reports of qualitative case studies, quantitative experiments and surveys, mixed method studies, action researches, meta-analyses, discussions of conceptual and methodological issues, etc. IJCRSEE publisher is The Association for the Development of Science, Engineering and Education, Vranje, co-publisher is Don State Technical University, Russian Federation..

IJCRSEE particularly welcomes articles on the results of scientific research in various fields of cognitive science (psychology, artificial intelligence, linguistics, philosophy and neuroscience) catering for international and multidisciplinary audience. Readers include those in cognitive psychology, special education, education, adult education, educational psychology, school psychology, speech and language, and public policy. IJCRSEE has regular sections: Original Research, Review Articles, Studies and articles, Book Reviews, Case Studies, and is published three times a year. This journal provides an immediate open access to its contents, which makes research results available to the public based on the global exchange of knowledge. The journal also offers access to uncorrected and corrected proofs of articles before they are published.

The main aim of the Journal is to discuss global prospects and innovations concerning major issues of cognitive science, to publish new scientific results of cognitive science research, including the studies of cognitive processes, emotions, perception, memory, thinking, problem solving, planning, education and teaching, language and consciousness study, the results of studying man's cognitive development and the formation of basic cognitive skills in everyday life. The Journal seeks to stimulate the initiation of new research and ideas in cognitive science for the purpose of integration and interaction of international specialists in the development of cognitive science as interdisciplinary knowledge.

All articles are published in English and undergo a peer-review process.

The scope of IJCRSEE is focused on cognitive research both in topics covered as well as disciplinary perspective:

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- Text Processing and Cognitive Technologies
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IJCREE provides a platform for academics and scientists professionals to refer and discuss recent progress in the fields of their interests. Authors are encouraged to contribute articles which are not published or not under review in any other journal.

Each submitted manuscript is evaluated on the following basis: the originality of its contribution to the field of scholarly publishing, the soundness of its theory and methodology, the coherence of its analysis, its availability to readers (grammar and style). Normal turn-around time for the evaluation of manuscripts is one to two months from the date of receipt.

Submission of an original manuscript to the journal will be taken to mean that it represents original work not previously published, that is not being considered elsewhere for publication; that the author is willing to assign the copyright to the journal as per a contract that will be sent to the author just prior to the publication and, if accepted, it will be published in print and online and it will not be published elsewhere in the same form, for commercial purposes, in any language, without the consent of the publisher.

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The requirement for the submission of a paper implies that it has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors.

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Plagiarism - Content should be properly referenced. Be sure to check the paper for possible accidental plagiarism. Some plagiarism checker websites include: <http://www.ithenticate.com/>, www.antiplagiat.ru, www.grammarly.com, www.plagtracker.com or www.duplichecker.com

Writing – Please write in good English (American or British usage is accepted, but not a mixture of these). For non-native English speakers, and perhaps even for some native English speakers, grammar, spelling, usage, and punctuation of the texts are very important for an effective presentation. Hence, manuscripts are expected to be written in a clear, cogent, and readily understandable by an international readership.

Manuscripts must be submitted online. Electronic submission reduces the editorial processing and reviewing time. As part of the submission process, authors are required to check off their submission compliance with all of the following items, and submissions may be returned to authors who do not adhere to the following guidelines:

The submission has not been previously published or presented to another journal for consideration (or an explanation has been provided in Comments to the Editor).

The submission file is in OpenOffice, Microsoft Word, RTF, or WordPerfect document file format.

Where available, DOIs and URLs for the references have been provided.

The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.

The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.

If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Double Blind Review have been followed.

A manuscript goes through the peer review process. Authors submit manuscripts to Editorial office via the online system. The acknowledgement letter should be sent to the author to confirm the receipt of the manuscript. The Chief Editor first reviews manuscripts. Chief Editor is assisted by Section Editors (could also be Co- or Associated Editors). The Editor assigns a Section Editor to see the manuscript through the complete review process and return it with a recommendation or decision. The manuscript is checked to see if it meets the scope of the Journal and its formal requirements. If it is incorrect or unsuitable, the author should be informed and the manuscript filed (or returned if requested) – direct rejection. Manuscripts that are not suitable for publication in the Journal are rejected. A Rejection letter is sent to the author stating the reason for rejection. If the manuscript conforms to the aims and scope of the Journal, and formally abides by the Instructions to Authors it is sent out for review. Depending on the type of paper, it could be accepted immediately for publication (invited Editorial, Book review etc) by the Chief Editor.

Check that the manuscript has been written and styled in accordance with the Journal style; that it carries an abstract (if applicable), keywords, correct reference system etc. and check that the correct blinding system has been used. If anything is missing ask the author to complete it before the manuscript is sent out for review.

The manuscript is sent out for review. The reviewer reads and evaluates the manuscript and eventually sends a review report to the Chief Editor. The time for review can be set to 2-6 weeks depending on the discipline (more time is usually given to papers in the humanities and social sciences). Make sure to provide the reviewer with clear instructions for the work, e.g. outlined in the form of a Review report or a number of questions to be considered.

Based on the reviewers' comments the Chief Editor makes a decision to:

- Accept the manuscript without further revision
- Accept after revision
- Ask authors to resubmit
- Reject

An acceptance letter is sent to the author and the final manuscript is forwarded to production. Sometimes, the authors are requested to revise in accordance with reviewers' comments and submit the updated version or their manuscript to the Chief Editor. The time for review can be set to 2-6 weeks depending on the discipline and type of additional data, information or argument required. The authors are requested to make substantial revisions to their manuscripts and resubmit for a new evaluation. A rejection letter is sent to the author and the manuscript is archived. Reviewers might be informed about the decision.

After review a manuscript goes to the Copy Editor who will correct the manuscript concerning the correct referencing system, confirmation with the journal style and layout. When Copy Editor finishes his/her work they send manuscripts to the Layout editor.

Layout Editor is responsible for structuring the original manuscript, including figures and tables, into an article, activating necessary links and preparing the manuscript in the various formats, in our case PDF and HTML format. When Layout Editor finishes his/her job they send manuscripts to Proof Editor.

Proof Editor confirms that the manuscript has gone through all the stages and can be published.

This issue has 18 articles (15 Original researches and 3 Review articles). Our future plan is to increase the number of quality research papers from all fields of science, engineering and education. The editors seek to publish articles from a wide variety of academic disciplines and substantive fields; they are looking forward to substantial improvement of educational processes and outcomes.

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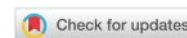
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Direct and Indirect Effects Between First Literacy Errors, Visual Perception, and Phonological Awareness Variables

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Abstract: This research is a descriptive study in the survey model to determine the direct and indirect effects between visual perception, phonological awareness, and literacy errors. The design of the study is exploratory correlational design. 552 first-grade primary school students participated in the study. The data were collected using measurement tools named phonological awareness, visual perception, word-sentence writing/spelling, and reading errors. According to the findings, visual perception affects sentence writing/spelling both directly and through word-writing-reading errors. Visual perception affects reading errors both directly and through word-sentence writing errors. The results show that the development of prerequisite skills and reading are mediated by writing, writing/spelling are mediated by reading, and learning develops in a spiral manner. It can be said that children's reading-writing/spelling errors increase because they have difficulty in converting from sound to the letter, from letter to sound, and in synthesizing and analyzing according to their initial level of phonological awareness and visual perception development.

Keywords: literacy, spelling error, reading, perception, phonology.

Introduction

Literacy skill constitutes the framework and essence of science, technology, and education, which are the main triggers of social change. As a result of the 20th-century scientific developments, it is seen that early literacy views have gained weight in research on the acquisition of this skill (see. [Commodari et al., 2020](#); [Guldenoglu, Kargin and Ergul, 2016](#); [Floyd, McGrew and Evans, 2008](#); [Foorman and Liberman, 1989](#); [Landerl et al., 2019](#); [Pfof et al, 2019](#); [Ouellette and Senechal, 2017](#); [Schatschneider et al., 2004](#); [Spee et al., 2004](#); [Turna and Guldenoglu, 2019](#); [Zhang and Lin, 2018](#)). However, writing/spelling was less studied until the first quarter of the 21st century ([Joshi, Wijekumar and Gillespie Rouse, 2022](#); [Treiman, 2017](#)). Some of the studies focused on the end of kindergarten and first grade of primary school when writing is learned ([Kim et al, 2011](#)). Other studies have examined the longitudinal relationships between literacy skills ([Lerkanen, 2003](#); [Leppänen et al., 2009](#)) and reading spelling errors ([Desimoni, Scalisi and Orsolini, 2012](#)).

During the decoding process, children may make errors in reading and writing. These errors may indicate language structures that are difficult to decode or proficiency in prerequisite skills. However, while investigating the relationships between reading skills and spelling/writing in the studies, either prerequisite skills were not taken into account or participants' prerequisite skills before first grade were measured. However, learning to read can increase phonological awareness ([Scarborough et al., 1998](#)), and the development of visual perception ([Tsai, Wilson and Wu, 2008](#)) can continue in the early years of primary school. These prerequisite skills may affect the decoding process. In addition to phonological awareness, visual coding is one of the most basic skills in learning to read and write. Because for visual coding, it is necessary to perceive, analyze and distinguish the properties of graphic symbols.

Literacy/Spelling

A strong relationship between reading and writing/spelling has been found in many studies ([Caravolas, Hulme and Snowling, 2001](#); [Juel, Griffith and Gough, 1986](#); [Andersen et al., 2018](#)). In literacy

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model development studies, the sources of reading and writing/spelling were identified. For example, both spelling and word recognition require code-dictionary knowledge (Juel, Griffith and Gough, 1986). According to the same model, code-dictionary knowledge, word recognition, and listening comprehension are components of reading comprehension. Writing/spelling can be realized through phonology. It is understood that this phonological knowledge is an important component of writing as it requires separating the heard words into syllables and sounds (Brynildssen, 2000).

In other studies, theoretical views on the developmental stages of literacy have been put forward (see Ehri, 2005 for details). According to Ehri (2014), children's learning to read words requires phonological awareness and knowledge of writing systems. The ability to read words accurately and automatically involves a developmental process from non-alphabetic visual features to grapho-syllabic connections. In addition, reading and writing require cognitive processes. Some of the studies in the literature suggest that the cognitive processes of reading and spelling may be similar (Berninger et al., 1994; Nikolopoulos et al., 2006). However, writing/spelling skills are based more on memory processes and functions in terms of perceiving sensory data such as letters-sounds, syllables, words, and sentences and requiring the perceived data to be encoded and recalled in memory (Juel, 1994). Accordingly, the amount of information to be retrieved from memory increases for spelling, which requires remembering letters in the correct order, compared to reading (Ferah, 1996). Children who read incorrectly may be more likely to write incorrectly. This may indicate difficulties and levels in the decoding process.

Children have to learn letter-sound correspondences at the beginning of literacy. An incomplete or misspelled language unit may not only indicate the developmental phase of children's literacy learning (Ehri, 2005), but it may also indicate structures that are difficult to encode in memory or remember. In an earlier memory study, it was determined that letters could be confused in short-term memory due to their sound similarities (Conrad, 1964). In another study, it was found that children make mistakes while learning to read and write in Turkish; letter sounds such as "ç, f, t, h, s, k, p, ş, b, d, n, m" and some affixesyllable structures are difficult to encode in memory (Ferah-Ozcan and Ozcan, 2016). Children who read incorrectly may be more likely to write incorrectly. This may indicate difficulties and levels in the decoding process.

Visual Perception and Literacy

Visual perception is the capacity to identify, classify, and interpret visual stimuli in light of prior knowledge (Aral and Erturan, 1999). Visual perception describes the cognitive skills that integrate visual information into higher cognitive functions and processes (Pienaar, Barhors and Twisk, 2014). The ability to discern similarities and differences between groups of objects, such as size, color, and shape, is known as visual discrimination. This improves the person's capacity to match letters (Ferah, 1996). Letter recognition is correlated with visual-sensing abilities (Bellocchi et al., 2017). Children can practice writing by flipping the letters until they learn which way is up (Cubelli and Della Sala, 2009). Additionally, Comadari et al. (2020) discovered that visual analysis and mental imagery have an impact on reading achievement. According to some studies, preschool assessments of visual motor skills are related to future reading success (Franceschini et al., 2012).

One factor that may either directly or indirectly affect decoding is visual perception, particularly in regular languages where alphabetic principles are introduced in the first grade of elementary school. But only a small amount of research has been done on the topic of visual skills (Bellocchi et al., 2017). It has been determined that children with high levels of visual perception at the beginning of the first grade also have high levels of reading and reading comprehension (Memiş and Sivri, 2016). It was also found that children's writing (Ferah, 1996) and reading errors (Memiş and Sivri, 2016) were related to their visual perception development in the first grade. Keskinova and Ajdinski, 2018 reported that one of the variables predicting Finnish children's reading skills in first grade was visual motor skills. It can be considered that visual perception may be one of the variables that may directly or indirectly affect decoding, especially in regular languages where alphabetic principles are taught in the first grade of primary school. Children with specific learning disabilities, such as those who have dyslexia-dysgraphia, can also exhibit deficiencies in motor coordination development (Keskinova and Ajdinski, 2018). Children who struggle with visual analysis often misspell letters and letter groups when writing or write them incorrectly (Ferah, 1996). Inadequate discrimination abilities could lead to more people writing letters backwards (mirror image). This is why early support for the development of visual perception is important.

Phonological Awareness and Literacy

The ability to recognize, comprehend, and manage the fact that language is made up of smaller units like words, syllables, and sounds is known as phonological awareness (Trawich-Smith, 2013). Some studies on reading have found strong evidence that phonological awareness is one of the important variables predicting children's literacy skills in primary school (Abbott and Berninger, 1993; Lerkanen et

al., 2004; Muter et al., 1997; Pfof, 2015; Sandoval, Briceño and Bargas, 2014; Zarić, Hasselhorn and Nagler, 2021; Stahl and Murray, 1994). In some studies, it has been determined that this skill is developed by learning real words through reading (Lerkkanen et al., 2004; Leppänen et al., 2009; Scarborough et al., 1998). Moreover, it has been determined that general and word-specific orthographic knowledge contributes to reading and spelling performance beyond phonological awareness (Zarić, Hasselhorn and Nagler, 2021). In one study, phonemic awareness with phoneme errors in word writing, stress awareness was determined to be related to accent errors in word/sentence writing. Based on this result, it has been suggested that prosodic awareness may also be related to learning to spell words (Gutierrez-Palma et al., 2019). Recent studies show that phonological awareness directly affects spelling, and its effect on reading is through invented orthography (Albuquerque and Martins, 2022). It has been found that children's invented spelling predicts their subsequent spelling and reading performance (Ouellette and Sénéchal, 2017, Treiman et al., 2019) and contributes to their learning to spell and read (Ouellette and Sénéchal, 2017). These spellings reveal children's knowledge of how letters are combined rather than reflecting a lack of alphabet knowledge or phonological awareness (Treiman, Kessler and Pollo, 2022). Reading has also been reported to predict phonological awareness (Burgess and Lonigan, 1998). However, researchers have not yet found sufficient evidence on the effects of this variable on visual perception and literacy errors in Turkish.

Present Study

In Turkey, formal learning of reading and writing begins in the first grade of primary school. Since Turkish has few syllable structure possibilities and each letter corresponds to a sound, it is known that letter-sound matching and spelling skills are acquired rapidly, and some children learn to read and write towards the end of the first semester of the first grade (Durgunoglu and Oney, 1999; Erdogan, 2012). Therefore, it can be expected that the effect of phonological awareness skills on literacy skills at the transition stage (Ehri, 1986) is relatively low. However, until reading and writing become automatic, both reading and writing errors continue to be made (Ferah, 1996; Ruotsalainen et al., 2022). The results of a study conducted with primary school first-graders aimed at learning two languages (Finnish-Estonian) whose spellings (orthography) are similar also revealed that there are students who cannot learn to decode in the spring semester (Ruotsalainen et al., 2022). In Turkish, it can be said that some of the first-grade students' writing/spelling achievements may also be low due to the mistakes made in letters/sounds that are difficult to encode, especially in the transition phase.

Children learning to read and write in regular languages spend very little time in the preliminary and partial alphabetic phases after learning the letter-sound relationship; however, letter name and shape knowledge is also fundamental for these phases (Ehri and McCormick, 1998). However, since children in Turkey are not taught alphabetic knowledge in the preschool period, it can be predicted that automaticity in letter-sound matching may progress more slowly in some children. The relatively low correlation of phonological awareness with first literacy skills when measured at the beginning of the first grade in Turkish first literacy teaching (Erdogan, 2012) and the correlation of these skills with visual perception (Ferah, 1996; Memiş and Sivri, 2016) requires taking into account the effect of visual perception as well as phonological awareness on literacy skills. Therefore, we predict that visual perception may have a direct effect on the acquisition of literacy/spelling skills in regular languages such as Turkish, as well as an indirect effect through phonological awareness as decoding continues. Analyzing these relationships may also clarify the educational measures that can be taken for children who have difficulties in the literacy learning process.

In this study, we focused on the mediating relationships between phonological awareness and visual perception variables and initial literacy/spelling errors in Turkish, a regular and highly transparent language, in the first grade of primary school. It was hypothesized that it would be possible to determine the levels of literacy/spelling errors in Turkish through a measurement tool that includes the letters, sounds, and affixes that children confuse when learning to read and write for the first time. This study can be said to be one of the first studies in the literature in terms of its target group being first-grade students, taking into account the effect of visual perception as well as phonological awareness in early literacy acquisition and focusing on the direct and indirect relationships of literacy errors made during the decoding process with prerequisite variables. No related study was found by the researchers in terms of this context and the variables addressed, and the analyzes performed. However, it is known that both in the period before the start of primary school and the process of first reading and writing, certain competencies and skills that form the basis of reading and writing (the concept of printing, visual perception, phonological awareness, etc.), affect academic performance in the first reading, writing, and learning process. For example, phonological awareness is one of the strongest predictors of reading skills (Ehri et al., 2001; Pfof, 2015; Sandoval, Briceño and Bargas, 2014; Zarić, Hasselhorn and Nagler, 2021). It is thought that the results

obtained from the study will shed light on the understanding of the literacy process in regular languages.

Purpose of the Study

The first aim of this study is to determine the possible multiple mediating roles of reading and word writing errors and phonological awareness in the effect of visual perception on sentence writing errors; the second aim is to determine the possible multiple mediating variable relationships of visual perception, phonological awareness, reading speed, word and sentence writing errors in the effect of visual perception on reading errors. In line with these aims, the research questions were determined as follows:

- Do phonological awareness, word writing, and reading errors have significant multiple mediating roles in the effect of visual perception on sentence writing errors?
- Do reading speed, phonological awareness, word and sentence writing errors have significant multiple mediating roles on the effect of visual perception on reading errors?

Materials and Methods

In this study, explanatory relational research design, one of the survey models, was used. Considering that the possible mediating factors between the success in the first literacy learning process and the reading/writing errors made by children and visual perception/phonological awareness variables are questioned, it can be said that the explanatory relational design is suitable for the purpose of the study (Creswell, 2013).

Population and Sample

Considering human resources, material resources, and time, it was decided to research the sample (Buyukozturk et al., 2012). The population of the study consisted of 69487 first-grade primary school students in Istanbul in the 2018-2019 academic year. However, considering the research costs (transportation, the printing of measurement tools, etc.) and time, the research was conducted on a sample expected to represent the population. The sample group of the study consisted of 552 first-grade students selected by convenience sampling from six schools in three districts of Istanbul. First, three easily accessible districts were determined. Considering time and cost, six schools from these districts were included in the study. Two of the schools were from regions with less socioeconomic development, two were from medium and two were from regions with more socio-economic development. Applications were carried out with first-year students whose parents' consent was obtained from the determined schools. It was observed that 47.8% (n=264) of the students in the sample were female, and 52.2% (n=288) were male. It was found that the number of samples representing 69487 people was 382 according to the formula of Krejcie and Morgan (1970), taking the ratio of the universe (p) 0.5, degree of accuracy (d) 0.05 and $X^2=3.841$ (at the level of 0.05).

Data Collection Tools

The Mountain Shadows Phonological Awareness Scale (MS-PAS), developed in 1998 (Watkins and Edwards, 2004), was adapted to Turkish culture by Buyuktaskapu (2012). Both the original and adapted forms consisted of 20 items, and both the same and different sound categories were used. Since the structure of the scale was known before the analyses, and it was desired to examine whether the available data set fit the predicted structure, CFA was conducted (Brown, 2015). Model fit indices were found to support data-model fit. χ^2/sd value less than 2 and RMSEA value less than 0.05 indicated a good fit (Schermelleh-Engel, Moosbrugger and Müller, 2003). CFI and TLI values greater than 0.95 indicated a good fit (Hu and Bentler, 1999). The factors were considered as a total due to their strong relationship with each other (0.882) (Cohen, Swerdlik and Sturman, 2013). It can be said that the reliability of the data obtained from the MS-PAS scale in terms of internal consistency is at an adequate level (McDonald omega coefficients 0.94 for the whole scale, n=552). Since the data set was dichotomized, CFA was conducted with a (1-0) tetrachoric correlation matrix.

The Word and Sentence Writing Errors Scale were developed by the researchers. The primary school word and sentence writing skills scales were aimed to include some language structures of Turkish. The targeted language structures are, respectively, low frequency (f, ç, h, v, ğ) and potentially confused (b, d, p, m, n) sounds; front-to-final open syllable, closed syllable, consonant-consonant and vowel-consonant syllable structures and some construction, inflection and possessive suffixes (-cı, -çi, lı, -luk, -lük, -cü, -suz, (-ğ)im). The sentences were organized as four, five, and six words, and the words as one, two, three, four, and five syllables, and it was determined that the scales adequately sampled the scope in line with the expert opinions. Types of typing errors were arranged according to expert opinions, and in the grading scale of word and sentence writing errors, words written without any errors were scored in three categories no errors (3), 1-3 errors partially wrong (2), and 4 or more errors wrong (1). The word

writing errors scale consisted of 10 items, and the rating scale for evaluating sentence writing errors consisted of 15 items. The dictation study was conducted with puppets and scenarios, and sentences were dictated in the form of phrases by dividing them into two meaningful parts to exclude the short-term memory effect. The Word and Sentence Writing Skills scale were administered in a single session during the same class period in March.

McDonald Omega coefficients (0.93 for sentence writing errors and 0.93 for word writing errors) were used in the reliability analysis. Exploratory factor analysis (EFA) was performed to reveal the structure of the word and sentence writing scales, and it was found that the data obtained from the scales had a unidimensional structure; therefore, a total score could be obtained from the scale (KMO 0.91 for sentence writing errors, $\chi^2= 2931.4$; $sd=15$; $p=0.00$, the variance explained by a single factor was 74.95%, and the factor loadings of the variables were found to be between 0.59 (plot 6) and 0.92 (plot 4). For word writing, KMO was 0.88, $\chi^2= 2364.8$; $sd=6$; $p=0.00$, the variance explained by a single factor was 89.54%, and the factor loadings of the variables were between 0.91 (plot 4) and 0.95 (plot 3).

The distribution of the total scores obtained from the sentence and word writing errors was examined, and it was observed that they were normally distributed (Skewness coefficient -0.48, kurtosis coefficient -1.72 for the lower group for sentence writing errors, skewness coefficient 1.03, kurtosis coefficient -0.58 for the upper group; For word writing errors, the coefficient of skewness for the lower group was -0.75, the coefficient of kurtosis was -1.42, the coefficient of skewness for the upper group was 0.37, the coefficient of kurtosis was -0.83). As a result of the independent samples t-test, it was observed that the average score obtained from the upper group for sentence writing errors (3.99) was statistically significantly different from the average score obtained from the lower group (-6.35) ($t(154,70)=-20.73$, $p<0.01$). For word writing errors, the mean score obtained from the upper group (2.51) was statistically significantly different from the mean score obtained from the lower group (-4.19) ($t(151,96)=-16.21$, $p<0.01$). On the other hand, item analysis was conducted for the parceled items of sentence and word writing errors, and the corrected item-total score correlation was examined for this purpose. It was observed that all item means differed between the lower and upper groups for both sentence and word writing errors; on the other hand, item-total correlations for sentence writing errors ranged from 0.57 (parcel 6) to 0.87 (parcel 5). Item-total score correlations for word writing errors ranged from 0.88 (parcel 4) to 0.91 (parcel 2). Accordingly, it was determined that the item discriminations were at a sufficient level and that the items discriminated against individuals with and without the trait measured in the item. In addition, it can be stated that the item parcels showed a sufficient relationship with the test as a whole.

For the exploratory factor analysis (EFA) conducted with the data obtained from the sentence and word writing errors, it was observed that the correlations between some variables were high, so item parceling was created to overcome the multicollinearity problem. The sentence writing data set was formed by grouping 15 items into 6 parcels, and these 6 variables were standardized and converted into z scores. For the exploratory factor analysis (EFA) conducted with the data obtained from word writing errors, 43 participants with significant Mahalanobis distance values ($\alpha = 0.001$) were excluded from the data set, and the analyses continued with a data set of 509 participants. The word writing data set was created by grouping 10 items into 4 parcels, and these 4 variables were standardized and converted into z scores. Therefore, since the word and sentence writing data set was continuous, EFA was conducted using the Pearson Product Moment correlation matrix.

While identifying reading errors, a literature review was conducted, and possible errors were listed. In the classification of errors, similar to the study of [Dessimoni, Scalisi and Orsolini \(2012\)](#), a classification was made as letter/syllable/word omission, letter/syllable/word insertion, and stress-tone-stop-sound quality. A 10-item rating scale was created in line with expert opinion. The rating scale is scored in 3 categories (1-Wrong, 2-Partially Wrong, 3-No Error). First, exploratory factor analysis (EFA) was performed with the reading error variables (KMO value 0.91, $\chi^2= 6249.6$; $sd=45$; $p=0.00$), and it was seen that the factor loads of the items ranged between 0.37 (item 6) and 0.87 (item 3). It can also be stated that the data obtained from the scale has a unidimensional structure, and therefore a total score can be obtained from the scale (explained variance 58.21%, McDonald Omega coefficient 0.92). Since the observed variables were skewed, the unweighted least squares (ULS) method was used as the factor extraction method in EFA. Since the data set was scored with three categories (1-3), EFA was performed with a polychoric correlation matrix. Factor 10.10 software ([Lorenzo-Seva and Ferrando, 2019](#)) was used in EFA for word writing, sentence writing, and reading errors. For reading speed, a text consisting of 117 words was given to the students, and their reading speed was measured in seconds, and the number of words they read per minute was determined by subtracting the words they read with errors from the total words they read.

The adaptation of the Frostig Visual Perception test ([Maslow et al., 1964](#)) to Turkish culture was

conducted by Aral and Butun (2016). Since the structure of the scale was known from previous studies (Aral and Butun, 2016), evidence for construct validity was sought with CFA. After modification, the χ^2 /sd value was found to be 5.63 and did not show an acceptable fit, while the RMSEA value was found to be 0.092, indicating a moderate fit. CFI and TLI values showed a very good fit. When the model-data fit is evaluated in general, it can be stated that the established measurement model is supported by the data. As a result of the reliability analysis of the data obtained from the Visual Perception Test, the McDonald Omega coefficient was found to be 0.87. According to the Mahalanobis distance, the data belonging to 6 people were excluded from the data set because it was significant at $\alpha = 0.001$ level. Maximum likelihood (ML) was selected as the estimation method in CFA using the Pearson correlation matrix for continuous data, and CFA was performed using Mplus software (Muthén and Muthén, 2012) for phonological awareness and visual perception.

Data Analysis

To answer the research questions, the mean scores of visual perception, phonological awareness, reading and writing (word and sentence) errors, and reading achievement test total scores were taken. While addressing the visual perception variable, standardization was performed to eliminate the effect of age. For this reason, the visual perception variable was examined as a percentage, and since the z values of the skewness and kurtosis values of the variables showed that the normality assumption was not met, the analyzes were carried out through the Spearman rank difference correlation coefficient. The results were interpreted according to the criteria of low correlation coefficients up to 0.30, medium correlation coefficients between 0.30 and 0.70, and high correlation coefficients above 0.70 (Buyukozturk, 2011). To answer the multiple mediation questions of the study, the Process plugin for SPSS prepared by Hayes (2018) was used in the mediation analysis. Comments on the mediation effect were made by taking into account the conditions presented by Baron and Kenny (1986). According to this, X's Y M, the effect of variable X on variable Y is analyzed by means of M. 1) Variable X statistically affects variable Y significantly predicted, 2) Variable X is statistically equivalent to variable M significantly predicted, 3) When variable X is kept under control, variable M, Y variable at a statistically significant level, 4) M variable control variable X is a statistically significant predictor of variable Y or there should be a reduction in the amount of association.

Results

As a result of the descriptive statistics of the research (n=552), visual perception (x=63.80, ss=32.12, min.=1, max.=100), phonological awareness (x=0.65, ss=0.25 min.=0, max.=1), reading error (x=2.40, ss=0.45, min.=1, max.=3), reading speed (x=39.09, ss=19.49, min.=0, max. =108), morphological features (x=2.10, ss=0.67, min.=1, max.=3), word writing error (x=2.53, ss=0.50, min.=1, max.=100), sentence writing error (x=2.51, ss=0.54, min.=1, max.=3) variables' mean, standard deviation, minimum and maximum values were calculated.

Spearman rank difference correlation coefficient was used to examine the relationships between students' visual perception, phonological awareness, reading achievement, word writing error, and sentence writing error levels (Table 1).

Table 1
Correlations between variables

| Variable | Visual perception | Sentence writing error | Word writing error | Phonological awareness | Mean Total Scores for Reading Error, Overall, and Reading Speed |
|---|-------------------|------------------------|--------------------|------------------------|---|
| Visual perception | 1,00 | 0,34* | 0,36* | 0,02 | 0,49* |
| Sentence writing error | | 1,00 | 0,70* | 0,09* | 0,62* |
| Word writing error | | | 1,00 | 0,07 | 0,60* |
| Phonological awareness | | | | 1,00 | 0,02 |
| Mean Total Scores for Reading Error, Overall, and Reading Speed | | | | | 1,00 |

*p<0,05

When the correlations between the variables are analyzed, it can be said that the scores obtained from the phonological awareness scale have no relationship with other variables. Reading achievement is positively and moderately correlated with sentence writing errors and word writing errors. Visual Perception is positively and moderately related to reading achievement and word and sentence writing errors. A significant positive correlation was found between sentence writing errors and word writing errors. Although the relationship between sentence writing error and phonological awareness variable is statistically significant, it is at a very low level.

To answer the research question "The mediating role of word writing error, phonological awareness and reading error in the effect of visual perception on sentence writing error," "multiple mediation effect" was examined. Direct effects between variables were examined (Table 2)

Table 2

Direct effects of visual perception on phonological awareness, word writing error, reading error, and sentence writing error

| Predictor Variable | Predicted Variable | Ba | SEb | β c |
|------------------------|------------------------|------|-----|-----------|
| Visual Perception | Phonological awareness | ,03 | ,04 | ,03 |
| Visual Perception | Word Writing Error | ,46 | ,04 | ,46* |
| Phonological awareness | | ,05 | ,04 | ,05 |
| Visual Perception | | ,24 | ,03 | ,24* |
| Phonological awareness | Reading Error | -,00 | ,03 | -,00 |
| Word Writing Error | | ,60 | ,03 | ,60* |
| Visual Perception | Sentence writing Error | ,03 | ,02 | ,03 |
| Phonological awareness | | ,02 | ,02 | ,02 |
| Word Writing Error | | ,71 | ,03 | ,71* |
| Reading Error | | ,20 | ,03 | ,20* |

p < .05 Unstandardized parameter estimation *b* Standard error *c* Standardized parameter estimation

As a result, the total effect of visual perception on sentence writing error ($c=0.46$; $SE=.04$; $t=12.29$; $p=.00<.05$) was found to be significant. The direct effect of visual perception on the mediating variable phonological awareness ($B=.03$; $\beta=.03$, $SE=.04$; $t=0.80$; $p=.43>.05$) was not significant. The direct effect of visual perception on word writing error ($B=.46$; $\beta=.46$; $SE=.04$; $t=12.08$; $p=.00<.05$) and reading error ($B=.24$; $\beta=.24$; $SE=.03$; $t=7.53$; $p=.00<.05$) was found to be significant. The direct effect of the mediating variables reading error ($B=.20$; $\beta=.20$; $SE=.03$; $t=6.64$; $p=.00<.05$) and word writing error ($B=.71$; $\beta=.71$; $SE=.03$; $t=24.92$; $p=.00<.05$) on sentence writing error was significant, while the direct effect of phonological awareness ($B=.02$; $\beta=.02$; $SE=.02$; $t=1.17$; $p=.24>.05$) on sentence writing error was not significant. When the direct effect of visual perception and mediating variables on sentence writing error at the same time was analyzed, the effect of visual perception on sentence writing error was not significant ($B=.03$; $\beta=.03$; $SE=.02$; $t=1.40$; $p=.16>.05$). When the effects of the mediating variables among themselves are analyzed, it can be stated that the effect of phonological awareness on word writing error ($B=.05$; $\beta=.05$; $SE=.04$; $t=1.29$; $p=.20>.05$) and the effect of phonological awareness on reading error ($B=-.00$; $\beta=-.00$; $SE=.03$; $t=-.12$; $p=.91>.05$) is not significant. The effect of word writing error on reading error was significant ($B=.60$; $\beta=.60$; $SE=.03$; $t=18.64$; $p=.00<.05$).

The indirect effects of visual perception on phonological awareness, word writing error, reading error, and sentence writing error were examined. The results are shown in Table 3.

Table 3

Indirect effects and specific indirect effects of visual perception on phonological awareness, word writing error, reading error, and sentence writing error

| Indirect Effects | Bootstrap | | | |
|---|----------------|-----|------|------|
| | Point Estimate | SE | Low | High |
| Total | ,43 | ,04 | ,36 | ,50 |
| Intermediary Value 1: Phonological awareness | ,00 | ,00 | -,00 | ,01 |
| Intermediary Value 2: Word writing error | ,33 | ,04 | ,25 | ,40 |
| Intermediary Value 3: Reading Error | ,05 | ,01 | ,02 | ,08 |
| Intermediary Value 4: Phon. Aw. and Word. Wri. Er. | ,00 | ,00 | -,00 | ,01 |
| Intermediary Value 5: Phon. Aw. and Read. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 6: Word. Wri. Er. and Read. Er. | ,05 | ,01 | ,03 | ,08 |
| Intermediary Value 7: Phon. Aw., Word. Wri. Er. and Read. Er. | ,00 | ,00 | -,00 | ,00 |
| C1 (Intermediary Value 1 – Intermediary Value 2) | -,33 | ,04 | -,40 | -,25 |
| C2 (Intermediary Value 1 – Intermediary Value 3) | -,05 | ,01 | -,08 | -,02 |
| C5 (Intermediary Value 1 – Intermediary Value 6) | -,05 | ,01 | -,08 | -,03 |
| C7 (Intermediary Value 2 – Intermediary Value 3) | ,28 | ,05 | ,18 | ,37 |
| C8 (Intermediary Value 2 – Intermediary Value 4) | ,33 | ,04 | ,25 | ,40 |
| C9 (Intermediary Value 2 – Intermediary Value 5) | ,33 | ,04 | ,25 | ,40 |
| C10 (Intermediary Value 2 – Intermediary Value 6) | ,27 | ,04 | ,19 | ,36 |
| C11 (Intermediary Value 2 – Intermediary Value 7) | ,33 | ,04 | ,25 | ,40 |
| C12 (Intermediary Value 3 – Intermediary Value 4) | ,05 | ,02 | ,02 | ,08 |
| C13 (Intermediary Value 3 – Intermediary Value 5) | ,05 | ,01 | ,02 | ,08 |
| C15 (Intermediary Value 3 – Intermediary Value 7) | ,05 | ,01 | ,02 | ,08 |
| C17 (Intermediary Value 4 – Intermediary Value 6) | -,05 | ,01 | -,08 | -,03 |
| C19 (Intermediary Value 5 – Intermediary Value 6) | -,05 | ,01 | -,08 | -,03 |
| C21 (Intermediary Value 6 – Intermediary Value 7) | ,05 | ,01 | ,03 | ,08 |

The statistical significance of the indirect effects in the model is examined using the bootstrap technique. Results were obtained with 95% confidence intervals. The total indirect effects of visual perception on phonological awareness, word writing error, reading error, and sentence writing error were statistically significant (point estimate=.43; 95% CI [.36 - .50]). In the indirect effect of visual perception on sentence writing error, phonology (point estimate=.00; 95% CI [-.00 - .01]), phonology and word writing error (point estimate=.00; 95% CI [-.00 - .01]), phonology and reading error (point estimate=.00; 95% CI [-.00 - .00]), phonology and reading error (point estimate=.00; 95% CI [-.00 - .00]), and phonology, word writing error, and reading error (point estimate=.05; 95% CI [.02 - .08]), while the mediation of reading error (point estimate=.05; 95% CI [.02 - .08]) and word writing error (point estimate=.33; 95% CI [.25 - .40]) was not significant. The significant pairwise comparisons of the mediating variables are shown in Table 2. For example, word writing error is a stronger mediator than phonological awareness, and word writing error is a stronger mediator than reading error. Also, reading error is a stronger mediator than reading error and phonological awareness. In summary, word writing error and reading error mediate the effect of visual perception on sentence writing error.

To answer the research question “The mediating role of reading speed, phonological awareness, word and sentence writing errors in the effect of visual perception on reading errors,” firstly “multiple mediation effect” was examined. Direct effects between variables were examined (Table 4).

Table 4
Direct effects of visual perception on phonological awareness, word writing error, reading error, and sentence writing error

| Predictor Variable | Predicted Variable | Ba | SEb | β c |
|------------------------|------------------------|------|-----|-----------|
| Visual Perception | Reading Error | ,02 | ,02 | ,02 |
| Reading Speed | | ,61 | ,03 | ,61* |
| Sentence writing Error | | ,15 | ,04 | ,15* |
| Word Writing Error | | ,20 | ,04 | ,20* |
| Phonological Awareness | | ,01 | ,02 | ,01 |
| Visual Perception | Word Writing Error | ,05 | ,02 | ,05 |
| Reading Speed | | ,07 | ,03 | ,07* |
| Phonological Awareness | | -,00 | ,02 | -,00 |
| Sentence writing Error | | ,81 | ,03 | ,81* |
| Visual Perception | Sentence writing Error | ,16 | ,04 | ,16* |
| Reading Speed | | ,56 | ,04 | ,56* |
| Phonological Awareness | | ,06 | ,03 | ,06 |
| Visual Perception | Phonological Awareness | ,03 | ,05 | ,03 |
| Reading Speed | | ,00 | ,05 | ,00 |
| Visual Perception | Reading Speed | ,55 | ,04 | ,55* |

p < .05 *a* Unstandardized parameter estimation *b* Standard error *c* Standardized parameter estimation

As a result, it was observed that the total effect of visual perception on reading errors ($c = .52$; $SH = .04$; $t = 14.19$; $p = .00 < .05$) was significant. The direct effect of visual perception on the mediating variables of reading speed ($B = .55$; $\beta = .55$; $SH = .04$; $t = 15.34$; $p = .00 < .05$) and sentence writing error ($B = .16$; $\beta = .16$; $SH = .04$; $t = 4.12$; $p = .00 < .05$) was significant. The direct effect of reading error on the mediating variables phonological awareness ($B = .03$; $\beta = .03$; $SH = .05$; $t = .66$; $p = .51 > .05$) and word writing error ($B = .05$; $\beta = .05$; $SH = .03$; $t = 1.90$; $p = .06 > .05$) was not significant. The mediating variables reading speed ($B = .61$; $\beta = .61$; $SH = .03$; $t = 21.15$; $p = .00 < .05$), word writing error ($B = .20$; $\beta = .20$; $SH = .04$; $t = 4.65$; $p = .00 < .05$) and sentence writing error ($B = .15$; $\beta = .15$; $SH = .04$; $t = 3.42$; $p = .00 < .05$), while the direct effect of phonological awareness ($B = .01$; $\beta = .01$; $SH = .02$; $t = .32$; $p = .75 > .05$) on reading errors was not significant. When the direct effects of visual perception and mediating variables on reading errors at the same time were analyzed, the effect of visual perception on reading errors was not significant ($B = .02$; $\beta = .02$; $SH = .02$; $t = .98$; $p = .33 > .05$). When the effects of mediating variables among themselves were examined, it was found that reading speed had no significant effect on phonological awareness ($B = .00$; $\beta = .00$; $SH = .05$; $t = .02$; $p = .99 > .05$), phonological awareness had no significant effect on sentence writing errors ($B = .06$; $\beta = .06$; $SH = .03$; $t = 1.96$; $p = .05 > .05$) and the effect of phonological awareness on word writing error ($B = -.00$; $\beta = -.00$; $SH = .02$; $t = -.11$; $p = .92 > .05$) was not significant. The effects of reading speed on sentence writing error ($B = .56$; $\beta = .56$; $SH = .04$; $t = 14.47$; $p = .00 < .05$), sentence writing error on word writing error ($B = .81$; $\beta = .81$; $SH = .03$; $t = 29.29$; $p = .00 < .05$) and reading speed on word writing error ($B = .07$; $\beta = .07$; $SH = .03$; $t = 2.36$; $p = .02 < .05$) were significant.

The indirect effects of visual perception on reading errors through reading speed, phonological awareness, and word and sentence writing errors were examined. The results are shown in Table 5.

Table 5

Indirect effects of visual perception on reading errors via reading speed, phonological awareness, word, and sentence writing errors¹

| Indirect Effects | Point Estimate | Bootstrap 95% Confidence Interval | | |
|--|----------------|--------------------------------------|------|------|
| | | SH | Low | High |
| Total | ,49 | ,04 | ,41 | ,57 |
| Intermediary Value 1: Reading Speed | ,33 | ,03 | ,28 | ,38 |
| Intermediary Value 2: Phonology | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 3: Sentence Writing Error | ,02 | ,01 | ,01 | ,05 |
| Intermediary Value 4: Word Writing Error | ,01 | ,01 | ,00 | ,02 |
| Intermediary Value 5: Reading Speed and Phonology | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 6: Reading Speed and Sen. Wri. Er. | ,05 | ,02 | ,01 | ,08 |
| Intermediary Value 7: Reading Speed and Wor. Wri. Er. | ,01 | ,00 | ,00 | ,02 |
| Intermediary Value 8: Phonology and Sen. Wri. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 9: Phonology and Wor. Wri. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 10: Sen. Wri. Er. and Wor. Wri. Er. | ,03 | ,01 | ,01 | ,05 |
| Intermediary Value 11: Reading Speed, Phonology and Sen. Wri. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 12: Reading Speed, Phonology and Wor. Wri. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 13: Reading Speed, Sen. Wri. Er. and Wor. Wri. Er. | ,05 | ,02 | ,02 | ,08 |
| Intermediary Value 14: Phonology, Sen. Wri. Er. and Wor. Wri. Er. | ,00 | ,00 | -,00 | ,00 |
| Intermediary Value 15: Reading Speed, Phonology, Sen. Wri. Er. and Wor. Wri. Er. | ,00 | ,00 | -,00 | ,00 |

¹ The numbers in the third or next digits of the mediator variables Word Writing Error (CI [.0004 - .0212]), Reading Speed and Word Writing Error (CI [.0003 - .02]) are greater than one or more than one. Therefore, the mediator role was interpreted as significant. Since the numbers were given in two digits, the third digits of the numbers were not written in the tables in order not to disrupt the order.

The statistical significance of the indirect effects in the model is examined using the bootstrap technique. The results were obtained with 95% confidence intervals. The total indirect effect of visual perception on reading errors through reading speed, phonological awareness, and sentence and word writing errors was statistically significant (point estimate=.49; 95% CI[.41 - .57]). In the indirect effect of visual perception on reading errors, reading speed (point estimation=.33; 95% CI[.28 - .38]), sentence writing error (point estimation=.02; 95% CI[.01 - .05]), word writing error (point estimate=.01; 95% CI[.00 - .02]), reading speed and sentence writing error (point estimate=.05; 95% CI[.01 - .08]), reading speed and word writing error (point estimate=.01; 95% CI[.00 - .02]), sentence writing error and word writing error (point estimate=.03; 95% CI[.01 - .05]), reading speed , sentence writing error and word writing error (point estimate=.05; 95% CI[.02 - .08]) are significant. As seen in Table 5, it was concluded that the mediation effect of other mediating variables and their associations was not significant. It was observed that 85/105 of the pairwise comparisons showing the power of the mediating variables for specific indirect effects were significant. In general, it can be stated that reading speed has a stronger mediation effect than the other 14 mediating variables. There is no significant difference between the mediator variables of sentence writing error and word writing error. In summary, when all conditions are taken into consideration, reading speed, sentence writing error, reading speed and sentence writing error, reading speed and word writing error, sentence writing error and word writing error have a mediating effect on the effect of visual perception on reading errors. This result is important in terms of revealing that visual perception affects reading errors both directly and through other literacy components.

Discussion

Literacy studies in recent years have focused on the effect of oral language skills on literacy skills. However, our research results reveal that visual perception's effect on literacy in transparent languages should be considered. The findings of the study showed that visual perception affects sentence writing errors both directly and indirectly through the mediating variables of word writing and reading errors in the learning of the Turkish language, which is a transparent language. Findings that writing skills at the decoding level predict reading support our research (Anderson et al., 2018). Word writing error is a stronger mediating variable in the effect of visual perception on sentence writing. Reading error is also stronger mediating variable than reading error and phonological awareness. These results point to the importance of spelling development. According to literacy development models, spelling is a low-level skill for writing (Juel, Griffith and Gough, 1986). Children's sentence writing errors indicate that they are not yet automatized in decoding letter-sound correspondences rather than a phonological awareness deficit (Treiman, Kessler and Pollo, 2022). In order to learn to read and write, the letter-sound connection must be established correctly. Even if children can decompose spoken language into units, they continue to make reading and writing errors unless the ability to recognize and remember the letter corresponding to the sound is automatic. It can be said that more mistakes are made, especially in writing, than in reading. Research on made-up spellings supports this conclusion (Ouellette and Sénéchal, 2017).

In a very transparent language such as Turkish, letter knowledge is given during literacy instruction. In the first semester of school, the teaching of all letters and sounds is completed. However, as new letters-sounds continue to be taught without thoroughly reinforcing the previously learned letter and sounds, especially similar letters and sounds can be confused. The reason for this is the difficulty in coding the visually similar (such as b-d, p-b), hard-to-hearing (such as f-v-h-g), or less-used letters and sounds in Turkish. Visual memory is affected by the ability to perceive, distinguish and recognize the physical features of perceptual stimuli. This skill is also affected by our previous experiences (Lupyan et al., 2020). In addition, the visual perception was found to have a strong effect on reading speed but a weaker effect on sentence writing errors and word writing errors, respectively. These results suggest that the contribution of phonological awareness to the reduction of reading, word and sentence writing errors in the transition phase of children who learn to read and write in a regular language in the first grade of primary school decreases over time, while the effect of visual perception continues, albeit limited. The results of studies examining the relationship between children's word recognition, reading comprehension, spelling, writing success, writing/spelling errors and visual perception variables also support this conclusion (Cayir, 2017; Clutten, 2009; Ferah, 1996; Memis and Sivri, 2016; Pienaar, Barhors and Twisk, 2014). It can be said that the difficulty in analyzing a letter within the letter groups directly affects the visual coding and writing skills in the decoding process.

The second result of the study on multiple mediation relationships revealed that both word and sentence writing/spelling errors and reading speed play a mediating role in the effect of visual perception on reading errors. When phonological awareness skill was measured in the first semester of the first grade of primary school, it was determined that its effect on reading speed, reading errors, and word and sentence writing/spelling errors measured in the second semester was very weak or had no significant effect. The reason for this may be the early development of phonological awareness skills in Turkish, which is a regular language, and the fact that the letter-sound matching training given in the first semester led to an increase in phonological awareness tasks (Erdogan, 2012; Durgunoglu and Oney, 1999). The importance of phonological awareness skills, which has a high contribution at the beginning, decreases at the end of the transition period.

The conclusion that the effect of phonological awareness on reading, word and sentence writing errors is not significant is supported by some research results (Erdogan, 2012; Guldenoglu, Kargin and Ergul, 2016) that examine the relationship between phonological awareness development and reading-writing/spelling in regular and irregular languages (Burgess and Lonigan, 1998; Vaessen and Blomert, 2013; Juel, Griffith and Gough, 1986). For example, according to the results of a study conducted with Finnish-speaking children, phonological awareness skills and letter-sound matching skills contribute to spelling skills (Vaessen and Blomert, 2013). The results of a study on Turkish spelling skills also showed that the underlying evidence for spelling is phonological awareness, while reading is fast automatic naming skills (Babayigit and Stainthorp, 2010). This may have been due to the difference in the time when these skills were measured and the variables considered. In addition, it can be thought that the power of phonological awareness, which was initially effective in the relationship between reading and writing/spelling, gradually weakened, and decoding and phonological processing skills became more effective in the transition phase (Vaessen and Blomert, 2013). However, phonological processing skills were not

measured in this study.

According to other results obtained in the study, the fact that spelling errors are effected by visual perception requires careful examination of memory beyond perception. Because sounds must be translated into visual symbols in order to be replicated when writing. Our current study is partially supported by the finding that preschool children's early decoding skills are related to their capacity to copy designs (Cameron et al., 2012). Children who struggle to make the effort necessary for developing early literacy skills because their motor and cognitive needs conflict may find it challenging to write letters (Traverso et al., 2022). It might be beneficial to plan actions and activities that enhance visual short-term memory or activate visual processing memory in light of the connection between perception and memory.

Based on another result of the study, the direct effect of word writing errors on sentence writing errors is stronger than the direct effect of reading errors. The result the basic dynamics of writing are partially differentiated from reading. In addition, this finding of the study does not coincide with Lerkkanen's (2003) finding that reading achievement at the end of first grade predicts spelling performance unidirectionally. This is because writing/spelling errors also have a direct effect on reading errors. The fundamental dynamics of writing may differ slightly from reading. Andersen et al. (2018) found strong effects between reading-writing skills. They argued that effective decoding can free up cognitive resources for writing by facilitating spelling, that literacy skills should be measured at different times at the word-sentence level, and that writing can support reading. These results are also consistent with the results of our study. For this reason, teaching should be focused on writing as well as reading (Graham and Herbert, 2011). Our research contributes to the literature by measuring literacy errors at the primary school first-grade level at the sentence and word level. It also reveals visual perception's direct and indirect effects on these errors with other mediating variables. The importance of visual perception skills in the process is also explained. It can be said that reading speed has a strong effect on reading-writing errors. This is because words are read repeatedly, and orthographic coding is performed; thus, the read word is accessed directly and quickly from memory. Because reading requires visual analysis of strings of letters and retrieval of word representations from memory (Bellocchi et al., 2017). This will facilitate syllable and word recognition. According to some studies, first-graders have morphological awareness, which influences how they spell words (Allen and Lembke, 2022; Apel and Werfel, 2014).

According to the other result obtained in the study, the direct effect of reading speed on sentence writing errors is significant and strong. The strongest variable that directly affects reading errors is reading speed; the other variable is visual perception. Although the effect of word and sentence writing errors on reading errors was significant, it was observed that their power was slightly lower than the other variables. Children who make reading errors will make more effort to decode words and read more slowly. According to the other result obtained in the study, the strongest variable that directly affects reading errors is word writing errors; the other variable is visual perception. When children cannot activate their initial sound/letter awareness while learning to read and write, they have difficulty applying the rules of sound-to-spelling and spelling-to-sound conversion and may make errors. The role of visual perception on word writing errors is an important finding in terms of showing the relationship between both literacy and decoding skills and decoding skills with visual perception. Sound-syllable forgetting errors show that the syllable concept has not developed in written language. Syllables are formed by differentiating the properties of letters over time and by letter-sound blending. In addition to not having basic knowledge and skills related to grammar rules about language elements and lexical rules, word splitting and merging errors show that children have not yet separated spatial relations from objects and that they differentiate and generalize spatial relations slowly (Ferah, 1996).

It can be thought that the basic evidence underlying the transition phase of literacy is beginning to differentiate. In Turkish, which is a transparent language, the effect of phonological awareness decreases in the transition phase of literacy. The effect of visual perception continues. Normally, children learn to read and write by discovering information about word meanings and the connections between sounds and letters (Share, 2004). However, it is also known that word reading requires skills such as phonological encoding and orthographic processing (Bellocchi et al., 2017). Reading requires the analysis, recognition, visualization, activation and use of visual stimuli (letter, syllable, word, etc.) (Commodari et al., 2020). Therefore, word writing errors and visual perception has a direct impact on reading errors. Children must analyze the graphic characteristics of letters, encode language units like letters and words, and possess phonological skills like breaking language down into its constituent sounds, blending sounds, and recognizing rhymes in order to learn to read. Visual spatial abilities are one of the most significant indicators of children's reading development (Zhang and Lin, 2018).

Conclusions

In this study, the authors focus on the relation between visual perception and the mistakes made by first-year students in writing and reading while gaining the first literacy skill. First, the effects of visual perception on sentence spelling errors indirectly through reading, word writing and phonological awareness variables, were determined. Secondly, the impact of visual perception on reading errors indirectly, through reading speed, word-sentence spelling errors, and phonological awareness variables was determined. The results show that visual perception directly affects sentence writing and reading errors. As a result, it has been determined that visual perception indirectly affects sentence spelling errors through word writing, reading errors and phonological awareness tool variables. The relationships among the mediating variables show that word writing errors are the strongest variable that directly affects sentence writing errors. In addition, it has been observed that visual perception indirectly affects reading errors through reading speed, word-sentence writing, and phonological awareness. The relationships between mediator variables show that reading speed is the strongest variable that directly affects reading errors. This research also indicates that visual-spatial skills contribute to developing reading and writing in a very transparent language like Turkish. Although reading seems to mediate writing, its fundamental dynamics differ. Writing also directly affects reading. Particular attention should be given to teaching writing in the transition phase. Although studies in recent years have revealed the importance of oral language skills in literacy acquisition, the results show that visual perception effects are more significant in transparent languages. Visual perception is one of the early literacy skills. Children with insufficient visual perception development may also have difficulty acquiring reading and writing. For this reason, visual perception development should be supported at an early age. Writing is a different skill from reading skill. For this reason, not only reading but also writing teaching should be included in the lessons.

Recommendations

The fact that perception is affected by information indicates that the relationship between literacy errors and memory (processing and long-term memory) should also be examined. Considering the increase in children's word recognition skills during the transition phase of literacy, the contribution of variables such as visual perception and morphological and syntactic awareness can be taken into account. Although the evidence for the effect of phonological processing skills on the automatization of reading gains importance, it can be said that searching for the underlying evidence of literacy in morphological and syntactic awareness tasks, which are real-life skills, may be more beneficial to the field. It can be suggested that teachers and practitioners organize additional activities for visual perception in lessons and give importance to writing activities. In addition, the following recommendations can be made for future research: Research can be designed to investigate the relationship between the variables discussed in this study and early literacy skills such as phonological processing skills, visual-spatial copying, etc. In a study to be conducted in the same context, longitudinal studies can be conducted in which students are followed in terms of related skills. In addition, mixed method studies in which both qualitative and quantitative methods are used together can be used to reach more in-depth and comprehensive data, and studies that can lead to multidimensional discussions can be conducted.

In this study, the Confirmatory Factor Analysis of the MS Phonological Awareness Scale was conducted by taking the total score due to the high correlation between the factors. The fact that it was not investigated whether a second-order factor structure could explain the scale is a limitation of this study. For this reason, conducting second-order factor analyses for the MS Phonological Awareness Scale may be recommended in future studies. In this study, a limitation is that the study was conducted through sampling due to time and cost constraints. In future research, repeating the study with a sample representing the whole of Istanbul may be recommended.

Statements and Declarations

Declaration: This study is based on the first author's doctoral dissertation. All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Author 1. The first draft of the manuscript was written by Author 1 and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

Ethical Statement

This study was ethically approved by University Human Research and Ethics Committee with the decision numbered 2018/215 and dated 21.11.2018.

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Psychological Predictors of Students' Behavior in Internet Under Information Uncertainty

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Abstract: This article is devoted to the study of psychological predictors of students' informational behavior and their peculiarities of over-coming stressful situations. The article reveals the relevance of studying this problem, the degree of study of the topic of informational behavior in various scientific fields. The necessity of studying the motivational basis of informational behavior is substantiated; the analysis of diagnostic approaches to the study of informational behavior is given. The article presents the author's approach to studying the motivational basis of informational behavior and reveals two groups of informational behavior strategies - normative and risky. The empirical part of the article presents an analysis of the conducted research for the study of psychological predictors of students' informational behavior in the Internet. It was revealed that the normative strategy of informational behavior "Internet as a motivating force" has the largest number of correlations with coping strategies and indicators of resilience. The results obtained can prove the adaptability of students who actively use the socially oriented strategy "Internet as a motivating force" and the level of their resilience.

Keywords: informational behavior, informational behavior motivation, normative strategies, risky strategies, psychological predictors, coping strategies, resilience.

Introduction

The familiarity of a modern person to the informational space changes his attitudes, behavior and life-style. The informational society sets certain guidelines for social relations and contributes to the emergence of human informational behavior. The situation of uncertainty increases the level of stress in the modern world and actualizes the coping behavior of a person in the conditions of internet environment.

In the scientific community, there are discussions about the legitimacy of using the term "informational behavior". However, discussions on this issue in foreign psychology led to the popularization and even wider use of this concept.

Informational behavior is manifested in the ability to navigate the informational space, in the skills of informational technology, in the ability to adequately assess and productively use the information received. The ability to create, distribute and be responsible for the dissemination of new information products also lies within the competence of informational behavior. Although the technical side of informational behavior is significant, this phenomenon cannot be considered one-sided, psychological aspects are important components. The lack of research on this aspect of informational behavior actualizes the need to study and disclose the psychological characteristics of informational behavior and its connection with the peculiarities of using coping strategies in the Internet.

Worldwide network of the Internet is considered today not only as an information infrastructure, but as a new virtual space where the urgent needs of both an individual and large groups can be realized. The openness of the Internet provides great opportunities for a person to realize his needs and motives, and the interactivity of this information tool allows you to "touch" various events in real time.

1. Literature review

Russian researchers are actively studying informational behavior and its various aspects. The informational behavior of readers and their information needs were actively studied in the 60-90s by

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Russian librarians and bibliologists (Yu.A. Schreider, E.S. Bernstein, E.L. Shapiro, T.N. Kolytyn). The pedagogical aspect of the informational behavior of specialists was studied by E. Kulakova. The culture of informational behavior of Internet users from a philosophical and cultural approach is considered by Matvienko D. V., the culture of informational behavior as a structural part of informational culture is reflected in the works of Antonov G., Vokhryshev M. G., Gorlov I. I., Degterev A. R., Dulatov A. N., Zinoviev N.B., Zubov Yu.S., Kudrin T. A., Lotman Yu. M., Petrov V. M.

Y. Drescher connects informational behavior to the efforts and actions that a person makes to obtain and master information and create new knowledge (Kulakova, 2000; Matvienko, 2009; Drescher and Atlanova, 2005).

On the Internet, through his informational behavior, a person is revealed, on the one hand, as a consumer, and on the other, as a creator and distributor of information. At the same time, the informational behavior reflects the degree of accessibility and comfort of using information resources (Potekhina and Belyakova, 2001).

The introduction of technical means into the life of a modern person has an impact on the motivational-need-sphere, "new technical means create new needs, as well as change the way existing needs are met. In addition to the main function, technical means are beginning to perform others - to indicate the status of a person, the extent of his acquaintance with technology" (Rasskazova, Emelin and Thostov, 2015).

In connection with the widespread prevalence of information and communication technologies, and in particular the Internet, it becomes urgent to study the features of the informational behavior of active Internet users, the motivational basis of such behavior, predictors of this behavior.

The motives of behavior on the Internet, the study of search queries and their use in the system of individualized online marketing are the subject of research of large corporations operating online. So, Google employees proposed a classification of behavioral models of mobile users, which is based on the motivation for going online:

1) "Repetitive Now": use mobile apps to search for current, updated and recurring information to stay in the loop. As a rule, this is viewing the same type of data, but at different dates and periods of time (weather forecast, discounts, and sports results);

2) "Bored Now": the behavior of users who just need to "kill time", something to do, have fun while they are waiting for something. It is characterized by short-term connection to the network and social services using a mobile device;

3) "Urgent Now": this behavior is inherent in users who need access or information, and who are very limited in time. As a rule, they look for information that is sensitive to the time of day, social or space-time context (Melnik, 2012).

In considering the types of informational behavior, researchers are studying coping behavior and resilience as psychological predictors that can help a person maintain psychological well-being and health.

Psychological research concerning motivation and predictors of informational behavior of Internet users is insufficiently represented today. The proposed research is aimed at filling the gap in this kind of research.

Materials and Methods

The study of informational behavior within the framework of psychology began back in the 70s and 80s of the twentieth century: the emphasis in research gradually shifted from the study of communication mediated by computers, to the analysis of the characteristics of user activity on the Internet and the construction of models of Internet behavior.

Diagnostic approaches to this problem have their own characteristic features. The first (and most at the moment) proposed diagnostic methods considered behavior on the Internet in the context of the formation of Internet addiction. So, K. Young, proposing his first version of the Internet Addiction Test (IAT) in 1994 uses the concept of "Internet addiction" to indicate the destructive effect of informational technology on an individual, comparing this addiction to an obsessive state. This technique deliberately does not differentiate between content that leads to obsessive behavior. The test can be used as a rapid diagnostic method to determine the presence / absence of addiction. Further study of Internet addiction and its specifics leads K. Young to the conclusion that Internet addiction can be caused by different reasons and manifest itself in different ways, requiring different types of treatment. The author supplements his IAT methodology (up to 20 questions) by introducing assessments related to the following areas: avoidance of reality, obsession, neglect of duties, anticipation, lack of control, social avoidance.

The diagnostic toolkit, developed in the late 90s of the XX in the early 2000s, focuses on the study of dependent informational behavior, and the presented methods are modifications of the scales of K. Young and S. Chen.

Since the 2000s, the availability of the Internet began to grow, mostly thanks to the revolution in the development of technical means (the emergence of smartphones and the mobile Internet), and the emphasis in the diagnosis of informational behavior is gradually shifting from determining the presence of dependence on the Internet, to the study of online behavior and its influence on the personal characteristics of the user, the model of his informational behavior.

In the proposed study, the emphasis is on the study of models of informational behavior using the author's technique "Strategies of informational behavior" SIP (Abakumova I. V., Romek V. G., Kolenova A. S., Grishina A. V., Zvezdina G. P.). The technique allows determining the severity of a particular strategy of informational behavior, based on the motivational orientation.

Let us consider in more detail the author's approach to the study of informational behavior. In our opinion, it is the motivation of users that is the most important link in behavioral models on the Internet. Understanding motivation as the determination of behavior as a whole, it is necessary to include in the concept of motivation all types of motives - motives, needs, interests, aspirations, goals, drives, attitudes and others (Meshkov, 2015). This understanding of motivation as a complex of factors influencing and determining behavior has led us to single out five models of Internet behavior: entertainment, informational, communicative, productive, and pragmatic. It should be emphasized that within the framework of the author's motivational approach to strategies for Internet behavior, the content consumed itself is not as important as the motive for using this content.

Based on the motives of informational behavior, we divided all the strategies we have identified into normative and risky ones. Normative strategies include Internet for killing time; Internet for information search; Internet to tell others about yourself; Internet for shopping; Internet as a motivating force (examples of others). Risky strategies include Internet as an access to alternative information (oppositional views); Internet for participation in communities (extremism, destructive tendencies); Internet for spying on others in social networks; The Internet for the realization of sexual needs; Internet for expressing ideas (manifestations of nationalism). Each strategy is distinguished by a certain direction of behavior and a complex of different motives of behavior. This study focuses on the normative strategies of informational behavior. Let's describe their features in more detail.

Behavior within the entertainment strategy (Internet for killing time) is aimed at the process of activity and at oneself, that is, the user himself receives knowledge, emotions, and impressions in the process of consuming entertainment content. This strategy includes motives associated with using information to maintain or change their emotional state, as well as in order to simply pass the time and be distracted.

Within the framework of the information strategy (Internet for information search), the user's behavior is directed towards the result of the activity and towards himself. This strategy is a classic consumption of information from the Internet to solve their educational, professional and even everyday tasks. In this case, the emphasis is on the search result, and not on its process, as in an entertainment strategy.

The communicative strategy of Internet behavior (Internet to tell others about yourself) includes all forms of behavior that involve interaction with other users (both active and passive). In this case, the activity is directed at oneself and at others, and the process of communication is more important than its result.

A productive strategy (Internet as a motivating force) presupposes the creation of new content, a product of one's own creativity, which is important to share with others, i.e. in this case, the activity is aimed at results for others.

Within the framework of the pragmatic strategy of Internet behavior (Internet for shopping), 2 types of behavior can be distinguished: 1) users who sell something and thus earn; 2) users who buy something, thereby satisfying their needs.

On the basis of the presented theoretical model, the author's methodology "Strategies of informational behavior" (SIP) was developed by Abakumova I. V., Romek V. G., Kolenova A. S., Grishina A. V., Zvezdina G.P. The technique has passed peer review and is being tested (Abakumova, Zvezdina and Grishina, 2022).

In order to study coping strategies and resilience, the following techniques were used: "Indicator of coping strategies" by Amirkhan, 1990 (adaptation by N. A. Sirota and V. M. Yaltonsky) and personal questionnaire "SACS" L. Hobfall, methodology "Test of vitality" by S. Maddy, in adaptation of Leontiev and Rasskazova, 2006.

Results

As part of the study of informational behavior, an empirical study was carried out in order to identify the features of informational behavior of students with different motivational orientations, to identify the psychological predictors of it and to study their peculiarities of overcoming stressful situations. Psychology students in the number of 240 people aged 18 to 25, were the respondents of the study. Boys and girls who study at daytime and evening education took part, of which girls made up more than 80% of the respondents.

The diagnostic results were processed using the methods of mathematical statistics, in order to study correlations, the Spearman coefficient was used.

According to the results obtained according to the "Strategies of informational behavior" (SIP) methodology, this sample of subjects demonstrated the informational behavior strategies presented on Figure 1.

Analysis of the severity of informational behavior strategies in the sample of students showed that the priority strategy most often used by students while using the Internet is "the Internet for information search". The use of the Internet as the main source of information indicates that students have, first of all, educational (business) motivation. The modern Internet space has a large information resource capable of satisfying various needs.

The second most popular strategy is the "Internet as a motivating force". This strategy performs, in a sense, the function of socialization of a person and is aimed, first of all, at the assimilation of patterns of behavior and examples of the way of life of the reference and authoritative groups on the network, which are significant for Internet users.

The strategy "Internet for killing time" ranks third in the hierarchy of motivational strategies. Orientation of student youth to meet hedonistic needs and constant presence in the Internet space creates in them the illusion of being busy and immersed in business.

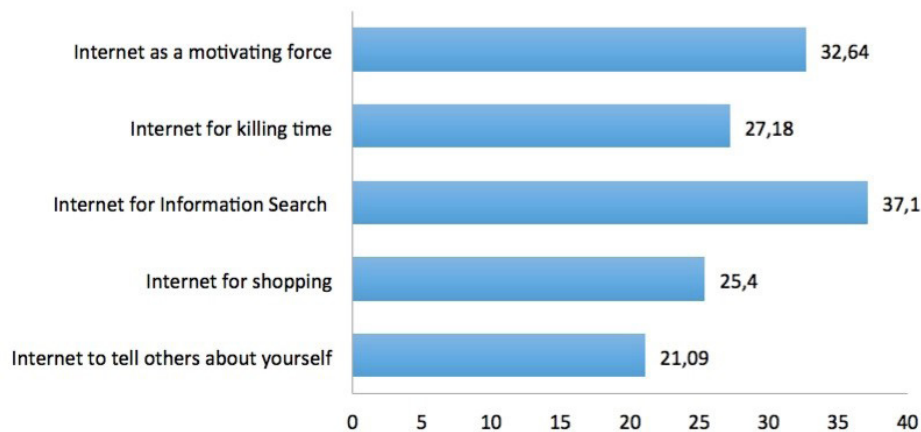


Figure 1. Representation of informational behavior strategies in the student sample

The pragmatic motivation "Internet for shopping" is expressed within the average values, students resort to it when necessary. The lowest indicators were scored by the strategy "Internet to tell others about yourself".

Thus, the analysis performed allows concluding that the repertoire of motivational strategies used by students is quite diverse and flexible.

At the next stage of the empirical study, psychological predictors were identified that are associated with strategies of informational behavior. The indicators of resilience and coping strategies were used as predictors. The study of Spearman's correlations between informational behavior strategies and coping strategies showed the presence of both direct and feedback relationships, presented in Table 1.

Table 1
Results of correlation analysis between motivational strategies of informational behavior and strategies of coping behavior

| Variables | Quantity of persons | Correlation coefficient (Rs) | Significance (p-value) |
|---|---------------------|------------------------------|------------------------|
| Internet to tell others about yourself & Internet as a motivating force | 240 | 0,502 | 0.01 |
| Internet as a motivating force & Internet for spying on others on social networks | 240 | 0.452 | 0.01 |
| Internet to tell others about yourself & seeking social support | 240 | -0,249 | 0.01 |
| Internet to tell others about yourself & problem solving scale | 240 | -0.247 | 0.01 |
| Seeking social support& Internet for spying on others on social networks | 240 | -0.376 | 0.01 |
| Internet for Information Search & Problem Avoidance Scale | 240 | 0.227 | 0.03 |

The informational strategy “Internet for information search” (0.227) has a direct relationship with the passive strategy of “avoiding problems”, and the strategy “Internet for killing time” (-0.227) has a feedback.

The results obtained may indicate that students, using the Internet as a source of information, avoid solving the problems that they face, or in this way avoid solving the problems they face.

And according to the results obtained, the more often students use the Internet to “kill” time, the less often they resort to avoidance strategies.

The analysis for the presence of a connection and tightness of connection between strategies of informational behavior and coping strategies showed that in the group of strategies for informational behavior the greatest number of correlations was found between the strategy “Internet as a motivating force” and different coping strategies.

Direct moderate and weakly expressed relationships were established using the Spearman coefficient between:

- strategy “Internet as a motivating force” and adaptive strategies for coping behavior as “assertive actions” (0.206), “entering into social contact” (0.41);
- the strategy “Internet as a motivating force” and non-adaptive strategies of coping behavior, such as “manipulative actions” (0.27), “impulsive actions” (0.22) and “asocial actions” (0.22);
- the strategy “Internet as a motivating force” and indicators of resilience: “engagement”(0,29), “risk taking”(0,20), “general level of resilience”(0,25).

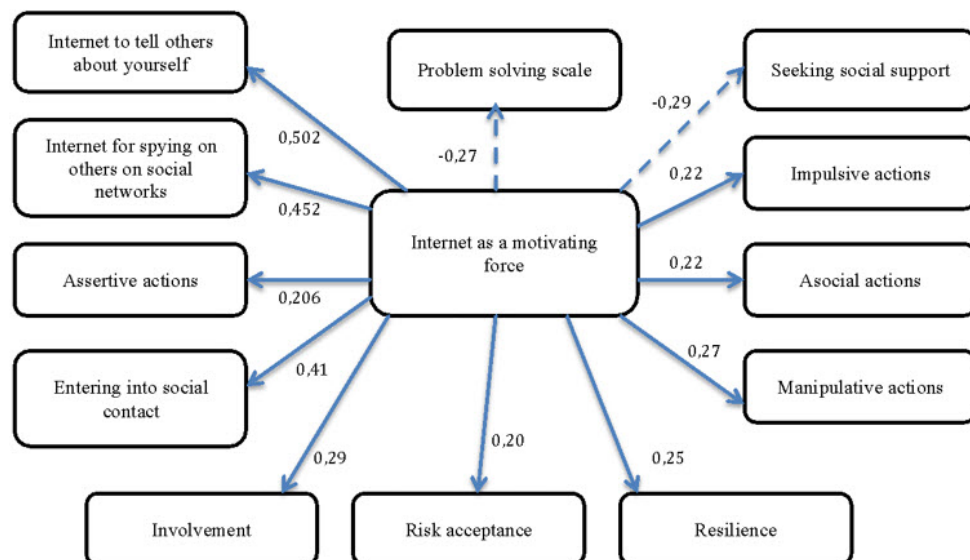


Figure 2. Correlation links with the strategy “Internet as a motivating force”

The presence of a connection between assertive actions and the motivating power of the Internet demonstrates that the positive experience of other people, their achievements and success contribute to constructive overcoming of life's difficulties, increase confidence in oneself and one's capabilities. It can be assumed that this strategy of informational behavior teaches a person constructive behavior, based on the demonstrated images of success.

The results obtained may indicate that when using adaptive strategies, Internet users turn to internal resources and rely on themselves, or resort to external social resources, such as entering into social contact.

When using non-adaptive coping strategies, Internet users try to cope with stressful situations through manipulative actions aimed at achieving the desired result through indirect actions and covertly using others to their advantage. Also, the list of non-adaptive coping strategies includes "impulsive actions". Coping actions with such a strategy lose their purposefulness and become mainly the result of the release of emotional stress. Asocial actions are also present in the arsenal of coping behavior of Internet users and are manifested rather in violation of generally accepted norms and rules, in violation of boundaries.

Also, negative inverse links were revealed between the strategy of informational behavior "Internet as a motivating force" and the coping strategy "Seeking for social support". The results obtained may indicate that due to the frequency of using the Internet as a social reference point and an example to follow, there is a decrease in the need to turn to others for help in stressful and difficult life situations. It is possible that active interaction with others on social media devalues real social support. Observing the lives of others, a sense of belonging and presence, perhaps becomes a resource for overcoming stressful situations.

The informational strategy "Internet as a motivating force" also has feedback with problemsolving coping. Active inclusion in the public space, using the possibilities of the Internet to satisfy one's needs for belonging to a group, to others, takes a person away from solving problems, creates illusions of well-being in him. The "problem solving" strategy requires a rational approach to problem solving, the ability to critically analyze the situation and choose the most adequate solutions. However, students-Internet users, focused on self-presentation of them in the Internet space, constantly wait for an emotional response from others and less often resort to an active problem-solving strategy that requires a person to be able to transform and overcome himself.

Thus, students actively resorting to the informational strategy "Internet as a motivating force" have in their arsenal different strategies and techniques of coping behavior, both adaptive active and maladaptive strategies, both direct connections and inverse ones. The results obtained may indicate that, depending on the life situation, users flexibly and dynamically use one or another strategy that helps to minimize stress and increase a sense of well-being.

The study of correlations between strategies of informational behavior revealed moderate positive links between the informational strategy "Internet as a motivating force" and other socially oriented strategies - "Internet to tell others about yourself" (0.502) and "Internet for spying on others on social networks" (0.452). Students actively use the Internet as a platform for their self-presentation, and as a resource for obtaining information about others, the peculiarities of their lives, successes and failures. The possibility of making social comparisons on the Internet may help in the formation of one's own identity.

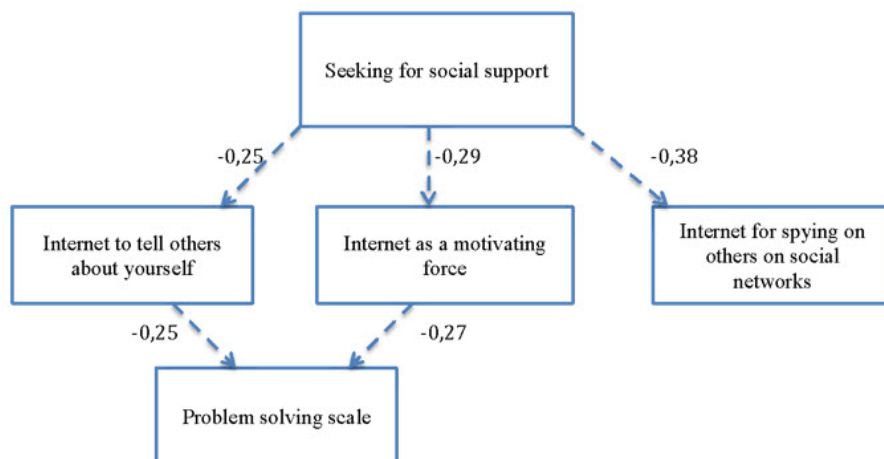


Figure 3. Correlation matrix of relationships between motivational strategies of informational behavior and strategies of coping behavior

Also, correlations were revealed between the strategy of informational behavior “the Internet as a motivating force” and indicators of resilience, such as “involvement” (0.29), “risk acceptance” (0.20), and a general level of resilience (0.25).

The results obtained may indicate that the socially oriented behavior strategy of student users of the Internet resource - “Internet as a motivating force” is positively related to involvement, which is characterized by the respondents' enthusiasm, the presence of internal motivation for what they are doing, life satisfaction. The relationship of this strategy with the scale of “risk acceptance” shows that students in whom this strategy is dominant are characterized by dispositional optimism, tolerance to uncertainty and optimistic attribution of failures.

The results obtained show that students who actively use the informational strategy “Internet as a motivating force” have demonstrated a sufficient level of resilience, allowing a person to overcome anxiety in situations of increased uncertainty and be independent of situational emotional reactions.

Discussions

Research on the problem of informational behavior reflects different aspects of this psychological category. The problem of coping styles in connection to digital consumption became of serious importance in the period of COVID-19 pandemic and social isolation, when social media and Internet recourses has become the only source of communication with relatives, colleges and friends.

Our studies in that period showed that increased informational consumption can be considered as a coping strategy of overcoming the pandemic social isolation for respondents with low hardiness and tolerance to ambiguity: searching different types of information (in particular the latest news about the COVID-19 pandemic) helps such people to overcome the ambiguity of the situation, makes their life more understandable and predictable, thereby giving confidence in the future and making today's interesting. Stable informational consumption indicates that these respondents are stable and confident in their interests, in their need for the information necessary to feel safe. Decreased informational consumption shows that for feeling calm and enjoy the opportunity to spend time on social isolation, these respondents do not need outside information (Grishina and Abakumova, 2020).

Zhao N. and Zhou G. (2021) studied the risk of addictive social media use (SMU) in COVID-19 pandemic. The results showed that COVID-19 stress was positively associated with tendencies toward addictive SMU. Path analyses revealed that this relationship was significantly serially mediated by active use and social media flow, with SMU time being controlled. Authors' findings suggest that individuals who experience more COVID-19 stress are at increased risk of addictive SMU that may be fostered by active use and flow experience (Zhao, N. and Zhou, G., 2021).

Wolfers L. N., Festl R., & Utz S. found within-person correlations between nomophobia (“no-mobile-phone phobia”) and stress at one time-point, but not over time. For the younger age group (18-39 years), more passive Facebook use than usual was associated with more stress than usual six months later, and more stress than usual was followed by less passive Facebook use six month later (Wolfers, Festl and Utz, 2020).

Nimrod G. explored older people's use of the Internet for coping with stress posed by the COVID-19 pandemic and found significant positive associations between stress and increase in Internet use for interpersonal communication and online errands. Linear regression analysis revealed a significant negative association between stress and subjective wellbeing, but it was only increased Internet use for leisure that associated significantly with enhanced wellbeing (Nimrod G., 2020).

This result can be supplemented by the conclusions made in the work of Gioia, F., Rega, V., & Boursier, V., showed that among adolescents it is the problematic use of the Internet that can act as a coping strategy to compensate for deficits in emotional regulation. The lack of social support and good relations between adolescents and parents negatively affects the ability to emotional self-regulation, which, in turn, further increases the risk of developing problematic Internet use (Gioia, Rega and Boursier, 2021).

The study of Brailovskaia, Schillack and Margraf, has links with our research, as they investigated the reasons for social media use (SMU), as well as their relationships with daily stress, depression and anxiety symptoms, experience of flow during the usage process and tendencies of addictive SMU. Authors suggest the following users' reasons to go online: “Search for Information and Inspiration”, “Search for Social Interaction”, “Beat of Boredom and Pastimes”, “Escape from Negative Emotions”, and “Search for Positive Emotions”. The empirical study showed that only the category “Escape from Negative Emotions” positively predicted tendencies of addictive SMU (Brailovskaia, Schillack and Margraf, 2020).

A number of other studies analyze personal qualities that determine or influence the informational behavior of a person (Shchebetenko S. A., 2013; Gordeeva A. V., 2016; Khasanova and Kotova, 2017; Rubtsova, Panfilova and Smirnova, 2018; Rubtsova, Panfilova and Smirnova, 2018; Moore and Craciun, 2021; Pogozhina et al., 2020). Studying digital behavior predictors Shchebetenko S. A. investigated the relationship between the personality traits of the Big Five and the behavioral patterns of students in the virtual space. The researcher identified indicators of user activity on the site and studied the relationship with the personality traits of the Big Five. The author found that extraversion, neuroticism, and agreeableness are important independent predictors of many behavioral indicators of activity, including the number of friends, the number of posts on the wall, photos and "likes" under a user photo, etc. The effects of openness to experience were found to be almost entirely mediated by association with extraversion. Conscientiousness effects have their own specifics, manifesting themselves in relation to the features of the "avatars" used by users: as conscientiousness indicators increase, they use substitute avatars less often and more often use their personal portrait photos. In general, user activity increases as extroversion and neuroticism scores increase, and these effects were found to be independent of each other (Shchebetenko S. A., 2013).

The relationship between the self-attitude of a teenager and the variability of his self-presentation in communication mediated by the Internet was studied by A. V. Gordeeva. The author has identified the following patterns:

1. The content of self-presentation of adolescents in the virtual space becomes more heterogeneous and unstable when there is no clear sense of identity. Then teenagers try different behaviors in Internet communication.

2. The variability of a teenager's self-presentation in Internet communication is not determined only by situational external causes, but is associated with the content characteristics of the user's self-attitude (Gordeeva A. V., 2016).

Marengo, D., et al, aimed to identify the relative prevalence of different patterns of social media use, and to evaluate potential between-group differences in the distributions of age, gender, education, and Big Five personality traits. It was found that individuals using at least one social media platform were generally younger, more often female, and more extraverted than non-users. Small differences in Conscientiousness and Neuroticism also emerged across groups reporting different combinations of social media use (Marengo et al., 2020).

Moore, K., & Craciun, G. showed that personality factors explained significant amounts of variance in terms of attitude towards Instagram, number of likes, total number of Instagram posts since account inception, and social media addictive tendencies (Moore and Craciun, 2021).

In this way, the results of Russian and foreign studies show that the informational behavior of a person is largely determined by the personal characteristics of the Internet user and, in certain situations, can help the person cope with stress, providing more information about the situation and distracting from actual problems. This coincides with the conclusions we made at different stages of the study.

Conclusions

Based on the conducted empirical research, the following conclusions can be drawn:

- it was revealed that the dominant motives for going online for students are motives of communication, cognitive and entertainment motives;

- it was found that the predominant motivational strategies of informational behavior in the student sample are strategies - "the Internet for information search" and "the Internet as a motivating force";

- it was found that coping strategies and indicators of vitality are psychological predictors of informational behavior;

- the greatest number of correlations between indicators of resilience and strategies of coping behavior was revealed with the motivational strategy of informational behavior "the Internet as a motivating force";

- the motivational strategy "the Internet as a motivating force" has a positive relationship with indicators of resilience - with inclusion and acceptance of risk, which may indicate that such students are able to withstand life failures in a situation of uncertainty;

- the variety and wide repertoire of coping strategies associated with the informational strategy "Internet as a motivating force" allows us to say that students using this strategy demonstrate an adaptive style of behavior and flexibility in coping with stress and life difficulties.

The study made it possible to reveal the features of informational behavior strategies in connection

with the resilience and coping strategies of respondents in using the Internet and outline the prospects for further study of this problem.

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Conflict of interests

The authors declare no conflict of interest.

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Primary Education in Serbia and Czechia. Are There Similarities?

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Abstract: In Serbia, primary education is compulsory, and it lasts eight years with two educational cycles, while in the Czech Republic, primary education lasts nine years with three cycles. Analysis of the teachers' attitudes toward primary education in Serbia and the Czech Republic has a goal to determine the current educational state in the two countries. Also, in this research it has been shown if there are similarities, as well as differences between the two educational systems. Views of the teachers on this topic are significant for this paper, so the survey was used as an instrument. The survey should have revealed whether the primary education was in line with the need of modernization and enhancement of young people's intellectual potential. It was necessary to reveal if the education in the two countries is in accordance with the modern world and whether the teachers agree with this. One of the aims of the research was to determine whether there are statistically significant differences in the teachers' answers and to relate those differences to the general educational situation in Serbia and Czechia.

Keywords: primary education, comparative analysis, teachers' attitudes, Europe.

Introduction

The end of the 20th century was marked by plenty of seminars, scientific meetings, and conferences of an international character. The most distinguished experts in pedagogy, methodology, didactics, and relevant teachers gathered and discussed the condition of educational systems in developed countries (Wadi, 1997). They initiated a question about changes in education. The quality and level of education affect the national economy, life standard, and international reputation. In a lot of countries, goals are independently arranged. Educational aims define the appropriate phase of education, while goals directly elaborate them (Mehisto, 1993; Đukičin Vučković et al., 2021). Compulsory education is arranged into two cycles, but every country (sometimes parts of a country) has specifics in its system. For instance, the organisation of compulsory education in German provinces varies from province to province. In Italy, for example, the first level of compulsory education is divided into two cycles. The first cycle lasts two years, while the second is three years long (Maksimović, 1997; Đukičin Vučković et al., 2021).

Most of the general educational characteristics of primary education are determined by the curriculums. Eric Donald Hirsch set up a base for a definition for a core of curriculums. He defines the "core of curriculums" as the main canon of fact learning knowledge in which it is stated what should be learned (Ministry of Education, Science, and Technological Development (2020)). The concept "curriculum" is related to pedagogy from the baroque period and means "the flow of education". This concept, in its educational meaning, has been used in Anglo-Saxon countries up to now (Đere, 1985; Đukičin Vučković et al., 2021). In most European countries, the concept has been accepted again in the sixties of the last century and is still being used (Romelić and Ivanović Bibić, 2015). A significant difference between traditional teaching plans and the development of the curriculum, which came as a reaction to them, should be looked for in the fact that the goals of teaching and learning in the curriculum are specified in a way that they list pupils' verifiable and perceptive reactions. European educationalists define the term curriculum

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as “the first draft of the learning and teaching process in which the statements on content, goals, learning conditions, teaching methods, and evaluation processes are collected in one place” (Ivanović, 1997; Ratković, 1997; Romelić and Ivanović Bibić, 2015). Curriculums differ from traditional plans in a tendency of the systematic concept, rationalization, and hierarchy schedule of teachers’ goals. Teaching aids are continuously developed and applied for the realization of teaching goals and used together with prepared instructions for learning and teaching. Overall success is based on the curriculum that systematically evaluates achieved educational goals and other effects (Komlenović, 2004).

Compulsory education represents, regardless of the structure of education in a particular country, a law-regulated compulsory education of children of different ages. The realization of goals and tasks of primary education is influenced by the following: age of a child in a process of education, organization and duration of primary education, ways and methods of teaching and educational process, quantity and quality of a curriculum, and the structure of the content of primary education (Đukićin Vučković et al., 2021). The case study of Serbia and the Czech Republic was taken into consideration to discover if there were similarities or differences in the primary education of countries which shared similar historical backgrounds (the communist era). Opposite to the communist era, their recent historical conditions for the development of primary education were completely different. That is why such case studies may be appealing.

Primary education in the Republic of Serbia and the Czech Republic

According to the data from the [Ministry of Education, Science, and Technological Development \(2020\)](#), primary education in Serbia is compulsory and lasts eight years, and it is divided into two cycles. The first cycle includes first, second, third, and fourth grade. In the first cycle, subject teaching is organized only for foreign language, elective and facultative subjects. The second cycle includes fifth, sixth, seventh, and eighth grade. For students of the second cycle, subject teaching is organized. For the members of national minorities, subject teaching is organized in the Serbian language and in the language of a national minority with elements of the national culture of that national minority from the first grade.

According to the Regulation of Primary Schools e.g. for 2018/2019, the school year in Serbia in primary school was divided into two semesters. The first semester started on the first working day of September. The second semester started in the middle of February and ended in the middle of June. Eight-grade students usually end primary education at the end of May. The school year for students of the eighth grade lasts 34 school weeks (from Monday through Friday) or 170 teaching days.

Decentralization of schools and their autonomy became key slogans in the reforms of school administration. The first reason is the natural reaction of educators and parents to the experience of the totalitarian system and the second is the evaluated decentralization trend which is manifested in many western countries (Komlenović, 2004; Đukićin Vučković et al., 2021). In the communist era, the Czech Republic adopted the Soviet model of public authority designed on a local regional committee. The first overall concept of education in the Czech Republic was adopted in the “White Book”, which is a national program of educational development. In the Czech Republic, in the year of 2002, a long-term plan for education and the development of the educational system was adopted (Adámková, 2007).

According to the data from the [Ministry of Education, Youth, and Sports \(2020\)](#), in the Czech Republic, primary education lasts nine years with three educational cycles. Primary education starts at the age of six. The nine-year primary school started in the school year 1999/2000 (only in well prepared primary schools), and for all others in the school year 2003/2004. Education in the Czech Republic is divided into several levels. The first is preschool education (0.5-6 years), which lasts five or six years. The second is primary education from age six to age fifteen. After the primary education the high school starts. High school lasts from the age of 15 through the age of 19. After four years of high school, students can go to the next level, which is higher education.

The school year in the Czech Republic starts on the first working day of September and ends at the end of June. Exceptions are the students in the ninth grade who end the school year in the middle of June. The school year consists of two semesters. Teaching lasts 38 weeks during five working days (from Monday through Friday), which is 190 days in a school year ([Ministry of Education, Youth, and Sports, 2020](#)).

In the curriculums for the first cycle of primary education (from the first to the fourth year) in Serbia, students have eight subjects during a school year. Mandatory subjects are the same for all grades in the first cycle except World around Us, which is taught in the first and second grades. In the third and fourth grades, students have Nature and Social Studies. Serbian Language and Mathematics are the most present in the curriculum with five classes a week, followed by Physical Education with three classes a week. The subjects with the fewest classes are Music and Art. The curriculum for the second cycle, or the

fifth, sixth, seventh, and eighth grades, includes 12 mandatory subjects. Students in the fifth grade have 10 mandatory subjects and get new ones, such as Biology, Geography, History, Technical Education, and Information and Communication Technology. From the fifth grade, students do not have Nature and Social Studies. This subject is further studied in more detail within Geography, Biology, and History. The Serbian language is the most included in the curriculum with five classes a week, followed by Mathematics with four classes a week. Other subjects are taught twice a week, except for Geography and History with one class. Students in the sixth grade get Physics (twice a week) and study it as a subject for the next three years. In the seventh grade, students get Chemistry (twice a week), which is also taught in the eighth grade ([Regulation of Teaching Plans for the Second Cycle of Primary Education in the Republic of Serbia, 2018](#)).

On the first level of primary education in the Czech Republic, the Czech Language is the most present subject, which is similar to the primary education in Serbia. In the second and third year, two more hours are included for practicing reading and writing in the Czech Language. Also, in the fourth and fifth year, two more hours are added, but this time to develop efficient communication among students. The second most important subject is Mathematics with four hours a week, which is an evident similarity with the primary education in Serbia. In the first, second, and third year of primary education, students have seven subjects: the Czech Language, Mathematics, the English Language, Art, Science, Physical Education, and Practical Activities. Science about the Country (or society) and Basics of Natural Sciences are the subjects that students get in the fourth grade with one hour a week. The noticeable difference is that in Serbian primary education subject Nature and Social Studies is taught from the third grade. In the fifth grade, students in Czechia get Nature and Science of the Homeland, which is a difference regarding Serbian primary education. In the second level of compulsory primary education, Czech students move to subject teaching, similar to Serbian education. In the sixth grade, students have the Czech Language and Literature, the English Language, Second Foreign Language (German, French, or Russian), Informatics, Mathematics, History, Geography, Biology, Physics, Music, Art, and Physical Education, almost the same as in Serbia. Additionally, in the seventh grade in Czechia, Health Education is taught, while in the eighth grade, students get Chemistry ([Ministry of Education, Youth, and Sports, 2020](#)).

Geography curriculum as an illustration of similarities

Developing and practicing geographical knowledge and skills is an important goal in teaching geography, besides knowledge itself. Not only are they connected with the capacity of geography-related problem solving, gathering and processing information, communicating and presenting, but they also extend one's reasoning abilities necessary to understand the Earth and society. Geography provides students with the most relevant knowledge on wide variety of natural and social topics, which is the main reason for presenting its curriculum. It is a subject that helps students acquire skills applicable to everyday life which is one more reason for the interest in its curriculum ([Geography For Life: National Geography Standards, 2012](#); [Handoyo, Amirudin and Soekamto, 2017](#)). The National Geographic and Improvement Project (2012) stated that geographical skills give the vital apparatus and strategies for us to think geographically. They are key to geography's distinctive way to grasp Earth's physical and human social patterns and cycles. These skills are utilized in making decisions significant for regular daily existence, e.g. where to purchase or lease a home; where to seek a new job; how to get to work or to friend's home; where to shop, go on a vacation, or how to go to class. All of these decisions involve the ability to acquire, arrange, and process geographic information. Making daily choices and taking a part in social activities are linked to systematic spatial thinking of nature and community related issues. According to all of the above, there are at least six applications of geographical skills, namely: (1) as a frame of reference to think geographically; (2) in everyday life decision making process, (3) making daily systematical decisions about community activities related to spatial issues considering the social environment, such as where to place the industries, schools, and residential areas; (4) acquire geographic data for business and government in the use of resources or international trade with the placement of the best locations, such as the location of regional airports and supermarkets; (5) help people make reasonable political decisions, such as foreign affairs and international economic policy or zoning on local land; (6) collection and analyses of information to come to a conclusion and make a plan of action ([Handoyo, Amirudin and Soekamto, 2017](#)).

A goal of geography teaching in both countries is to develop conditions where students can achieve basic language and scientific literacy, to develop a realization of educational standards of achievement, to train for solving problems and tasks in a new and unknown situations, to express and explain their opinion and discuss with others, to develop motivation for learning and interests for certain subjects ([Ivkov, 2002](#); [Ministry of Education, Youth, and Sports, 2020](#)).

Table 1
Geographical curriculum in primary schools of Serbia and Czechia

| Grade | Geography content in Serbia | Grade | Geography content in Czechia |
|---------|--|---------|---|
| Fifth | Earth as a whole | Sixth | Earth, its parts and geographical indicators |
| Sixth | Regional geography of Europe (general regionalization) | Seventh | Regional geography of non-European continents |
| Seventh | Regional geography of Europe and non-European continents | Eighth | Regional geography of Europe and social geography |
| Eight | National geography-serbia | Ninth | National geography – czech republic |

Source: [Regulation of teaching plans for the second cycle of Primary Education in Republic of Serbia, 2018](#); [Ministry of Education, Youth, and Sports, 2020](#).

Students need to meet and understand geographical objects, laws, and occurrences in space, to develop their casual consequences and relations, and to develop geographical literacy and geographical way of thinking (Ivkov, 2002; [Ministry of Education, Youth, and Sports, 2020](#)).

Geography as a subject in primary schools in Serbia starts in the fifth grade, while in the Czech Republic it starts in the sixth grade. Before the sixth grade, students in the Czech Republic have the subject which includes the basics of physics, chemistry, biology, and history. This subject is being taught in the first, second, and third year with two and three hours (third grade) a week. From the fourth grade, the subject divides into Natural Sciences and Social Sciences with two lessons a week ([Liberty Square Elementary School 3, 2020](#)).

According to Table 1, the geographical content in primary schools in Serbia and Czechia is similar. The main difference is that geography teaching starts in the fifth grade in Serbia and in the sixth in the Czech Republic. The final year is dedicated to the national geography, which makes students be aware of natural, social, and regional content related to the country they live in. On the whole, they gain knowledge that is beneficial in their everyday life, which is highly regarded in both countries.

Materials and Methods

In this research, the method of a survey was used. The design of the questionnaire was based on the original study, which was in accordance with similar previous studies in the field of education ([Višnić et al., 2017](#); [Đukićin Vučković et al., 2021](#); [Lukić et al., 2019](#)). The respondents were informed of the general purpose of the study and that the participation is anonymous and voluntary. Cronbach's alpha test was run to estimate the reliability of the questionnaire and the obtained value was 0.74. Bearing in mind that reliability coefficients higher than 0.7 are considered satisfactory, the used questionnaire has acceptable reliability ([Mišćević-Kadijević, 2009](#)).

The questionnaire consisted of 12 questions, and it was divided into three segments. The first part (from the first to the third question) involved items related to the socio-demographic profile of the respondents. The second part (from the fourth to the eleventh question) of the survey included questions about different aspects of teachers' attitudes about the primary education. All the questions in the second part were measured by using a 5-point Likert scale (1 - strongly disagree, 2-disagree, 3- neutral, 4- agree, 5- strongly agree) ([Likert, 1932](#)). The third part (the twelfth question) of the survey included a question where respondents had to answer with 'yes' or 'no'. The survey was conducted in order to answer and follow trends of education of students in Serbia and Czechia. The survey has proven to be a successful tool in the research related to the education ([Višnić et al., 2017](#); [Đukićin Vučković et al., 2019](#); [Lukić et al., 2019](#)).

The survey was conducted during the school year of 2019/2020. After filling the surveys, their total number was 43 in Serbia and 43 in Czechia. Respondents were of different gender, working experiences, place where school was located, and subject they teach. All respondents were employed in primary schools.

One of the goals of the research was to compare educational systems in both countries. The goal was also to gather a great number of teachers, whether teaching single or multiple subjects, to find out their opinion about the primary education in the countries where they teach. It was supposed that the

teachers from both countries are likely to have different experiences about working in primary schools and that they are likely to agree with some general questions about education. Having in mind that there are respondents of different gender and working experience, certain differences in their attitudes were expected. Because of all mentioned above, the first hypothesis is that there are statistical differences in the answers of the respondents who work in primary education regarding their gender. The second hypothesis of this paper is that there are statistically significant differences between the answers of respondents regarding the duration of working in a school.

The results obtained in this work were analyzed using the SPSS statistical program initially applying descriptive statistical analysis followed by the independent samples t-test and the one-way analysis of variance (ANOVA). Post-hoc Scheffe test was used to determine how significant the difference among individual groups was. The independent samples t-test was applied to compare the responses of the two groups of respondents: male and female. ANOVA was used to examine if there is a statistical difference between dependent variables (items related to attitudes of the respondents) and independent variables (social characteristics of the respondents). Some previous studies in the field of education successfully applied mentioned statistical procedures (Langdon and Vesper, 2000; Lukić et al., 2019).

Results and Discussions

When the work experience of the respondents is concerned (Figure 1), the greatest number of teachers work in a school between 6 and 15 years (44%), followed by the teachers with more than 26 years of experience, or 26%. Next are teachers working in a school between 16 and 25 years (16%) and the least number of teachers are the ones working in a school for less than 5 years. The equal number of respondents working in Serbia and Czechia participated in this study. The majority of respondents were female (74%), while 26% were male. Teachers who teach 15 different subjects took part in this research. The greatest number of respondents are teachers (belonging to the first cycle of education) (24), followed by the teachers of mathematics, and English (14) and teachers of the Slovak, Czech, and Serbian language. Teachers belonging to the first cycle of primary education, together with Mathematics, Serbian, Czech and English language teachers represent vast majority of examined teachers in both countries. The teachers of history, chemistry, geography, physics, art, physical education, biology, and teachers of foreign languages are present in the smallest number.

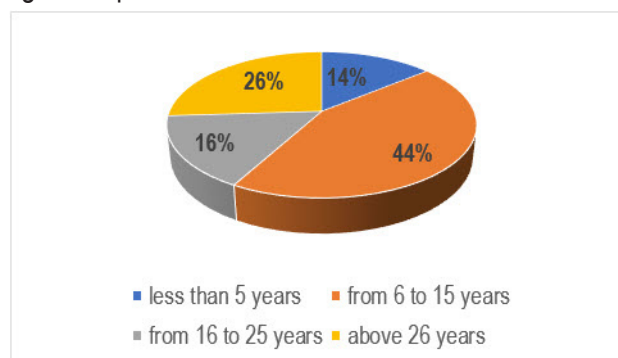


Figure 1. Length of working experience at school (%)

In Table 2, the mean values of the respondents' answers were shown. Most of the respondents agreed with the statements, or their attitudes were neutral. Regarding Serbian respondents, the statement: "Education is the most important and the most complex factor of modern society" was the highest rated. Teachers who work in Serbian schools expressed a high level of agreement with an average value of 4.82. In the Czech Republic, respondents mostly agree with the statement: "Primary education needs to provide more than the teaching of fluid reading, writing, and calculating", with an average value of 4.77. A statement that respondents from Serbia agreed the least is: "Autonomy of schools is one of the factors that can have a big role in the development of quality of education", with an average value of 3.96, while the respondents in the Czech Republic agreed the least with the statement: "Processes of globalization affect national educational systems and their development", with an average value of 4.13.

Table 2
Mean values of the respondents' answers

| Statement | Country | Mean value |
|---|---------|------------|
| Education is the most important and the most complex factor of modern society. | Serbia | 4.82 |
| | Czech | 4.63 |
| Democratization in education is necessary in the 21 st century. | Serbia | 4.37 |
| | Czech | 4.17 |
| Modernization of education develops scientific attitudes of children, creativity, critical spirit, objectivity, accuracy, and students' skills. | Serbia | 4.26 |
| | Czech | 4.44 |
| The main goal of modern education is to encourage the development of creative capabilities, students' skills, and the raising of intellectual potentials of the youngsters. | Serbia | 4.30 |
| | Czech | 4.44 |
| Processes of globalization affect national educational systems and their development. | Serbia | 4.51 |
| | Czech | 4.13 |
| Primary education needs to provide more than teaching of fluid reading, writing, and calculating. | Serbia | 4.67 |
| | Czech | 4.77 |
| Autonomy of schools is one of the factors that can have a big role in the development of the quality of education. | Serbia | 3.96 |
| | Czech | 4.23 |
| The open curriculum is a step toward greater autonomy of schools, and a step toward more innovations and creativity of teachers. | Serbia | 4.27 |
| | Czech | 4.54 |

Regarding the mean values of the respondents' answers from both countries, it is abundantly clear that teachers have similar attitudes toward some general questions about primary education. This means that not only do primary school systems in both countries have similarities, but the teachers' attitudes are also similar.

The Independent samples t-test was applied to analyze the responses of the two population groups, male and female. The statistical difference in the responses of male and female respondents is observed in three out of nine tested statements (Table 3). There is a significant difference in the answers of the respondents from Serbia in two statements and only in one for the respondents from the Czechia. The biggest difference is in the statement: "Open curriculum is a step toward bigger autonomy of schools, and a step toward more innovations and creativity of teachers". These values clearly show that the hypothesis about the statistically significant differences in attitudes of teachers of different gender is partially confirmed due to the fact that statistically significant difference is noticeable only in three out of nine statements. It is very important to take into consideration the fact that there are more female than male teachers, which means that women participate more in the research related to primary education (Gal, Schreuer and Engel-Yeger, 2010; Haq and Mundia, 2012).

Table 3
The results of the t-test for male and female respondents

| Statement/question | Country | p | F |
|---|---------|--------------|--------------|
| Education is the most important and the most complex factor of modern society. | Serbia | 0.019 | 7.056 |
| | Czech | | 0.549 |
| | | | 0.436 |
| Democratization in education is necessary in the 21 st century. | Serbia | 0.443 | 0.289 |
| | Czech | | 0.126 |
| | | | 0.726 |
| Modernization of education develops scientific attitudes of children, creativity, critical spirit, objectivity, accuracy, and students' skills. | Serbia | 0.001 | 11.752 |
| | Czech | | 0.031 |
| | | | 0.918 |
| The main goal of modern education is to encourage the development of creative capabilities, students' skills, and the raising of intellectual potentials of the youngsters. | Serbia | 0.643 | 0.334 |
| | Czech | | 0.223 |
| | | | 0.577 |
| Processes of globalization affect national educational systems and their development. | Serbia | 0.392 | 1.187 |
| | Czech | | 0.001 |
| | | | 0.962 |
| Primary education needs to provide more than teaching of fluid reading, writing, and calculating. | Serbia | 0.507 | 0.712 |
| | Czech | | 3.626 |
| | | | 0.059 |
| Autonomy of schools is one of the factors that can have a big role in the development of the quality of education. | Serbia | 0.773 | 0.101 |
| | Czech | | 3.671 |
| | | | 0.433 |
| The open curriculum is a step toward greater autonomy of schools, and a step toward more innovations and the creativity of teachers. | Serbia | 0.135 | 2.363 |
| | Czech | | 20.329 |
| | | | 0.000 |
| Do you think that educational system in your country is at the satisfactory level? | Serbia | 0.332 | 1.345 |
| | Czech | | 1.552 |
| | | | 0.219 |

The analysis of the variance was implemented to determine the statistically significant differences between dependent variables (attitudes of respondents) and independent variables (working experience). The analysis of the variance showed that there are no statistically significant differences between the attitudes of respondents of different working experience. Nine statements were tested and none of the statistically significant differences were noticed. Because of that, the hypothesis is not confirmed. The results of research in other countries on the topic of different attitudes of certain groups of teachers toward general educational questions correlate with the results of this research to a high extent. In the research groups of the teachers are of the opinion that it is necessary to involve modernization and the development of intellectual capacities of students as much as it is possible, which is in accordance with some results from this research (Dupoux et al., 2006; Sharma and Dunay, 2018; Đukićin Vučković et al., 2019). In this research, which is one of the initial studies concerning primary education in Serbia and Czechia, it was more important to collect and analyse data showing the attitudes of the teachers of different gender and with different working experience than to record statistically significant differences between their attitudes. This is important regarding future research that may pay thorough attentiveness to the differences between the respondents' attitudes. Conducting the research related to this issue may be beneficial for discovering the influence of gender or working experience on general educational beliefs.

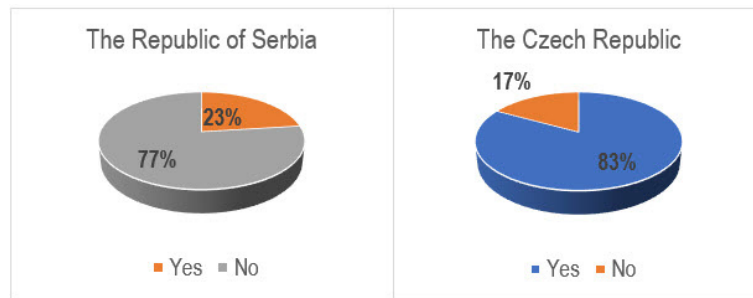


Figure 2. Do you think that the educational system in your country is at a satisfactory level?

The third part of the survey consists of a question: Do you think that the educational system in your country is at a satisfactory level? Respondents had to answer with 'yes' or 'no' (Figure 2). Most of the respondents from Serbia (77%) who participated in this survey think that the educational system in Serbia is not at a satisfactory level. Contrary to that, teachers from Czechia think that the educational system in their country is satisfactory (83%). Since most of the Serbian respondents think that educational system is not at a satisfactory level, it can be concluded that teachers are aware of the complexity of educational questions in Serbia and that the education needs improvements. At the same time, the vast majority of Czech respondents stated that they were satisfied with the educational system in their country which is the result of well-organized reforms and thoroughly precisely planned educational changes.

Conclusions

The overall insight into the primary education of the two countries shows that there are many similarities in the organization and realization of this educational level. Distribution of teaching subjects through grades are similar, as well as the particular curriculum of the subject (the example of geography). This makes the idea of comparing primary education in these two countries justified.

Results show that the hypothesis about the statistically significant differences in attitudes of teachers of a different gender is partially confirmed due to the fact that statistically significant difference is noticeable only in three out of nine statements. Also, the analysis of the variance showed that there are no statistically significant differences between the answers of respondents with different working experience and the second hypothesis was not confirmed. Being aware of such results, it can be concluded that teachers with different working experiences responded remarkably similar.

The last question in this survey can be a perfect indicator for the further steps of educational enhancement in Serbia and Czechia. Teachers from the Czech Republic are satisfied with their educational system. On the other hand, Serbian teachers have a less positive overall opinion, which should lead to general educational improvement by following the example of other more developed countries. Some future studies about primary education should provide guidelines for enhancement.

Some of the limitations in the questionnaire-based research are that the authors cannot completely control the process of understanding and answering questions. The conditions in which the respondents give their answers also cannot be controlled (e.g. appropriate place that provides respondents with a suitable atmosphere for thinking).

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Conflict of interests

The authors declare no conflict of interest.

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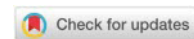
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Recognition of Facial Expressions Based on Information From the Areas of Highest Increase in Luminance Contrast

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Abstract: It is generally accepted that the use of the most informative areas of the input image significantly optimizes visual processing. Several authors agree that, the areas of spatial heterogeneity are the most interesting for the visual system and the degree of difference between those areas and their surroundings determine the saliency. The purpose of our study was to test the hypothesis that the most informative are the areas of the image of largest increase in total luminance contrast, and information from these areas is used in the process of categorization facial expressions. Using our own program that was developed to imitate the work of second-order visual mechanisms, we created stimuli from the initial photographic images of faces with 6 basic emotions and a neutral expression. These images consisted only of areas of highest increase in total luminance contrast. Initially, we determined the spatial frequency ranges in which the selected areas contain the most useful information for the recognition of each of the expressions. We then compared the expressions recognition accuracy in images of real faces and those synthesized from the areas of highest contrast increase. The obtained results indicate that the recognition of expressions in synthesized images is somewhat worse than in real ones (73% versus 83%). At the same time, the partial loss of information that occurs due to the replacing real and synthesized images does not disrupt the overall logic of the recognition. Possible ways to make up for the missing information in the synthesized images are suggested.

Keywords: expression recognition, saliency, total luminance contrast, second-order visual filters.

Introduction

It is obvious that different image areas contain different volume of information. Classical experiments of A. Yarbus (Yarbus, 2013) have made it possible to see that the eyes ignore homogeneous areas of the image and, on the contrary, the gaze is directed to the most heterogeneous areas.

Starting from the early levels of visual processing, neurons respond precisely to heterogeneities. So, striate neurons are activated by luminance heterogeneity in their receptive fields (Marat et al., 2013). However, single luminance gradients are only local heterogeneities. When it comes to the perception of scenes or objects, salient regions have significant spatial extent. In this case, the heterogeneity is spatial modulation of luminance gradients (changes in their contrast, orientation, or spatial frequency).

The optimization of the visual perception implies finding and processing the most informative parts of the input image. A number of authors have posited that the areas that differs most from the surroundings are of the greatest interest to the visual system and attract the attention of the observer (Bruce and Tsotsos, 2009; Marat et al., 2013; Perazzi et al., 2012; Xia et al., 2015). Perhaps, mental representations of complex visual stimuli are formed by the information from these areas. The importance of finding the areas of interest determines a large number of studies aimed at finding an algorithm for identifying them and constructing saliency maps. However, a significant part of proposed saliency detection algorithms often is not based on nor considers real brain mechanisms of visual perception (Cheng et al., 2015; Perazzi et al., 2012; Wu, Shi and Lu, 2012).

The human visual system has tools for detecting spatial modulations of luminance gradients in the input image. These are the so-called second-order visual filters (Graham, 2011), which act preattentively. They at a certain spatial interval combine the outputs of striate neurons (first-order filters) with the same

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frequency tuning. First-order filters encode information about the carrier (localization, spatial frequency and orientation of luminance gradients). The second-order filters are activated when spatial modulation of the contrast, orientation or spatial frequency of these gradients (envelope) fall within their receptive fields. Moreover, the higher the modulation amplitude, the stronger their reaction. At the same time, it has been shown that different second-order filters respond to different modulations (Yavna, 2012). Since orientation modulations are primarily important for detecting texture boundaries (Solomon and Morgan, 2017), and spatial frequency modulations are important for detecting surface curvatures (Sakai and Finkel, 1995), it is fair to consider the filters selective to contrast modulations to be the first candidate for the role of a segmentation mechanism for real scenes and objects (Açık et al., 2009; Frey, König and Einhäuser, 2007; Hart et al., 2013).

The aim of our study was to determine the role of image areas of largest increase in total (non-local) luminance contrast in visual processing using facial expression recognition tasks. The hypothesis was that information from these areas of the image is used in categorization.

We chose faces as visual stimuli due to both their high social significance and multidimensionality, which implies separate processing of variable and invariant facial characteristics. At the same time, face detection and identification is characterized by unique speed (Cauchoix et al., 2014; Willis and Todorov, 2006). The same applies to emotion recognition (Willis and Todorov, 2006; Liu and Ioannides, 2010; Vuilleumier and Pourtois, 2007).

To test our hypothesis, we created gradient operator of total contrast (GOTC), a computer program that simulates the second-order filters and calculates a map of instantaneous values of the non-local contrast modulation function over the entire image (Babenko et al., 2021). These maps make it possible to create stimuli using areas of the raster image with certain modulation values.

To a certain extent, this approach resembles the Bubbles method (Gosselin and Schyns, 2001; Smith et al., 2005). In both approaches the accuracy of expression recognition is studied when fragments of the face image are shown to the subjects. The difference is that in the Bubbles method, the fragments are selected randomly, and in our study, they are selected in accordance with the contrast gain. In addition, the Bubbles technique involves the preliminary learning of the initial set of faces, so observers are working with familiar faces, and this changes the range of effective spatial frequencies (Butler et al., 2010; Lobmaier and Mast, 2007; Smith, Volna and Ewing, 2016). Our approach allows us to use unfamiliar faces, which does not limit the number of stimuli and brings the experimental procedure closer to the real conditions of face perception. In addition, the bubbles technique can not be used to answer the question about the mechanisms for highlighting certain facial features.

Prior to creating stimuli, it was necessary to determine several parameters of the model that simulates how second-order filters work. First of all, we had to choose the spatial frequency ranges in which the contrast modulation should be calculated. Since second-order filters were previously found to form five spatial frequency pathways that are tuned in 1 octave steps (Elleberg et al., 2006), we decided to follow this scheme.

Secondly, it was necessary to select the parameters of the apertures through which the whole image and its fragments are passed during the formation of facial stimuli. To keep the constant ratio between the carrier and envelope frequencies, the aperture diameter was reduced by a factor of 2 to increase the filtering frequency in cycles per image (CPI) by 1 octave, while the filtering frequency inside the aperture of different diameters remained constant and was equal to 4 cycles per aperture diameter. Such a filtering frequency was due to the data on the optimal ratio of the carrier and envelope frequencies in human perception of contrast modulations (Babenko, Ermakov and Bozhinskaya, 2010; Sun and Schofield, 2011). Similar psychophysical results were also obtained in the analysis of neuronal responses in V2 in primates (Willis and Todorov, 2006). Another aperture parameter is the transfer function. Based on the central subfield profile of the second-order filter the transfer function was set as Gaussian.

Thirdly, the number of apertures at each filtering frequency had to be determined. The entire face image is described by a single aperture with the lowest filtering frequency (in CPI). We decided that since at each next step the filtering frequency should double, the number of selected areas should also double. In this case, the total diameter of apertures remains constant, and the filtering frequency in cycles per image increases by a factor of 2 at each frequency step.

Materials and Methods

Participants

The experiments involved 179 subjects of both sexes in total, Europeans, aged 18 to 30 years. All participants had normal or corrected vision and had no history of neurological or psychiatric disease. The subjects were informed about the upcoming procedure and gave written consent to voluntarily participate in the experiment. The study was approved by the local ethics committee and was performed in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

Equipment

The experimental setup included an x86-64 compatible Ubuntu Linux PC with NVIDIA GeForce GT 730 graphics and Acer VG271U Pbmiiipx monitor. Screen resolution was 2560x1440, frame rate was 60 Hz. The monitor was calibrated with a digital luminance meter in grey scale mode. ACM (Adaptive Contrast Management) and HDR (High Dynamic Range) functions have been disabled. The luminance varied from 1 to 225 cd/m², gamma non-linearity was standard with an exponent of 2.2.

Stimuli

The set of stimulus images of faces with different emotional expression was compiled from open access databases: MMI (Pantic et al., 2005), KDEF (Lundqvist, Flykt and Öhman, 1998), Rafd (Langner et al., 2010) and WSEFEP (Olszanowski et al., 2015). For further processing and preparation of the stimulus material we selected 70 initial full-faced photographs of male and female Caucasian faces with the expression of 6 basic emotions according to P. Ekman (Ekman, 1992) (fear, anger, sadness, disgust, surprise, happiness), and a neutral expression. Each emotion was represented by 10 faces (5 male and 5 female). Different faces were used for different expressions.

First, faces from different databases were equalized in average luminance (50 cd/m²) and RMS contrast, and size-adjusted to a circle of 880 pixels. Then, each initial image was processed using GOTC that simulates the functioning of the second-order filters set with the same localization and filtering frequency in full range of orientation tunings. The operator is a concentric area with Difference of Gaussians profile. The diameter of the center of this area («window») is equal to the width of the surrounding ring. The filtration frequency in the window was constant and equaled to 4 cycles per window. When the size of the operator was 2 times reduced, the filtering frequency in cycles per image (CPI) doubled. Thus, for an image filtered at a frequency of 4 CPI, the window diameter is equal to the size of the entire image. For an image filtered at a frequency of 8 CPI, the window 2 times decreased and equaled the half the image size, for a filtering frequency of 16 CPI it decreased by 4 times, for 32 CPI - by 8 times and for 64 CPI - by 16 times. The bandwidth of all filters was the same and equaled 1 octave.

The operator window calculates spectral power of the image filtered at a given frequency in CPI. The spectral power of all spatial frequencies perceived by a human was calculated in the surrounding ring and rescaled to average power per 1 octave. The non-local contrast increase in each position was calculated as the difference between the total energy in the center of GOTC and on its periphery. The operator scans the entire image and builds a two-dimensional map of the contrast gain.

As a result, 5 saliency maps were generated for each initial image (for 5 filtering frequencies). Then, on each map, the local maxima of the increase in contrast were ranked in descending order of the amplitude value. Local maxima were selected, starting from the highest, according to the following rule: 1 position was selected at a filtering frequency of 4 CPI, 2 positions were selected at a frequency of 8 CPI, 4 positions were selected at a frequency of 16 CPI, and 8 positions, and on 64 CPI - 16.

After that, we moved on to creating stimuli. First, each initial image was filtered (with a 10th order Butterworth filter) in five one-octave-wide frequency bands with center frequencies of 4, 8, 16, 32, and 64 CPI. Then, a circular aperture with a Gaussian transfer function was placed in the positions previously selected on the saliency maps. An already filtered image of the corresponding spatial frequency was passed through it. The aperture diameter was equal to the diameter of the central region of the gradient operator (at the lowest frequency, the entire image is transmitted; at higher frequencies, progressively smaller fragments of the image are transmitted).

Facial stimuli were created by combining images transmitted through the aperture from different spatial frequency ranges (15 different combinations of frequency ranges were used). As a result, for each initial face image, 15 stimuli were created, consisting of areas of highest increase in non-local contrast. For experiment 1, stimuli were created in a similar way, consisting of areas of the initial image with the smallest increase in contrast.

After performing all calculations, the created stimuli were scaled down to 8.5 ang deg. As a result,

the lowest filtering frequency, equal to 0.5 CPD, approximately corresponded to the frequency tuning of the lowest frequency channel in the human visual system.

Procedure

Prior to the experiment, observers were instructed and looked through the examples of faces expressing basic emotions. In the experiment, stimuli were presented in a random sequence, and their duration was not limited. Viewing distance was 70 cm. The observers were tasked with recognizing facial expressions, choosing 1 of 7 possible responses that characterize emotional expression. The responses were given verbally. The accuracy of recognition for each type of stimuli was calculated as a percentage of correct responses.

Statistical data analysis

ANOVA was used for statistical analysis of the results. Pairwise comparison of the percentages of correct responses by Student's t-test was carried out in the ANOVA procedure as post-hoc tests performed with Holm's correction for multiple comparisons.

Results

Experiment 1. Influence of the magnitude of the increase in the contrast of the regions forming the stimulus on the recognition of facial expression

In one of the previous works, it was shown that the greater the increase in the total contrast in the areas from which the facial stimulus is formed, the more accurately happy (joyful) and neutral faces are distinguished (Babenko et al., 2021). However, since in the present study it was supposed to use a significantly larger number of facial expressions (6 basic emotions according to Ekman and a neutral expression), we considered it necessary to conduct a repeated experiment in which we compared the recognition accuracy of 7 expressions. Now we have limited ourselves to two sets of stimuli created from areas with the largest and the smallest increase in total contrast.

Procedure

Experiment 1 involved 52 observers.


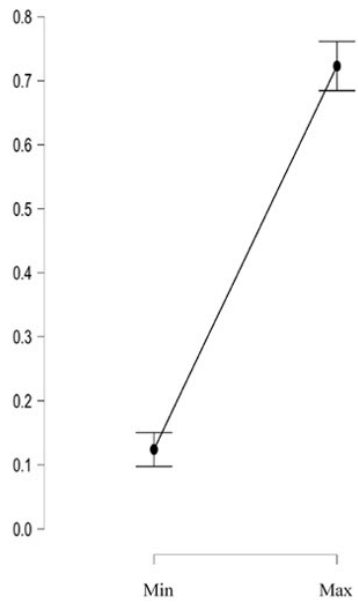
Stimuli were created by combining selected fragments of the initial image in 4 spatial frequency ranges with peak frequencies of 8, 16, 32, and 64 CPI (Fig. 1). Each of the 7 facial expressions was represented by 20 stimuli formed from 5 female and 5 male faces (10 images were created from areas with the lowest non-local contrast modulation, and 10 from areas of highest contrast). A total of 140 stimuli $((10+10)*7)$ were generated for this experiment.

26 subjects were tasked to categorize facial expression when viewing stimuli created from regions with the lowest non-local contrast gain. The other 26 observers were tasked similarly with stimuli generated from regions with the highest increase in non-local contrast. Each subject was presented with 70 stimuli. One of the possible responses was the "I don't know" answer.

Data analysis was performed using one-way ANOVA (intersubject, repeated measures). The independent variable was the amplitude of contrast modulation of the areas that were used for synthesized stimuli. The dependent variable was the proportion of correct responses in the expression recognition task.

Results

Experiment 1 revealed a statistically significant effect of the contrast of the areas that were used for creating stimuli on the accuracy of expression recognition ($F(1,50) = 699.28, p = 0.000, \omega^2=0.931$). The performance was significantly higher for stimuli created from areas of the initial image with the highest increase in non-local contrast (max) compared to stimuli created from areas with the lowest increase in contrast (min) (Fig. 2).

| | |
|--|---|
|  |  |
| <p><i>Figure 1.</i> Examples of stimuli used in experiment 1.</p> <p>An example of a stimulus created from areas of the initial face image with the highest contrast gain (above). An example of a stimulus created from areas with the lowest gain in non-local contrast (bottom). The regions used to create stimuli were selected in the range of spatial frequencies from 5.6 to 90.2 CPI.</p> | <p><i>Figure 2.</i> Accuracy of expression recognition depending on the contrast gain in the areas that were used for creating stimuli. “Min” is for stimuli created from areas of the initial image with the lowest non-local contrast increase, “Max” is for stimuli created from areas of highest contrast increase. The y-axis shows the proportion of correct responses.</p> |

The obtained results indicate that the information contained in the areas of the face image with the highest contrast increase in the range of 4 octaves is useful for recognizing expressions and provides a relatively high accuracy of recognition. In stimuli created from regions with the lowest contrast gain, emotions are correctly determined only at a random decision level.

Experiment 2. Accuracy of expressions recognition in facial stimuli created using the areas of highest increase in contrast with different combinations of spatial-frequency ranges

After it was established that the information contained in the areas of the facial image with the highest contrast gain is useful for expression recognition, it was necessary to understand in which frequency range this information provides the best result for recognizing a particular facial expression.

The majority of researchers agree that the average spatial frequencies are most important for face recognition. However, there is a variety of data on different “effective” ranges: 8-16 CPF (Costen, Parker and Crow, 1996; Gold, Bennett and Sekuler, 1999), 8-13 CPF (Nasanen, 1999), 11-16 CPF (Tanskanen et al., 2005). Collin et al. (2006) extended this range to 25 CPF. At the same time, the role of the general configuration in face recognition was emphasized by many studies (eg, Cheung et al. 2008; Leder and Bruce 2000; Maurer et al., 2002; McKone, 2008). A holistic perception of the face implies its low-frequency description – lower than 8 CPF (Awasthi et al., 2011; Goffaux and Rossion, 2006).

As for facial expression recognition, many authors also prefer configuration information, and hence low spatial frequencies, when solving this problem (e.g., Bombari et al., 2013; Calder et al., 2000; Calvo and Beltrán, 2014; Tanaka et al., 2012; White, 2000). Others, on the contrary, emphasize the role of internal features of the face and, as a result, higher spatial frequencies (Blais et al., 2012; Royer et al., 2018; Smith and Schyns, 2009). The fMRI data also contradicts the notion that low frequency information plays a critical role in the processing of facial expressions (Morawetz et al., 2011). Moreover, C. Deruelle and J. Fagot provide evidence in favor of the priority of high-frequency information in the task of expressions categorization (Deruelle and Fagot, 2005). This contradiction in experimental findings could be caused by the fact that different emotional expressions are encoded by different spatial frequencies (Kumar and Srinivasan, 2011; Pourtois et al., 2005; Stein et al., 2014; Vlaming, Goffaux and Kemner, 2009; Vuilleumier et al., 2003).

Thus, the objective of the second experiment was to determine the frequency ranges for the best recognition accuracy for each of the basic emotions, as well as neutral facial expressions, created from

areas of highest increase in non-local contrast.

Procedure

Experiment 2 involved 78 subjects.

The stimuli were created using the areas of the initial images with the highest increase in the total non-local contrast. Fragments of the face were isolated in five ranges of spatial frequencies with peak frequencies of 4, 8, 16, 32, and 64 CPI. All possible combinations of adjacent frequency ranges were used. A total of 1050 facial stimuli were created (10 initial faces (5 male + 5 female) * 7 facial expressions * 15 combinations of spatial frequencies).

The stimuli were presented in a random sequence. Observers chose one of 7 possible responses after each stimulus was presented.

Results

In experiment 2, we calculated the accuracy of recognition of all basic emotions and neutral facial expressions in stimuli created from areas of highest increase in total nonlocal contrast with different combinations of spatial frequency bands in the stimulus (Table 1).

Table 1

Expression recognition accuracy with different frequency contents of facial stimuli created from areas of highest increase in nonlocal contrast

| Stimulus frequency content | Facial expressions (expression recognition accuracy in percent) | | | | | | | Mean (%) |
|-------------------------------|--|-------|---------|---------|---------|----------|-----------|-------------|
| | fear | anger | sadness | disgust | neutral | surprise | happiness | |
| * | | | | | | | | |
| 4 | 4,2 | 6,3 | 40,4 | 1,9 | 33,2 | 7,1 | 31,7 | 17,8 |
| 4+8 | 9,9 | 35,5 | 44,9 | 21,9 | 44,0 | 49,9 | 66,4 | 38,9 |
| 4+8+16 | 60,5 | 58,2 | 51,7 | 69,7 | 69,4 | 69,9 | 78,1 | 65,4 |
| 4+8+16+32 | 46,4 | 55,6 | 80,3 | 73,7 | 84,2 | 79,7 | 90,1 | 72,9 |
| 4+8+16+32+64 | 35,1 | 50,1 | 70,0 | 72,8 | 85,9 | 81,8 | 97,4 | 70,5 |
| 8 | 16,9 | 27,8 | 23,9 | 17,7 | 24,1 | 41,9 | 27,1 | 25,6 |
| 8+16 | 41,9 | 43,7 | 60,8 | 69,5 | 66,9 | 71,5 | 72,1 | 60,9 |
| 8+16+32 | 40,3 | 47,2 | 58,6 | 70,9 | 81,3 | 81,7 | 95,6 | 67,9 |
| 8+16+32+64 | 61,8 | 61,0 | 60,5 | 76,3 | 83,1 | 81,9 | 95,6 | 74,3 |
| 16 | 36,8 | 30,0 | 36,9 | 64,0 | 66,2 | 60,4 | 67,1 | 51,6 |
| 16+32 | 26,8 | 36,0 | 48,1 | 71,4 | 80,1 | 75,4 | 96,5 | 62,1 |
| 16+32+64 | 37,7 | 44,9 | 56,5 | 74,9 | 82,6 | 77,2 | 93,2 | 66,7 |
| 32 | 41,9 | 23,5 | 31,0 | 42,6 | 55,8 | 56,3 | 79,7 | 47,3 |
| 32+64 | 26,7 | 12,7 | 35,8 | 47,6 | 68,5 | 47,4 | 92,2 | 47,3 |
| 64 | 16,5 | 9,7 | 31,4 | 26,2 | 50,1 | 20,8 | 67,3 | 31,7 |

* - here and in the following tables the integration of spatial frequency ranges in the stimuli is shown (the central frequency of the range is in cycles per image)

We began the analysis of the obtained results with an assessment of the accuracy of expression recognition based on a low-frequency holistic description of the face. To do this, we analyzed the percentage of correct responses for those trials when the image of the entire face filtered in the range of 2.8–5.6 CPI (central frequency 4 CPI) was presented as a stimulus. These stimuli were created by filtering the initial images at a specified frequency, through an aperture with a Gaussian transfer function, the diameter of which corresponded to the largest extent of the analyzed image (facial image height). Table 1 shows that in this case the accuracy of expression recognition was 17.8% (the random decision level was 14.2% and the confidence interval ranges was from 10.76% to 27.86% for the 95% significance level). At the same time, our previous findings indicate that if such facial stimuli are presented in a set of other objects created in a similar way, the accuracy of face detection reaches 75%. It suggests that low-frequency information may be sufficient to detect a face, but not enough to differentiate the emotions expressed on it. This confirms the idea that only low-frequency information is not enough for facial expression recognition (e.g., Jennings, Yu and Kingdom, 2017).

Taking into account the data confirming the global precedence effect (Goffaux et al., 2011; Peyrin et

al., 2010), we studied how the accuracy of recognition changes with a gradual expansion of the bandwidth, starting from the lowest frequency range (2.8-5.6 CPI), by adding more and more high-frequency ranges (function 1 in Figure 3). As expected, expanding the range of spatial frequencies improves the results. The most noticeable performance increase was observed when expanding the range from 1 to 3 octaves. The addition of the 5th octave no longer affected the accuracy for this task.

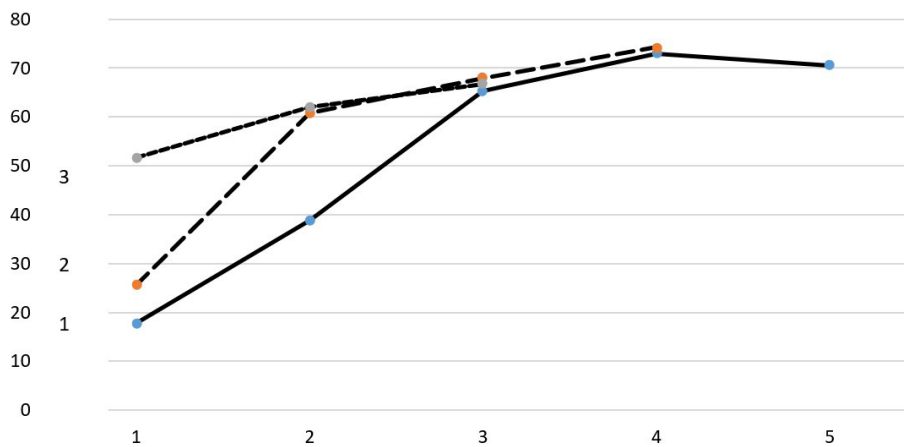


Figure 3. Accuracy of expression recognition with expanding the range of spatial frequencies that used for the facial stimuli. For function 1, the expansion of the frequency range starts from a frequency of 4 CPI, for function 2 - from 8 CPI, for function 3 - from 16 CPI. On the x-axis is the width of the frequency band of the stimulus in octaves. The y-axis shows the percent of correct responses.

Functions 1 and 2 in Figure 3 overlap when the bandwidth becomes equal to 3 octaves. However, the initial increase for function 2 was more significant. The difference is especially noticeable at a bandwidth of 2 octaves. If the spatial frequency increment starts from a higher frequency range (11.3-22.6 CPI, the center frequency is 16 CPI), a significant difference between this curve and the previous ones arises already for a frequency band of 1 octave (function 3 in Figure 3).

It has been shown that any range of spatial frequencies three octaves wide is sufficient for relatively efficient (about 70% correct responses) differentiation of expressions in facial stimuli created from areas of highest contrast gain. The comparison of the obtained functions was performed using two-way Repeated Measures ANOVA with Greenhouse-Geisser correction (main effects: Band Width (1, 2 and 3 octaves) and Start Frequency (4, 8 and 16 CPI), as well as their interaction). It revealed that a significant increase in the performance with the expansion of the frequency band of the stimuli towards higher spatial frequencies ($F(1.699, 130.852) = 1804.298, p < 0.0000, \omega^2 = 0.824$) depends on the frequency from which the band expansion begins ($F(1.661, 127.934) = 519.873, p < 0.0000, \omega^2 = 0.584$). Significantly more information about facial expression is contained precisely in the range with a central frequency of 16 CPI and 1 octave width, in comparison with other frequency ranges of the same width (Table 2). And the increase in performance occurs faster when expanding the range, starting from this frequency ($F(3.479, 130.852) = 246.979, p < 0.0000, \omega^2 = 0.472$).

Table 2
Comparison of expression recognition accuracy for stimuli with a bandwidth of 1 octave

| frequency content of compared stimuli (central frequency in CPI) | expression recognition accuracy (%) | Student's t-test (t) | significance level adjusted for multiple comparisons (P_{Holm}) |
|--|-------------------------------------|----------------------|---|
| 4 / 8 | 17.8 / 25.6 | 7.453 | 0.000 |
| 4 / 16 | 17.8 / 51.6 | 32.316 | 0.000 |
| 8 / 16 | 25.6 / 51.6 | 24.863 | 0.000 |

However, if we track how the accuracy of expression recognition changes with the expansion of the frequency range not only towards an increase, but also towards a decrease in the spatial frequency, then we will get a somewhat unexpected result. For different emotions, the optimal direction of the frequency range expansion is evidently different (Table 3).

Table 3

Comparison of recognition accuracy of different expressions for stimuli with a bandwidth of 2 octaves

| Facial expressions | 8+16 / 16+32 | Student's t-test | significance level adjusted for multiple comparisons |
|--------------------|--------------------|------------------|--|
| | % | (t) | (P _{Holm}) |
| fear | 41.9 / 26.8 | 6.615 | 0.000 |
| anger | 43.7 / 36.0 | 3.364 | 0.068 |
| sadness | 60.8 / 48.1 | 5.550 | 0.000 |
| disgust | 69.5 / 71.4 | 0.841 | 1.000 |
| surprise | 71.5 / 75.4 | 1.628 | 1.000 |
| neutral | 66.9 / 80.1 | 5.774 | 0.000 |
| happiness | 72.1 / 96.5 | 10.708 | 0.000 |

Higher accuracy values in comparison pairs are shown in bold.

The table shows that for the happiness and a neutral facial expression, it is really more optimal to add a higher spatial frequency to the range of 11.3 - 22.6 CPI the information. For the recognition of emotions of negative valence (fear, anger, sadness), it turned out to be more effective to expand the frequency range towards lower spatial frequencies. Moreover, this is less typical for anger than for other negative emotions. At the same time, for disgust and surprise, the expansion in both directions turned out to be almost equivalent.

Considering that the range with the central frequency of 16 CPI turned out to be the most informative (see Figure 3), we can assume that information from this range is processed first. This information may be sufficient to hypothesize a probable facial expression, and the results of this preliminary analysis determine the direction of further expansion of the frequency range.

This assumption does not contradict the thesis about the sequential processing of spatial frequencies from lower to higher ones, but at the same time, it is consistent with the data on the possibility of flexible use of early perceptual representation by top-down control. This allows the visual system to selectively use different spatial frequencies depending on how useful they are for solving a particular problem (Flevaris and Robertson, 2016; Oliva and Schyns, 1997).

We then moved on to the main question in experiment 2: what combination of frequency ranges is most effective for recognizing each of the expressions? The result of this analysis is shown in Table 4.

Table 4

Combinations of spatial-frequency ranges in facial stimuli formed from areas of highest contrast gain, providing the best result of expression recognition

| frequency content of stimuli | Facial expressions (expression recognition accuracy in percent) | | | | | | |
|------------------------------------|--|-------------|-------------|-------------|-------------|-------------|-------------|
| | fear | anger | sadness | disgust | neutral | surprise | happiness |
| 4+8+16+32 | 46.4 | 55.6 | 80.3 | 73.7 | 84.2 | 79.7 | 90.1 |
| 4+8+16+32+64 | 35.1 | 50.1 | 70.0 | 72.8 | 85.9 | 81.8 | 97.4 |
| 8+16+32+64 | 61.8 | 61.0 | 60.5 | 76.3 | 83.1 | 81.9 | 95.6 |

Higher accuracy values in comparison pairs are shown in bold.

It is shown that for different facial expressions, the optimal combinations of spatial frequencies in the stimulus differs. So for better recognition of a neutral facial expression and happiness, the full frequency range, that is, all 5 octaves, is more preferable. To recognize other emotions, a band of 4 octaves is enough. However, for stimuli expressing sadness, the effective range is shifted to a lower spatial frequency, while for other emotions it is shifted to a higher frequency region. It should also be noted that for the negative emotions (fear, anger, sadness) the optimum is quite clear (significant differences were obtained according to Student's test), and for other expressions it is not so obvious.

Finding the optimal combination of spatial-frequency ranges for each facial expression allowed us to move on to experiment 3.

Experiment 3. Testing the possibility of effective expressions recognition in facial stimuli created with the areas of highest contrast gain.

The results obtained indicate that the information from the areas of the face with the highest contrast gain is indeed useful for expression recognition. However, the question remains how much the solution to this problem depends on whether the subject uses all the information about the face, or only information from areas of highest increase in non-local contrast. To do this, under the same experimental conditions, it was necessary to compare the accuracy of expression recognition in photographic images of real faces (unfiltered) and in faces formed from fragments selected in the optimal spatial frequency ranges for each emotion.

Procedure

Experiment 3 involved 49 subjects.

Synthesized facial stimuli expressing fear, anger, disgust, and surprise included frequencies of 8, 16, 32, and 64 CPI. Stimuli expressing sadness were created from the ranges with central frequencies of 4, 8, 16, and 32 CPI. Stimuli with a neutral expression and happiness were created from fragments identified in the range of five octaves: 4, 8, 16, 32 and 64 CPI. The set of real face images used as stimuli did not overlap with the set of initial images used to create the synthesized stimuli. A total of 70 synthesized and unfiltered facial images were used (10 faces x 7 expressions).

The stimuli were presented in a random sequence. The exposure time was not limited. After training, the subjects were asked to make a decision on each presented stimulus as quickly as possible and press the key. Pressing the key removed the image. That way it allowed us to measure the decision time. Then the subjects gave a verbal response and it was recorded by the experimenter. As before, the range of possible responses was limited to 7 expressions.

Results

The results obtained in experiment 3 are shown in Figure 4. In general, the average accuracy of expression recognition was expectedly somewhat higher when perceiving natural facial images (83% correct responses) compared to synthesized stimuli (73%). For real images, the decision time was also shorter (by 290 ms on average).

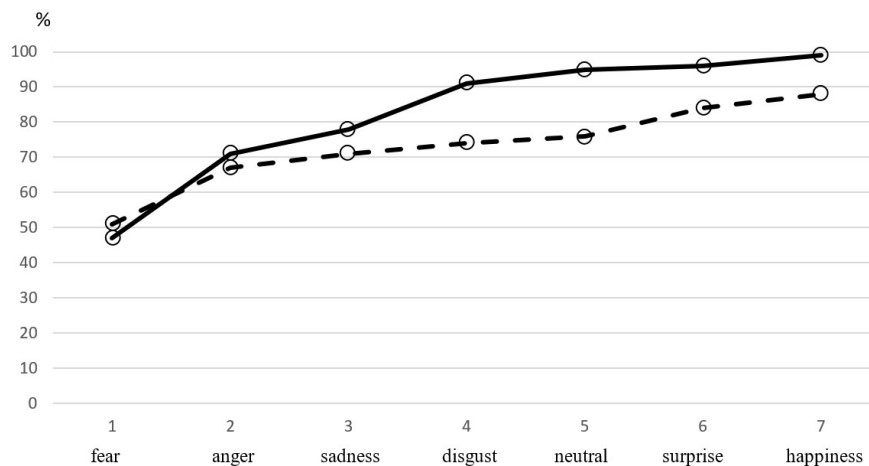


Figure 4. Accuracy of expression recognition in real (continuous line) and synthesized (dotted line) faces.

For statistical analysis of the obtained data we used a two-way Repeated Measures ANOVA (main effects: Expression (7 expressions) and Stimulus Type (real and synthesized), as well as their interaction). It was confirmed that the recognition accuracy of different expressions is different for both real and synthesized facial stimuli ($F(3.284, 157.609)=68.276, p<0.0000, \omega^2=0.530$, Greenhouse-Geisser corrected). The accuracy of expression recognition for different types of stimulus differs significantly ($F(1, 48)=110.154, p<0.0000, \omega^2=0.351$). The curves from Figs. 4 are also different ($F(4.755, 228.233)=8.911, p<0.0000, \omega^2=0.101$, Greenhouse-Geisser corrected). The last of these differences is determined by the fact that for disgust, surprise, happiness and neutral expression the recognition accuracy is higher for real face images, while fear, anger and sadness are actually recognized with the same accuracy as in

synthesized images (Table 5).

Table 5
Comparison of recognition accuracy of different expressions for real and synthesized facial stimuli

| Facial expressions | Stimuli | | t | PHolm |
|--------------------|--------------------|---------------|--------|-------|
| | real / synthesized | % | | |
| fear | 47 / 51 | 92.16 | -1.424 | 1.000 |
| anger | 71 / 67 | 104.48 | 1.582 | 1.000 |
| sadness | 78 / 71 | 110.00 | 2.610 | 0.246 |
| disgust | 91 / 74 | 123.00 | 6.487 | 0.000 |
| surprise | 95 / 76 | 125.00 | 7.357 | 0.000 |
| neutral | 96 / 84 | 114.29 | 4.430 | 0.000 |
| happiness | 99 / 88 | 112.50 | 4.746 | 0.000 |

Higher accuracy values in comparison pairs are shown in bold.

The accuracy of expression recognition in real and synthesized facial stimuli somewhat differs. At the same time, real and synthesized faces formed the same sequence of gradual increase in recognition accuracy in a series of expressions (see Fig. 4). Statistical analysis using rank correlation coefficient showed that these are similar functions (Kendall's $\tau_b(47) = 1, p = 0.000$). This may indicate that the natural course of the information processing is not disturbed when a real face is replaced with a synthesized image created from fragments with the highest contrast gain. However, there is enough information to recognize emotions of negative valence in synthesized stimuli, but not enough for recognition of other expressions. That suggests that in the synthesized facial stimuli some important information is missing.

Discussions

The ability of the human visual system to process huge amount of information in a very short time is determined by the ability to find "useful" areas in the input image. This step can be based on the search for spatial heterogeneities in the image using the second-order visual mechanisms. To simulate the operation of these mechanisms and to test the usefulness of the information extracted by them in the expression recognition, we created the gradient operator of total non-local contrast (GOTC). Two variables determine the overall contrast: the contrast of the single luminance gradients and the number of gradients in a given area of the image. Moreover, the second variable make a greater contribution to the total signal energy. Therefore, regions of interest first of all are the areas with the largest accumulation of luminance gradients.

The design of the created operator reflects the main properties of second-order visual filters: the multichannel nature of the second-order mechanism (a set of operators of different sizes); bandpass filtering of carrier and the certain relationship between the carrier and envelope frequencies (the operator size has inverse relation with filtering frequency in CPI); opponent organization of the filter, which makes it possible to encode the amplitude of the contrast modulation (concentric organization of the GOTC); weighting function of the filter receptive fields (Gaussian transfer function aperture). The stimuli we used were created using this gradient operator.

In experiment 1, we showed that the recognition of 7 basic emotions in facial expressions has relatively high level of accuracy when it is based on the information of different spatial frequencies from areas of highest increase in non-local contrast (about 75% of correct responses). At the same time, facial stimuli created from areas with the lowest contrast gain turned out to be absolutely ineffective in terms of solving this problem (recognition accuracy was at a random decision level). Together with the previously published results (Babenko et al., 2021), this indicated that the informativeness of the image area is determined by the degree of its difference in the total contrast from the surroundings.

We then analyzed the possibility of using a low-frequency representation of the entire face in expression differentiation tasks. In previous studies, we have shown that stimuli generated by the operator with a central area that matched the full size image were recognized as faces in a series of other stimuli with high accuracy (about 75%). When in experiment 2 the task was transformed and it was required not only to detect a face, but to differentiate the emotions in facial expressions, the result decreased significantly - to about 18% of correct responses (when a random decision level was 14%). This result is

consistent with widely accepted assumption that face processing should be considered as consecutive steps of face detection and individualization (Comfort and Zana, 2015). However, at the second stage of the processing the low-frequency description is no longer enough. Higher spatial frequencies provide additional information about the internal features of the face, which are very important for its configurative description (Goffaux, 2009; Piepers and Robbins, 2012).

In experiment 2, we studied the accuracy of expression recognition in facial stimuli with different combinations of fragments isolated in different ranges of spatial frequencies. We found that the most effective frequency range is the 11.3-22.6 CPI band with a center frequency of 16 CPI. And while this result is not consistent with the idea of the low spatial frequencies importance in the perception of faces, it is consistent with the data indicating that the frequencies of the middle range are most important in identifying faces. It is noteworthy that in this frequency range (11.3–22.6 CPI), the GOTC more often singled out the eyes and mouth as areas of interest in the initial images, which are known to be very important for conveying emotionally significant information.

However, unlike the experiments with Bubbles technique, we did not aim to determine the independent contribution of each frequency range to expression recognition, since the perception of a face is not a simple sum of its components (Jack et al., 2012, but see Gold, Mundy and Tjan, 2012). It was important for us to determine the range of spatial frequencies for each expression that provides the best accuracy of recognition.

Our results certainly do not provide an unambiguous answer to the question of how information from different spatial frequency pathways is combined. Previously published results in this area have also been somewhat controversial. There is data on that the visual system processes spatial frequencies in a certain sequence, from low to high (Gao and Bentin, 2011). At the same time, flexible top-down selection of spatial frequency channels can significantly optimize the visual processing (Flevaris and Robertson, 2016). It is also impossible to exclude the possibility of simultaneous processing of all frequencies. Considering the above, our results clearly indicate the frequency range that contains the most useful information about facial expressions and which would be the most reasonable to start processing with (11.3-22.6 CPI). The conclusion that this information can determine the strategy for further integration of spatial frequencies is also supported by the fact that for emotions of negative valence it is more optimal to add information from a lower frequency ranges, and for other facial expressions from a higher frequency ranges.

Different frequency ranges turned out to be effective for different expressions. For the best recognition of neutral and joyful facial expressions, all 5 octaves were required. This result is consistent with the data on neutral facial expression containing a complete set of basic expressions (Lee and Kim, 2008), and that the expression of happiness is encoded by both low and high spatial frequencies (Becker et al., 2012). Our data showed that in sadness recognition, 4 octaves were enough (without the highest frequency range). To recognize fear, anger, disgust and surprise, 4 octaves were also enough, but without the lowest-frequency range.

So, as a result of the experiment 2, we have determined in what ranges of spatial frequencies the areas of the greatest contrast gain should be extracted in order to provide the best recognition accuracy of a particular expression. Now it was necessary to make sure that this is exactly the information that is used by the visual system when recognizing the expression of real faces. To do this, in experiment 3 we compared the accuracy of recognition of each expression in the perception of the images of real faces and stimuli formed from the optimal combination of selected fragments. Indeed, synthesized images were recognized somewhat worse than real ones (73% versus 83%).

It is interesting to note that the decrease in the recognition accuracy for the synthesized stimuli was not found for the expressions of negative valence. In these cases, these fragmentary images of faces were perceived with approximately the same accuracy as real ones. Such peculiarity of the recognition of negative expressions is consistent with the data on that the perception of such emotions is associated with the activation of special mechanisms (Shaw et al., 2011; Stein et al., 2014; Vuilleumier et al., 2003). However, this does not dismiss the question of the insufficiency of the information contained in the selected areas for the recognition of other emotions. It became obvious that some of the useful information in the synthesized stimuli is missing. Probably the same is evidenced by the increase in reaction time. In fact, this was expected.

Even though choosing the operator parameters we tried to rely on literature data, we had to make the choice arbitrarily in a number of cases. This concerns the number of areas that stand out in each of the frequency ranges, for example. An increase in their number, especially at high spatial frequencies, will be expected to improve the recognition rate. Another aspect that can affect accuracy of expression recognition is the filtering frequency in cycles per aperture. Previous research suggests that the optimal carrier-envelope ratio in second-order filters is 1 to 8 (Babenko, Ermakov and Bozhinskaya, 2010; Peng

and Schofield, 2011). However, this result was obtained in the tasks with modulated textures and not faces. Obviously, even a slight increase in the filtering frequency (for example, from 4 to 4.5 cycles per aperture) can improve the accuracy of expression recognition.

The most interesting finding that we would like to emphasize is that numerous studies have shown that people recognize different expressions with different efficiency, and the recognition accuracy for different expressions form a certain sequence. Fear is recognized with the worst accuracy, and happiness with the best. In experiment 3, as in previous studies, we found a certain sequence of the increase in accuracy of expression recognition for images of real faces. And it was repeated with synthesized images created from the areas of the greatest contrast gain. This may be evidence that the replacement of a real image by a fragmented one, although accompanied by some general decrease in recognition accuracy, does not violate the general logic of the processing.

Conclusions

The obtained results indicate that the informative content of image areas can be determined by the difference between these areas and their surroundings in terms of such a physical parameter as the total non-local contrast. Moreover, the greater this difference, the higher the informational significance of these fragments. This seemingly unexpected result can be explained by the fact that the greatest contribution to the value of the total contrast is made not so much by the contrast of each single luminance gradients, but by the total number of gradients in the analyzed image area. And since each gradient is a kind of visual information unit, the more gradients it contains, the more informative this area would be.

We established that information from the areas of highest increase in contrast is necessary for facial expression recognition. Moreover, this information is sufficient for recognition of basic expressions with a very high accuracy.

These areas are characterized by spatial modulation of luminance gradients and they can be extracted from the input image by second-order visual filters. Thus, these filters are good candidates to be viewed as mechanism of selecting the areas of interest.

Since the signal at the filter output is proportional to the amplitude of the modulation, those that are more activated than their neighbors gain an advantage, due to the lateral interaction between the filters. The locations of these filters form a saliency map, in which priorities for selective attention are distributed in accordance with the amplitude of the modulation.

At the same time, the filters themselves, drawing attention to certain areas of the image, can actually play the role of windows through which information from these areas of the visual field is transmitted to post-attentive levels of processing.

Thus, the results obtained allow us to draw the following conclusions:

- Information from image areas of highest increase in luminance contrast is necessary and sufficient for recognition of basic facial expressions.
- The second-order visual filters extract the salient regions of the image, and a signal value at the filter output determines its priority for attention.
- The receptive fields of the second-order filters act as windows for the attention to extract information, which is then transferred to post-attentive levels of processing.

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Conflict of interests

The authors declare no conflict of interest.

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The Correlation Between Father Involvement and The Academic Achievement of Their Children: Meta-Analysis

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Abstract: Parental involvement is an important factor in students' achievement, and numerous studies have shown that it increases students' success. As research on father's involvement has become one of the current topics in education today, there is a need to separate the effect exercised by fathers from the overall family one. The aim of this study is to synthesize various studies which have focused on different aspects of fathers' involvement; therefore, a meta-analysis would be an ideal method to create a synthesis of these perspectives and provide one general measure of fathers' involvement effect. Nine studies have been included in the meta-analysis, where fathers' involvement has been operationalized through father's involvement in: education of children at school and at home, psychosocial well-being of children, modelling of behavior and leisure activities. The results show that the total measure of effect size differs from zero after applying the fixed model ($z=13.510$, $p=0.000$) and the random effect model ($z=4.588$, $p=0.000$), that is, there is a statistically significant positive correlation between the involvement of fathers and the academic success of their children. The value of the heterogeneity test ($Q=66.560$, $df=8$, $p=.000$, $I^2=87.981$) indicates that the overall effect can be viewed according to the assumptions of the random effects model. The conducted meta-analysis has confirmed the assumption that fathers' involvement is positively related to children's academic performance.

Keywords: father's involvement, academic achievement, children, meta-analysis.

Introduction

Student academic success is a major concern in many societies. Parental involvement is an important factor in student achievement, and numerous studies have shown that parental involvement increases student achievement (Hoover-Dempsey et al., 2005; Blazer, 2009; Galindo and Sheldon, 2012). However, little is known about the individual contributions of mothers and fathers to their children's education, as most studies have not differentiated between maternal and paternal involvement. Studies that have made this distinction have mostly focused on mothers (Kim and Hill, 2015), although researchers have suggested that fathers also play an important role (Lamb, 1975; Amato, 1994; Sarkadi et al., 2008). Few studies have been done on this topic, and those that have been done are mostly qualitative studies, while there are few studies that can offer quantitative data on the effect of fathers' involvement in children's academic performance (Fan, 2001).

Father's involvement has become one of the more current topics in education today (Coles, 2015). In the small number of studies dealing with fathers' involvement and children's academic success, it is not clear which aspects of involvement are most important (Paquette, 2004).

The very notion of father involvement dates to the 1980s. It is believed to have been conceived between 1984-1987 (Pleck and Masciadrelli, 2004), and in a paper from 1987, Michael Lamb was one of the first to offer the operationalization of this term through three dimensions: interaction (engagement) - availability - responsibility (Lamb, 1987; according to Krampe, 2009). There have also been attempts to define father involvement through 4 dimensions: expectations, interest, school involvement and family involvement (Fagan and Palm, 2004).

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There are several basic changes to the father's role over time. First, the changes concern the perception of the father as a parental figure - from the father as the breadwinner of the family, with an emphasis on the material aspect of the role, through the father as a biological necessity, to the father as a parent - in terms of the effects on the development of both the child and the father personally. Also, the concept of the tasks of fatherhood changed - from a father who had the position of moral supervision, to a father who is required to be dexterous in understanding and monitoring the child. Related to this is the change in the concept of fatherhood - from the dominance of the father's goals and the family program intended for the child, to parenthood as a process by which the child's development, characteristics and goals are met, directed and integrated. Considering these changes in the role of the father motivated by the historical context, sociologically oriented scholars describe two social aspects of these changes. One of them is the culture of fatherhood and it includes norms, values, beliefs about a man as a parent. Second aspect is implementation or behavior in the role of father. These two aspects do not necessarily have to be synchronous, and it is assumed that the culture changed (and is changing) faster than the behavior itself as a form of adaptation to changes (Lamb, 2000). Although there is a significant shift from the role of the father as a nurturer to the father as a guardian (Atkinson and Blackwelder, 1993), recent studies indicate that the role of the father in society is still shown to be deficient in various ways compared to the role of the mother as a parent (Phelke et al., 2009). The fact is that the 1990s have been declared the "decade of fathers" which brought with it a major shift in research attention devoted to types of fathers, father involvement, the effects of father presence and involvement, fathers' parenting behavior, father-child interaction, etc. (Tan and Golbderg, 2009). Modern generation of men, often known as "modern fathers", consists of individuals who reject the paternal practices of previous generations, actively and consciously participate in the development of children and spend more time with their children (Gottzen, 2011; Yogman and Eppel, 2022; Trahan and Cheung, 2016). Modern fathers strive to connect with their children, and focus on the emotional aspect (Carrillo et al., 2016). Moreover, fathers more often than mothers describe parenthood as a central part of their identity (Yogman and Eppel, 2022). Interestingly, there is a growing population of activist fathers who are gaining more attention through social media, by writing and reporting on fathers' contributions to child development and their fathering practices today (Scheibling, 2020).

There are multiple conceptualizations of father involvement and attempts to define the father's role in childcare. We will mention some of them. Social-structural approach (father's involvement as an aspect of division of labor), developmental approach (father's involvement as a result of developmental changes and adaptation), father's involvement as a social role (ecological theory), father's involvement as a behavioral aspect of parental identity... When we talk about the assessment of father involvement after overcoming the dichotomy of understanding the father's role as present or absent, the focus of research has become the type of involvement, the time and aspects of father involvement, the nature, reasons and context of father involvement. In this sense, great research and theoretical attention is devoted to the understanding of personal factors that have effects on its optimum solution. Addressing individual development and characteristics as potential determinants of father involvement in childcare has opened several very important domains of potential determinants. Fatherhood is one of the important aspects of family development, too. In addition, it is important to look at fatherhood in the context of society. Employed fathers who have positive emotional experience at work, such as autonomy at work, a sense of belonging to a team and job satisfaction, are associated with a more pronounced emotional closeness with the child, even when the father spends less time with him (Day and Padilla-Walker, 2009). The involvement of fathers has positive effects on children at all ages. The relationship with the father remains significant even in adulthood. The quality of the relationship with the father significantly contributes to life satisfaction, a lower expression of distress in adulthood, regardless of the quality of the relationship with the mother (Amato, 1994; Chung et al., 2020). Long-term effects on adult children's life satisfaction and mental health and better adaptive capacities in adulthood (Lewis and Lamb, 2003) have also been observed in another research. Apart from the children, the father's involvement has a positive impact on his personal development and the development of the family.

Some evidence suggests that fathers are spending more time with their offspring than they did in the past (Lamb, Pleck and Levine, 1985), although these findings are not consistent (Coverman and Shelley, 1986). In any case, most researchers agree that fathers' involvement is important for men themselves, their children, and their wives (Baruch and Barnett, 1986; Easterbrooks and Goldberg, 1984). Fathers who spend more time caring for their children may influence the development of secure attachment (Palkowitz, 1985), and their children benefit from these improved attachments (Lamb, 1975; Lamb, 1980).

School-aged children whose fathers are involved in care, upbringing and education achieve better academic results. They receive higher grades more often, have better quantitative and verbal abilities

(Campbell, 1973; Goldstein, 1984), have higher grade point averages, and generally perform better on tests than their peers (Astone and McLanahan, 1991; Cooksey and Fondel, 1996). Children of involved fathers are more likely to live in homes that are cognitively stimulating (Jeynes, 2007). Also, they prefer to enjoy school, have more positive attitudes towards school, get involved in school-related activities...

Epstein divides fathers' involvement in children's education into six dimensions: parenting (helps the family, provides support, understands child and adolescent development, adjusts the climate in the home to be conducive to learning and development); communication (communicates with children and the rest of the family about school programs, the child's progress, etc.; creates two-way communication between school and home); volunteering (encourages family members to volunteer at school and in the community); learning at home (involves family members in learning at home, doing homework, setting goals, etc.); decision-making (involves the family in decisions about the school the children attend, participates in committees and other school bodies); cooperation with society (Epstein, 2007).

Although expectations regarding fatherhood have increased, the parenting literature is still more focused on mothers. Mothers are believed to be more involved in childcare and education than fathers (Amato, Dorius and Lamb, 2010). The literature related to fatherhood does not offer much material related to father involvement and children's education.

The decision to conduct a synthetic study looking at the effects of father involvement on children's academic performance arose from the lack of meta-analyses on this topic. In the literature, we found at least 10 meta-analyses dealing with the effects of parental involvement on various aspects of children's academic life (Fan, 2001; Jeynes, 2007, 2012; Hill and Tyson, 2009). There are meta-analyses looking at the effects of father involvement on children's cognitive development (Pedersen, Rubinstein and Yarrow, 1979). Also, most authors show more interest in family structure and parental involvement than they do in father involvement (Jeynes, 2015). Likewise, different studies have focused on different aspects of fathers' involvement, and therefore a meta-analysis would be an ideal method to synthesize these different perspectives and provide one general measure of effect.

Materials and Methods

Literature search and criteria for including papers in the meta-analysis procedure

The literature search was conducted during January and February 2022 and included the papers from the English-speaking area. The first database that was searched was Google Scholar using the key words: father involvement + child academic achievement; paternal involvement + child academic success/ grades/ attainment; father parenting + child cognitive outcomes. 43 potentially relevant papers were checked considering the title that indicated the involvement of fathers. A subsequent search using the same/similar keywords was followed by a search of databases and the Science Direct search engine, where 21 potentially relevant papers were found. Three papers that were found by searching through Google Scholar were duplicates. As for the Ebsco database, 5 potentially relevant papers and a Springer link where most of the papers were the same as in previous search engines and databases, and the number of potentially relevant papers was 9. The results of the search carried out in this way yielded 78 potentially relevant titles that could be included in the meta-analysis. An extensive review of the papers that were available (12 papers could not be opened) revealed that in 21 papers there are unclear indicators of academic success of children, and therefore they were excluded from further analysis. Also, 16 papers were the result of a repeated search, 7 papers were not empirical but theoretical, and 14 papers did not contain the data needed to calculate the effect size. Each research and study included in the meta-analysis had to meet the following criteria:

1) In the studies, the following operationalizations were accepted as measures of Father's Involvement, which resulted from the search of primary research and theoretical papers dealing with the involvement of fathers: - father's involvement in children's education from the school aspect (visiting school, participating in school events, visiting school on open-school days and parent-teacher meetings; fathers' involvement in children's education at home (writing homework, helping with learning), father's involvement related to children's psychosocial well-being (conversations with children about their problems, needs, wishes, involvement in their daily life and problems, warmth, openness), father's involvement in modeling and correcting children's behavior, father's involvement in leisure activities (playing with children, watching TV, going for a walk...). Measures of fathers' involvement were self-report questionnaires or questionnaires filled out by children about their perception of fathers' involvement.

2) Grade point average was used as a measure of the academic achievement (performance) of children, provided by children, teachers or parents. Also, variables that were quantified as a measure of

the most frequent grade at school (the most common grade 5, coded as 5) were also included. Studies that assessed children's general cognitive achievement were excluded.

3) The meta-analysis included papers published in scientific journals in English, as well as unpublished sources. The methodological quality of the study was not used as an inclusion/exclusion criterion on this occasion, given that the methodological requirements of the study are based on the existence of descriptive indicators when it comes to the grade point average and correlation when it comes to the involvement of fathers.

4) The Father Involvement variable was separated from other characteristics and variables in the study. For example, if Father Involvement could not be isolated due to operationalization specifics (e.g., Parental Involvement), such a study was not included in further analysis.

5) The imperative when conducting a meta-analysis is that the effect size measures from individual studies are mutually independent, that is, that there is no duplication of data, that is, that the same data are not included more than once in the analysis (Lipsey and Wilson, 2001). We made the decision that if there are multiple measures of father involvement in the study, the mean value of the effect size measure is calculated and that value is treated as the effect size measure in further analysis.

The final number of studies included in the meta-analysis was 9.

Data analysis

Given that the subject of the meta-analysis is the correlation between fathers' involvement and children's academic success, correlation coefficients were used as a measure of the effect size of individual studies and the overall measure of effect size. There was a dilemma whether to apply a fixed or random effects model as a model for calculating the overall effect size measure. Given that the random effects model can be reduced to a fixed model if the variance between studies is close to zero (Bornstein et al., 2009), both random and fixed effect size measures will be conducted. The software used to calculate individual and overall effect size measures is Comprehensive Meta-Analysis - trial version. Regarding the assessment of the existence of the "the file drawer effect", i.e., the bias of the effect size measure in published versus unpublished studies, the graph of the symmetry of the studies around the overall effect size measure and the results of the Trim and fill analysis are presented.

Results

Table 1

Meta-analysis: the correlation between fathers' involvement and children's academic success

| Study name | r | 95% confidence interval | | Z | p |
|---------------------------|-------|-------------------------|---------|-------|--------|
| | | DG | GG | | |
| Jones | 0,400 | 0,610 | 0,137 | 0,003 | 2,904 |
| Grolnick, Ryan, Deci | 0,170 | 0,278 | 0,058 | 0,003 | 2,968 |
| Tan & Goldberg | 0,220 | 0,354 | 0,077 | 0,003 | 2,992 |
| Bogenschneider | 0,240 | 0,277 | 0,202 | 0,000 | 12,046 |
| McBride, Schoppe-Sullivan | 0,040 | 0,093 | - 0,014 | 0,144 | 1,460 |
| Paulson | 0,410 | 0,509 | 0,301 | 0,000 | 6,804 |
| Rogers et. al | 0,120 | 0,245 | - 0,009 | 0,069 | 1,821 |
| Grolnick, Ryan | 0,060 | 0,151 | - 0,032 | 0,201 | 1,279 |
| Dumka | 0,120 | 0,167 | 0,073 | 0,000 | 4,938 |
| FIXED Model | 0,161 | 0,184 | 0,138 | 0,000 | 13,510 |
| RANDOM Model | 0,182 | 0,256 | 0,105 | 0,000 | 4,588 |

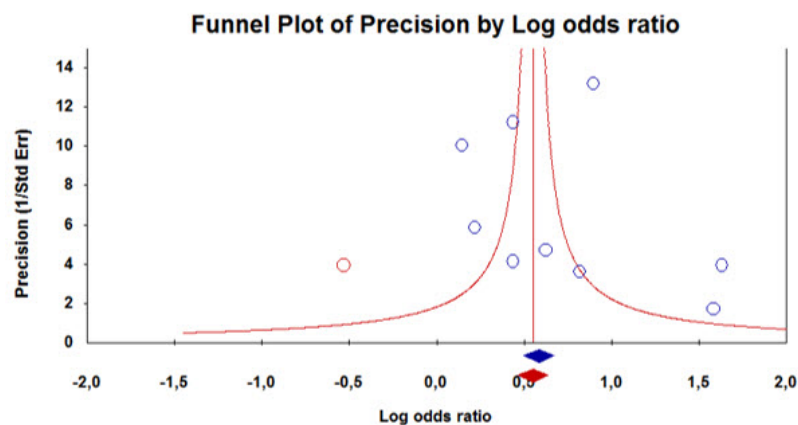
It follows from the above results that the overall effect size measure is different from zero both after applying the fixed model ($z = 13.510$, $p=0.000$) and after applying the random effects model ($z = 4.588$,

$p = 0.000$), that is, there is a statistically significant positive correlation between fathers' involvement and children's academic success.

As for the heterogeneity of the effect size measure, the value of the heterogeneity test $Q = 66.560$, $df = 8$, $p = .000$, $I^2 = 87.981$ indicates that the true/total effect most likely does not vary significantly within the studies themselves, that is, that the data from individual studies can be viewed according to the assumptions of the fixed effect model.

The file drawer effect

The existence of the file drawer effect, i.e., the bias of the studies that were included in the meta-analysis in relation to the study that was not, was also examined, which could have an impact on the overall measure of the effect size. The results conducted so far indicate that the overall measure of effect size does not differ between the random and fixed effects models, so we will present results only for the fixed effects model.



Graph 1. Asymmetry of studies included in the meta-analysis

As we can see from the graph, the studies included in the meta-analysis are not evenly distributed around the vertical axis, but there is a greater concentration of studies on the right side, but considering that this is a very small difference, it cannot be assumed that it is "the file drawer effect" until a larger sample is obtained. Trim and Fill analysis to correct the skewness indicates a lack of 1 study on the left side of the vertical axis (overall effect size measures). By adding these studies, the effect size measure within the fixed model would be $r = 0.15167$ (95% confidence interval = 0.12891- 0.17427), and within the random effects model $r = 0.15406$ (95% confidence interval 0.07322 – 0,23288). The dispersion measure for the fixed model is $Q=66.55990$, and for the random effects model $Q=86.76070$.

Discussion

The main and basic goal of this paper was to summarize the results of several studies and draw general conclusions about the effect of fathers' involvement on children's academic performance. The involvement of fathers has been given a well-deserved position in the scientific research field in recent decades. Many studies examine the effects of father involvement on various aspects of family, partnership, and father-child relationships. During the literature search and the process of defining the problem to be addressed with the meta-analysis, the aspect of fathers' involvement in children's academic performance stood out as a relevant area and as an area on which we could not find available synthetic studies. After the problem was identified, data collection by sampling valid and relevant studies, following the established operationalization, the statistical aggregation of the results of independent studies was started.

The results of the conducted meta-analysis indicate that there is a significant overall effect, i.e., that there is a statistically significant low positive correlation between fathers' involvement and children's academic performance ($r=0.161$, 95%IP = 1.138-1.184, $z = 13.510$, $p = 0.000$ - fixed model; $r = 1.182$. 95%IP = 0.105-0.256, $z = 4.588$, $p=0.000$ – random effects model). The measure of the size of the total effect is significant in both the fixed and random effect models that do not rest on the same assumptions. A fixed effect model assumes that there is a single true effect and all variances are attributed to the study sampling error. The random effects model, on the other hand, assumes that there is a distribution of

true effects and that the variance also comes from individual effects between studies. The heterogeneity test tells us that the overall effect most likely does not vary significantly within the studies themselves. By calculating the “file drawer effect”, we cannot conclude that there is a bias in relation to the selection of studies that will be included in the meta-analysis process. However, it should be borne in mind that 9 studies were included in this analysis, so calculating the symmetry of the distribution of studies using this method is difficult, which is why the results should be interpreted with extra caution.

The meta-analysis that was conducted confirmed our assumption about the positive effect of fathers' involvement on children's academic performance. Children from stable families have the privilege of growing up with both parents by their side, which does not mean that if parents are present, they are really involved in their children's lives (Belsky, 2007; Miller et al., 2020). Primary research on the topic of fathers' involvement has mostly confirmed the assumption that fathers who are involved in raising their children, as well as in their education, raise children who will have better quantitative and qualitative results in school (Bing, 1963; Baker, 2018; Baker, Kainz and Reynolds, 2018). There are many benefits that father's involvement has on children, in addition to academic performance; more self-confidence, a higher sense of responsibility, better capacities for cooperation with adults as well as with peers, all of which contribute to equipping the child with skills and capacities that will facilitate the achievement of high academic success (Hastings and Rubin, 1999). Also, research was done on the subject of father's involvement on the regularity of school attendance (Epstein and Sheldon, 2002) as well as on other behavioral aspects of children related to school that also confirm the importance of father's involvement on positive outcomes. There is longitudinal research that proved big impact of father involvement into educational activities of child on child's cognitive outcomes, too (Cano, Perales and Baxter, 2019).

As it was said in the theoretical section of this research, some papers dealt with the involvement of fathers and the academic success of children, but it was not emphasized which aspects of involvement are the most important (Paquette, 2004; Henry et al., 2020). In this research, we tried to include as many aspects of fathers' involvement as possible: fathers' involvement in children's education related to the school domain (visiting school, participating in school events, visiting school on open-school days and parent-teacher meetings; fathers' involvement in children's education at home (writing homework, helping with learning); father's involvement in children's psychosocial well-being (conversations with children about their problems, needs, wishes, involvement in their daily life and problems, warmth, openness); father's involvement in modeling and correcting children's behavior, fathers involvement in leisure activities (playing with children, watching TV, going for a walk ...).

Conclusions

The aim of this study was the synthesis of different researches which focused on different aspects of father's involvement and their connection with children's academic achievement. After an extensive search, nine studies were included in the final analysis. The hypothesis about the positive effect of father's involvement on children's academic performance was confirmed.

The limitations of this study are reflected in the small sample of primary studies that were used in the meta-analysis procedure (N=9), although on the other hand, this same disadvantage can be seen as an advantage due to the appropriateness, quality and reliability of the data contained in the final selection of papers. In this meta-analysis, there were no restrictions on the geographical area from which the participants come, so we have participants from Europe, but also from other continents (Mexico, Taiwan, USA).

Studies from leading scientific journals were included in the narrow analysis, although this was not the intention of the researchers. This could lead to study selection bias and to the effect of meta-analysis results. In support of these limitations are graphical and quantitative indicators of the “file drawer effect”.

As a recommendation for the next meta-analysis that would address this topic, the moderating influence of some other variables from the domain of personality or family relationships could be considered.

Regardless of the above-mentioned limitations and the fact that the results should be used tentatively, this meta-analytical study can allow parents and experts who work with children (teachers) to understand the importance that father's involvement has on children's development in general, and especially on the academic aspect and academic achievement of their children.

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Conflict of interests

The authors declare no conflict of interest.

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Distance Learning: Cross-Cultural Characteristics of Stress Resistance of Russian and Chinese Students

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Abstract: The paper presents a theoretical and empirical analysis of the features of distance learning at universities and its impact on the characteristics of anxiety, psycho-emotional states and stress resistance of modern students. The purpose of the study was to determine the specifics of anxiety and stress resistance in Russian and Chinese students during the period of distance learning. The novelty of the paper lies in the fact that Russian and Chinese students took part in a cross-cultural empirical study: in total, the sample consisted of 80 students: 40 Russian students (20 boys and 20 girls) and 40 Chinese students (20 boys and 20 girls) aged 18 to 25 years studying in 2-3d years of Bachelor programs. The following methods were used in the study: 1) Spielberger anxiety scale adapted by Yu. L. Khanin; 2) the questionnaire "Well-being, activity, mood" by V.A. Doskin, N.A. Lavrentieva, V.B. Sharaya and M.P. Miroshnikov; 3) a short scale of stress resistance by E.V. Raspopin. The conducted research identified specific features of anxiety and stress resistance manifestation in Russian and Chinese students. We established significant differences in indicators of anxiety, stress resistance and psycho-emotional state components as well as determined meaningful between indicators of well-being, activity, mood, anxiety and stress resistance in students. Based on the data obtained, the content of the paper presents conclusions and recommendations on optimizing the educational process at the university in order to reduce anxiety and increase stress resistance in students who have to endure the distance-learning format.

Keywords: Russian and Chinese students, stress resistance, anxiety, online learning.

Introduction

Distance learning in an educational environment is far from being an innovation. In the conditions of intensive knowledge accumulation and updating, the emergence of new technologies that led to the information revolution at the end of the 20th century, there appeared a need to develop new ways of transmitting knowledge and ensuring the possibility of spreading it among an unlimited number of people. The concept of distance learning, which was established at the turn of the 20th and 21st centuries, has acquired global significance, having a significant impact on the education systems' functioning in many countries of the world and becoming a resource for continuous acquisition of knowledge in accordance with the social needs (Lukin, 2021; Reza, 2022; Stošić and Stošić, 2015). Online learning has appeared in the world community as an educational industry, which includes a huge number of educational institutions and students (Mamatov et al., 2006).

Nevertheless, when there was a need for an "emergency" transfer of training to a distance format caused by the COVID-19 pandemic, it turned out that Russia has no unified system capable of ensuring the effective conduct of training sessions in such a mode (Mikhailova, 2018). The educational process participants, both teachers and students, faced a number of problems related to adaptation to the new educational format and restructuring their life style (Makarova, 2021). Psychology Department students at St. Petersburg State University (St. Petersburg, Russia) identified the following factors that had a negative impact on their vital activity and psycho-emotional state: 1) an increase in the volume of educational tasks; 2) the need to use a computer and mobile devices for a long time and, consequently, health deterioration; 3) emotional deprivation, including the lack of real communication with peers and teachers; 4) loss of a

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sense of time (Vodopyanova, et al., 2020).

It should be noted that many specialists have studied anxiety as a psychological phenomenon manifested in the student environment (Alharbi et al., 2019; Islam et al., 2020; Lee, Jeong and Kim, 2021; Mohamad et al., 2021). One of the most relevant areas of research in today's reality is the study of correlation between anxiety and productivity (Badmaeva and Bardaleeva, 2021). A particularly relevant area of research in modern psychology is the study of the negative impact of anxiety on health in adolescence and youth (Parodi et al., 2022). According to the data obtained on students, a high level of anxiety also has a negative impact on their success in educational activities, including academic performance, and on their psychophysiological adaptation (Stošić and Fadiya, 2017).

In general, anxiety manifests itself quite often in students, while different factors cause it within different training courses (Núñez-Peña and Bono, 2019). Thus, the first year of study is associated with adaptation to a new environment and unfamiliar requirements: a first-year student faces the need for self-regulation and self-control, as well as personal responsibility for his academic performance and behavior, which naturally leads to an increase in stress and anxiety (Ekhaeva and Sugaipova, 2016).

Some researchers note the restrictions imposed by higher education institutions on the students' behavior as one of the important factors of anxiety. Students can continue their studies only if all the necessary requirements for this, concerning both the discipline and the learning process itself, are met. All this contributes to the growth of anxiety, stress levels and even aggression (Kudinov et al., 2017).

The modular-rating training system itself, common for most universities, is also singled out as one of the factors increasing the level of anxiety among students (Hull et al., 2019). The need for constant activity during the academic semester, including regular answers at seminars and attending all the lectures — since points for skipping classes cannot be compensated — lead to an increase in the students' anxiety (Alieva and Tazhutdinova, 2009).

Despite the successful solution of organizational problems, distance learning in itself, namely its main characteristics, is a factor that has a negative impact on the life, health and psycho-emotional state of both teachers and students (Rzanova et al., 2022). It is well-known that prolonged sitting at a computer and other electronic devices, coupled with psychological stress, negatively affects attention and efficiency (Malaya and Larionova, 2020).

One of the factors adversely affecting the students' health is their use of phones mostly to participate in online classes (a small screen and symbols on it, electromagnetic radiation) (Di Malta et al., 2022). The students' inability to keep the correct working posture, the tension of the neck and shoulder girdle muscles that goes beyond the norm also negatively affect the students' health (Adedoyin and Soykan, 2020). As the students themselves note, they have the main problems in distance learning when organizing their daily routine, as well as due to the lack of personal space for learning activities. Moreover, the students themselves can trouble close people (roommates or family) or they can be distracted from the learning process as well (Krylov et al., 2020).

Describing the student's lifestyle during online learning, V. M. Krylov, A. V. Krylova and T. A. Ponomaryova note that the majority of students, despite the high level of activity inherent in their age, had their overall physical activity significantly decreased (Krylov et al., 2020). For many of them, this is due to an increase in the amount of homework, the need for a long time spent at the computer, which also leads to back pain and weight gain (Almuraqab, 2020). Some of the student respondents noted a decrease in psychological activity and pointed to the lack of "live communication" and loneliness (Waterhouse, Samra and Lucassen, 2022).

Thus, determining the main factors that have a negative impact on the students' health during distance learning, the authors identify low physical activity, which is a consequence of a "sedentary" lifestyle, psychological deprivation, fatigue and a violation of the usual lifestyle (Fetisova, Milenin and Senik, 2020). With the distance-learning format, many students for various reasons began to actively combine study and work, which, of course, resulted in the educational process detriment.

Characterizing the emotional state of college students during distance learning, L. A. Grigorovich, S. S. Grigorovich and E. B. Kachalina note problems with students' self-regulation, as well as an insufficient level of their self-reflection, which leads to an increase in their levels of anxiety and frustration, as well as to the feeling of despair (Grigorovich, Grigorovich and Kachalina, 2020).

In turn, T. I. Kulikova, according to the results of the study of the psycho-emotional states of students during distance learning, notes that the situation of uncertainty naturally triggers anxiety, promotes the manifestation of neurotic reactions and provokes a feeling of loneliness in students (Kulikova, 2021).

V. V. Pozdnyak, N. I. Saulenko, A. O. Polushko, V. V. Shishkov, A. V. Ilyichev, who studied the mental state of students during self-isolation, identify a factor of general concern about the consequences of distance learning that causes anxiety and fears among students (Pozdnyak et al., 2021).

All of the above problems pose new tasks for higher school employees to reduce the stressful factors of the educational process and optimize educational activities (Brooke et al., 2022). Two important factors that have a positive impact on the stress resistance development in students and the formation of their positive attitude to learning were identified: 1) external factors, including the teachers' influence, interpersonal interaction with them and with other students, active student activity (both extracurricular and scientific), the system of incentives available at the university; 2) internal factors represented by psychophysiological, socio-psychological, as well as psychological and pedagogical characteristics of the individual (Stošić, Dermendzhieva and Tomczyk, 2020).

Our theoretical research has confirmed that the students' anxiety and stress resistance expressed during distance learning have specific features (Başağaoğlu Demirekin and Buyukcavus, 2022; McLafferty et al., 2022; Mirna and Ali, 2021; Pelucio et al., 2022; Sindiani et al., 2020), and differ from the indicators of anxiety and stress resistance in full-time education. It was also revealed that the problem of the Chinese students' psychological well-being in general and the manifestations of their anxiety and stress resistance in particular remains poorly understood.

It is important to note that psychological well-being characteristics of those Chinese students who study remotely in Russia have certain specifics (Chenn and Agyeiwaah, 2022), since Chinese students, unlike Russian students, face a number of additional stressful situations such as learning in a foreign language (Aristovnik et al., 2020), the need to urgently master online platforms and work effectively with them (Abramova, Filkina and Sukhushina, 2021), difficulties in online communication with teachers (Abramova, Sukhushina and Rykun, 2020), etc.

In order to develop methods for the prevention of anxiety, stress resistance maintenance and development, as well as to identify criteria and create conditions for comfortable implementation of educational activities in online format, there is a need to study the characteristics of anxiety and stress resistance in students, including those studying abroad. Thus, having identified the main characteristics of anxiety and stress resistance of Russian and Chinese students studying remotely, we will be able to more fully consider the impact of online learning on the students' psychological well-being as a whole. Such a study will allow us to develop recommendations for overcoming anxiety and developing stress resistance in students, taking into account ethno-cultural characteristics.

Materials and Methods

Based on the theoretical analysis carried out, we have set the purpose of our empirical research — to identify the specifics of anxiety and stress resistance of Russian and Chinese students during distance learning.

The organization of the empirical study was based on the following assumptions: 1) there are specific features of anxiety and stress resistance in Russian and Chinese students studying remotely; 2) there are differences in the manifestation of anxiety and stress resistance in Russian and Chinese students studying remotely.

Students of the Peoples' Friendship University of Russia (Moscow, Russia), Philology Department, became our respondents. The sample consisted of Russian students aged 18 to 25 years and Chinese students aged 18 to 25 years: 40 Russian students (20 boys and 20 girls) and 40 Chinese students (20 boys and 20 girls) studying in 2-3d year of Bachelor program. The respondents' national belonging was not taken into account; the study was based solely on the actual data of the respondents' nationality.

The results presented in the study were interpreted using the following techniques: 1) Spielberger anxiety scale adapted by Yu. L. Khanin (Greiben, 2014); 2) "Well-being, activity, mood" questionnaire by V. A. Doskin, N. A. Lavrentieva, V. B. Sharaya and M.P. Miroshnikov (Vasilyeva, 2014); 3) the short scale of stress resistance by E. V. Raspopin (Raspopin, 2013). The methodology has been repeatedly tested for informative and discriminatory validity.

Since the study was conducted during the online-learning period, the methods we selected were presented to the subjects in Google Forms. The methods presented to Chinese students were translated into Chinese by semantic translation and adapted by a native Chinese speaker with a high level of the Russian language knowledge. The results were processed using mathematical and statistical methods: Mann-Whitney U-test and Spearman's rank correlation coefficient.

Results

The results of identifying the features of anxiety in Chinese and Russian students using C.D. Spielberger Anxiety Scale in Y.L. Khanin's adaptation are presented in Figure 1.

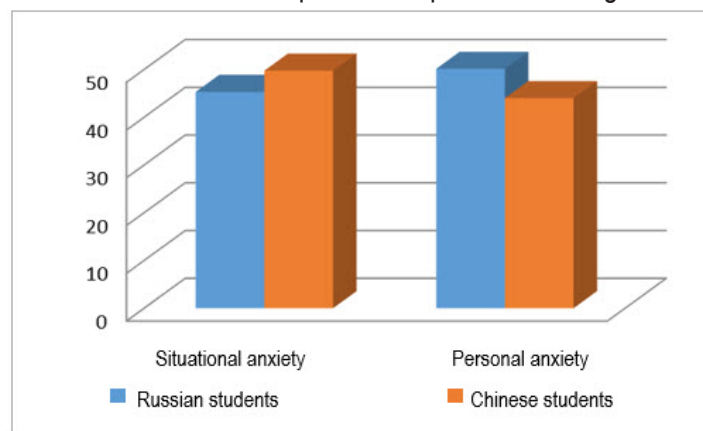


Figure 1. Comparative analysis of the features of anxiety state in Russian and Chinese students studying remotely (n=80)

Having analyzed the data presented in Figure 1, we found differences in both groups. Moreover, lower indicators of situational anxiety are inherent in Russian students, while lower indicators of personal anxiety are characteristic of Chinese students. The greatest differences can be noted on the scale of personal anxiety. In general, both groups of students demonstrated high situational anxiety.

In order to establish the significance of the differences in the obtained empirical data, we carried out mathematical and statistical processing of the results (Mann-Whitney U-criterion). The results obtained during further studies within the framework of the stated problem are presented in Table 1.

Table 1

Results of establishing the significance of differences in the level of anxiety indicators in Russian and Chinese students (n=80)

| Methodics scale | Average value (Russian students) | Average value (Chinese students) | Mann-Whitney U-criterion | p-level |
|--------------------------|----------------------------------|----------------------------------|--------------------------|---------|
| Situational anxiety (SA) | 45.3 | 49.75 | 568 | 0.025* |
| Personal anxiety (PA) | 50.125 | 44 | 525.5 | 0.008** |

Note: * - significance level $p < .05$; ** - significance level $p < .01$

After analyzing the data presented in Figure 1 and Table 1, we noted that the level of situational anxiety in Chinese students (82%) is significantly higher than that in Russian students (47.5%). This may be due to a number of specific stressful factors that foreign students face when studying in Russia. Unlike Russian students, Chinese students have to study in a foreign language, which has complicated their adaptation to the distance learning format. Therefore, the need to work quickly and efficiently on Russian-speaking online platforms, difficulties in communicating with teachers, and the lack of a language environment have been additional sources of stress for Chinese students.

Respondents from China and Russia scored high on the "Situational Anxiety" scale (65% of students from the total number of respondents), which indicates psychological discomfort, increased tension, expressed in high situational anxiety.

Russian students scored high on the "Personal Anxiety" scale. Low and medium levels of personal anxiety were demonstrated by 45% of Chinese students and 32.5% of Russian students. Compared to Chinese students, the group of Russian students has a fairly stable tendency to perceive events happening to them as threatening and react to them by developing great anxiety. Perhaps these results are related to the ethno-cultural characteristics of Chinese culture representatives in general. Chinese students have more patience with difficulties and stressful situations, and also stick to active lifestyle, proper nutrition, a

balanced daily routine and other factors that reduce the level of anxiety.

“Well-being, activity, mood” symptomatic questionnaire by V. A. Doskin, N. A. Lavrentieva, V. B. Sharaya and M. P. Miroshnikov was used to analyze the situation. This data is presented in Figure 2.

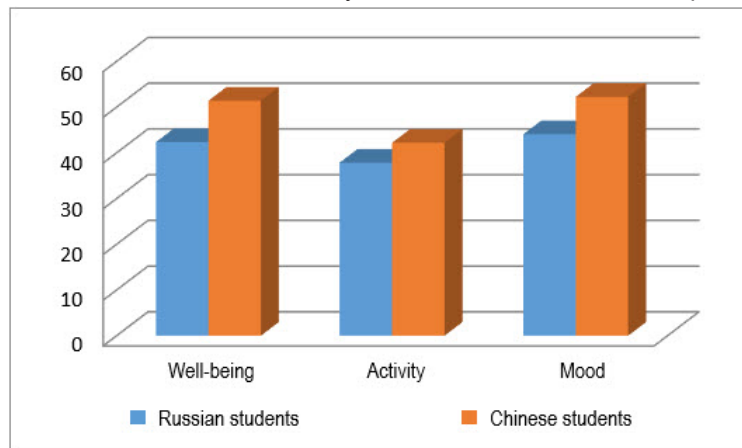


Figure 2. Results of the “Well-being, activity, mood” symptomatic questionnaire application (Russian and Chinese students (n=80))

Based on the analysis of the data from “Well-being, activity, mood” questionnaire, differences were revealed on all scales. Chinese students, unlike Russian students, demonstrated the highest indicators of psycho-emotional state. The greatest differences were obtained on the scales of “Well-being” and “Mood”. In general, Russian students demonstrated average results on all scales of the questionnaire. This suggests that their psycho-emotional state is less satisfactory compared to Chinese students, whose well-being and mood are at a fairly high level. At the same time, the indicators on the “Activity” scale are average for both groups of students, which may be the result of distance learning: a sedentary lifestyle, a long time spent at the computer, a reduction in the number of walks.

In order to establish the significance of the differences in the obtained empirical data, we carried out their mathematical and statistical processing using the Mann-Whitney U-test. We presented the results in Table 2.

Table 2

The results of establishing the significance of differences in the level of indices of the actual psycho-emotional state in Russian and Chinese students studying remotely

| Methodics scale | Average value (Russian students) | Average value (Chinese students) | Mann-Whitney U-criterion | p-level |
|-----------------|----------------------------------|----------------------------------|--------------------------|---------|
| Well-being | 42.35 | 51.40 | 418 | 0.000** |
| Activity | 37.852 | 42.20 | 578 | 0.032* |
| Mood | 44.05 | 52.225 | 501.5 | 0.004** |

Note: * - significance level $p < .05$; ** - significance level $p < .01$

Chinese students scored the highest on the mood scale, which characterizes them as generally more optimistic, positive-minded and cheerful compared to Russian students. This result may indicate both the easier tolerability of the changed living conditions (distance learning) by Chinese students, and their ethno-cultural characteristics: tolerance and resilience towards difficulties, hope for a change in circumstances for the better. At the same time, we should not forget that the results we have obtained are students’ self-assessment. Chinese students can strive both to present themselves on the positive side and to convince themselves (and others) that their emotional state is at a high level, since it is not customary in Chinese culture to openly demonstrate emotions to strangers.

Chinese students also scored the highest points on the “Well-being” scale compared to Russian ones. This result may indicate that despite the conditions of distance learning, constant spending time at home, Chinese students take care of their health.

Both groups of students demonstrated an average indicator on the “Activity” scale (51.25% of the total number of respondents demonstrated an average level of activity, 13.75% showed a low level of

activity). Chinese students demonstrated low and medium levels of activity (7.5% and 85%, respectively), while Russian students demonstrated 20% and 72.5%, respectively. Thus, we can assume that even in the conditions of distance learning, Chinese students try to regularly perform physical exercises and take walks.

In general, the majority of Russian students rated their well-being and mood at an average and low level, while the majority of Chinese students rated their well-being and mood at a high level. Thus, the Chinese students' well-being, activity and mood is significantly higher than those of Russian students, which was confirmed during mathematical and statistical data processing.

The results of the application of the short stress tolerance scale by E. V. Raspopin are presented below in Table 3.

Table 3

Results of determining the significance of differences in the level of stress resistance indices in Russian and Chinese students (n=80)

| Methodics scale | Average value (Russian students) | Average value (Chinese students) | Mann-Whitney U-criterion | p-level |
|-------------------|--|--|-----------------------------|---------|
| Stress-resistance | 2.7 | 4.35 | 519 | 0.006** |

Note: ** - significance level $p < .01$

The data presented in Table 3 suggest that Chinese students scored the highest on the stress tolerance scale compared to Russian students. 55% of Chinese students and 27.5% of Russian students demonstrated high and medium levels of stress resistance. Compared to Russian students, Chinese students are more resistant to stressful situations, as well as events that disrupt their usual way of life, also for a long time. This may be a consequence of the Chinese students' cultural characteristics, expressed in patience, a more stoic attitude to difficulties.

The results of the correlation analysis of the correlation between stress resistance and anxiety in Russian students are presented in Table 4.

Table 4

The results of the correlation analysis of anxiety and stress resistance specifics in Russian students (n=40)

| Methodics scale | Well-being | Activity | Mood | Stress-resistance |
|--------------------------|------------|----------|---------|-------------------|
| Situational anxiety (SA) | -.691** | -.327* | -.762** | -.550** |
| Personal anxiety (PA) | -.720** | -.652** | -.651** | -.546** |
| Stress-resistance | -.436** | -.321* | -.335* | 1.000 |

Note: * - significance level $p < .05$; ** - significance level $p < .01$

After analyzing the obtained data, we revealed significant inverse correlations between indicators of anxiety, stress resistance and components of functional psycho-emotional state in Russian students (Table 5). We observe quite pronounced inverse relationships on "Situational anxiety" and "Personal anxiety" scales and the scales of the "Well-being. Activity. Mood" methodology. Obviously, the higher the anxiety indicators are, the lower the indicators of the psycho-emotional state, in particular, mood, activity, well-being, are. Thus, situational anxiety among Russian students is more pronounced in mood, while personal anxiety is reflected in the indicators of well-being. In addition, anxiety indicators have negative correlations with stress resistance indicators, that is, the higher anxiety is there, the less stress resistance is expressed.

The correlation analysis data obtained from a sample of Chinese respondents are presented in Table 5.

Table 5
The results of the correlation analysis of anxiety and stress resistance specifics in Chinese students (n=40)

| Scale | Well-being | Activity | Mood | Stress-resistance |
|--------------------------|------------|----------|---------|-------------------|
| Situational anxiety (SA) | -.373* | -.398* | -.504** | -.614** |
| Personal anxiety (PA) | -.338* | -.350* | -.373* | -.514** |
| Stress-resistance | .158 | .218 | .195 | 1.000 |

Note: * - significance level $p < .05$; ** - significance level $p < .01$

In general, based on data analysis, we see that Chinese students studying remotely in Russia have lower indicators of the inverse correlation of situational and personal anxiety with the scales of “Well-being. Activity. Mood” methodology than those of Russian students. However, unlike in the group of Russian respondents, the stress resistance in Chinese students is not related to psycho-emotional state indicators (well-being, activity and mood). Although, like a group of Russian students, they have an inverse significant correlation between indicators of anxiety and indicators of “Well-being. Activity. Mood” methodology. The obtained results demonstrate that Chinese students have a greater potential for stress tolerance compared to Russian respondents.

Discussions

Our empirical study of anxiety and stress resistance specifics in Russian and Chinese students studying at the Philology Department at Peoples’ Friendship University of Russia revealed some specifics and significant differences in indicators of anxiety and stress resistance, as well as in the characteristics of the respondents’ functional psycho-emotional state during distance learning.

Characterizing the features of anxiety in both groups of respondents, we can note a high level of situational anxiety in both Russian and Chinese students (65% of the total number of respondents). A high level of situational anxiety may be a consequence of students’ reaction to the upcoming session. It is important to note that the session in the distance format has certain specifics that also increases the students’ anxiety level for the following reasons:

- 1) the need to look into the camera when answering;
- 2) difficulties in understanding teachers;
- 3) the presence of proctoring technology, etc. One of the reasons for the high level of situational anxiety may be a situation of uncertainty.

Despite the expectations of those students who want to continue their full-time studies at the beginning of the academic year, universities have decided to maintain a remote mode for an indefinite period of time until the epidemiological situation improves. Thus, students who had to stay on distance learning reacted with an increased level of anxiety.

An interesting fact revealed during the study is that the level of personal anxiety in Chinese students is significantly lower than that of Russian students. This may be due to the peculiarities of the nervous system, upbringing, as well as the ethnic characteristics of Chinese culture representatives in general. Chinese students have great patience with difficulties and stressful situations; they also use various methods adopted in Chinese culture that reduce the level of anxiety (active lifestyle, proper nutrition, healthy daily routine, etc.).

Analyzing the peculiarities of well-being, activity and mood indicators manifestation of both groups of students as a whole, we can note that both groups of respondents demonstrated an average level of activity. This indicator is a consequence of the specific features of distance learning and the pandemic as a whole. Thus, students spend a lot of time at the computer, studying online and doing homework, the volume of which, as some students note, has increased. Many students could not afford sports at home due to housing conditions, and also did not attend the gym and other public places intended for active recreation, due to restrictive measures, as well as the risk of morbidity.

It is worth noting that the average activity rate of Chinese students is higher than that of Russian students. In general, the Chinese students’ well-being, activity and mood is significantly higher than that of Russian students. Thus, we can assume that higher indicators of the psycho-emotional state in Chinese

students are associated with their culture peculiarities.

The analyzed stress resistance indicators in both groups of respondents show that Chinese students are more stress-resistant. In general, stress tolerance in the sample of Chinese students was revealed at an average level, and stress tolerance in the sample of Russian students is characterized as low. The results obtained during the study clearly demonstrated a statistically significant connection between stress resistance and anxiety in both groups of students. Consequently, the higher the students' stress tolerance index is, the higher their anxiety level is. Accordingly, the lower their stress resistance index is, the lower the level of anxiety is.

The study revealed meaningful connections between the indicators of personal /situational anxiety and functional psycho-emotional state components both Russian and Chinese students demonstrate. Since anxiety is a deeper emotional state, it naturally influenced the respondents' well-being, activity and stamina. Thus, the high level of Russian students' personal and situational anxiety is associated with low indicators of well-being, activity and mood. It is obvious that the high level of anxiety among Russian students reduces mood characteristics and has a negative impact on their health due to neuropsychiatric tension. Analyzing the indicators of correlation between Russian students' anxiety and energy, we can assume that the lack of their physical activity led to an increase in anxiety. The data obtained is important to take into account for the preparation of psychological recommendations aimed at reducing the level of anxiety among students.

The situation is somewhat different for Chinese respondents. Although the level of personal anxiety of Chinese students is close to high and the level of situational anxiety is noticeable, too, the indicators of their psycho-emotional state are quite prominent. This explains that, compared to Russian students, the Chinese respondents' anxiety is much less expressed in their well-being, activity and mood. Thus, we can assume that Chinese students are more resistant to stressful situations, maintaining their psycho-emotional indicators at a worthy level.

The results of the correlation analysis of Russian students' psycho-emotional state indicators with the level of their stress resistance are of much interest. We discovered positive associations between the level of stress resistance and well-being indicators, activity and mood. This may indicate that the Russian students' level of stress resistance may increase due to physical exercises that have a positive and relaxing effect on their nervous system and mood. Deterioration of health and decrease in physical activity, respectively, increase anxiety and negatively affect the Russian students' stress resistance, which in turn causes depression.

Unlike with Russian students, the Chinese students' psycho-emotional state indicators are not related to their stress resistance. Since stress is mainly associated with tension and is not a deep emotional state like anxiety, it is not significantly expressed in the Chinese students' well-being, activity and stamina. It can be assumed that Chinese students endure stressful situations more stoically.

Based on the revealed differences and correlations of anxiety and stress resistance manifestation specifics in Russian and Chinese students, it is important to develop recommendations for the anxiety correction and stress resistance development in students who have to study remotely.

Conclusions

Our empirical research revealed specific features by which Russian and Chinese students manifest their anxiety and stress resistance. Significant differences were detected in terms of anxiety and stress resistance expression, as well as in all components of the functional psycho-emotional state of these groups of students. The research also disclosed reliable correlations between indicators of well-being, activity, stamina and indicators of anxiety, stress resistance in Russian students; reliable correlations between indicators of well-being, activity, stamina and anxiety in Chinese students.

Based on the results of the study, the following recommendations can be formulated in order to optimize the teaching forms and methods, to reduce the level of anxiety and increase the stress resistance in students during distance learning:

1) Psychological services at universities need to develop and implement psycho-corrective online programs and online trainings for stress resistance development in both Russian and foreign students.

2) It is important to conduct educational work on the methods and techniques by which students could organize their personal time as well as to introduce students to time management techniques that will help them correctly allocate their resources during the day. The university psychological service can develop and publish recommendations for students on managing their academic activities and creating a rational daily routine.

3) It is important for specialists in the educational process organization and management to optimize the forms and methods of teaching, to form a clear and understandable system for students to monitor and report on doing the tasks. The psychological service of the university needs to work on teaching the students some psycho-technical exercises that reduce the level of anxiety and regulate their psycho-emotional state. It is necessary to organize interaction between Russian and Chinese students promoting the experience exchange in the use of motor and emotional relaxation anti-stress programs, including various stress management practices adopted in both countries.

4) It is important for the university teaching staff to introduce new methods of activating mental activity and motivating learning in order to stimulate the timely completion of educational tasks by students, as well as lectures attendance. In this case, the point-rating system helps increase the number of points for active work in the classroom and for timely homework completion.

5) Specialists in working with students and group supervisors need to develop and implement a mentoring system for foreign (including Chinese) students within the same study group. The student-mentor, whose work should be encouraged by the management, should monitor the completion of homework by foreign students, as well as assist in explaining the teachers' requirements and the specifics of working with Russian-language online platforms.

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Conflict of interests

The authors declare no conflict of interest.

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Metacognitive Awareness Perceptions of Students with High and Low Scores on TIMSS-Like Science Tests

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Abstract: The current study explores the differences in metacognitive awareness perceptions of students who had high and low scores on TIMSS-like science tests. The sample consisted of 937 Omani students, 478 in Grade Five and 459 in Grade Nine. TIMSS-like tests were specially designed for both grade levels, and students also completed a metacognitive awareness perceptions inventory which explored their use of four main skills: planning, information management strategies, debugging strategies and evaluation. MANOVA was used to analyze the data. The findings indicated that students with high scores in the TIMSS-like test out-performed students with low scores in the test on all four metacognitive skills surveyed. This was true for all three performance areas analysed: performance in the TIMSS-like test as a whole, performance in lower-level test questions and performance in higher-level test questions. These findings highlight the extent to which students' metacognitive skills influence their performance in science tests. The study recommends that students be trained to improve their metacognitive skills, reviews several methods for doing this, and suggests that such training might better prepare them for taking science tests. However, it also notes that further research is needed to explore the impact of metacognitive training on student performance in specific science examinations such as TIMSS.

Keywords: debugging, evaluation, information management, metacognition, planning, science, TIMSS.

Introduction

Omani students have participated in the Trends in International Mathematics and Science Study (TIMSS) since 2007, but have consistently scored lower than the cut-off point throughout that time (Mullis et al., 2020). While little is known about the factors affecting Omani students' performance in TIMSS, internationally the TIMSS has gained the interest of a number of researchers (Kang and Cogan, 2020), resulting in a growing body of research exploring the factors associated with TIMSS test-taking (Chiu, 2012; Kang and Cogan, 2022; Ruthven, 2011; Tighezza, 2014; Wang and Liou, 2018). According to several studies, one of the main factors affecting student performance in science is metacognition (Casselmann and Atwood, 2017; Hong, Bernacki and Perera, 2020; Oyelekan, Jolayemi and Upahi, 2019; Wang and Chen, 2014; Wang et al., 2014).

Metacognition has attracted a range of researchers since the term first appeared in the literature in the 1970s. The scientist who first developed metacognitive theory defined it as individuals' awareness of their mental and cognitive processes and the way they affect performance (Flavell, 1979); other researchers have described it as involving the ability to reflect on one's own thinking, and to monitor and control its progress in order to achieve the goals one desires (Brown et al., 1983; Efklides, 2011; Larkin, 2006; Tang et al., 2016). Metacognition has also been explained as the process of thinking about one's own thinking, a skill which is believed to promote higher-order thinking (Adey, 1999).

Research into the brain has shown that there is an executive control mechanism in the pre-frontal cortex; this is known as "inhibitory control" and is responsible for metacognition. This mental mechanism

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is believed to play a crucial role in inhibiting any initially ineffective or inappropriate response we might have and in guiding us to accept a more fruitful and powerful one (Larkin, 2010). The value of this ability to inhibit initial responses allows an individual to plan effectively. It does this by enhancing their capacity to assess prior knowledge retrieved from long-term memory, to mediate the construction of meaning in the working memory, and also to accommodate new knowledge into existing knowledge networks (Al-Harthy, 2016; Larkin, 2010; Wang and Chen, 2014).

The impact of metacognition on learning and academic achievement has been solidly established in research literature; it has been positively linked to improved levels of learning, intelligence, problem-solving, and decision-making (Al-Harthy, 2016; Balashov et al., 2020; Larkin, 2006; Lee et al., 2012; Mahdavi, 2014; Sari Faradiba et al., 2019; Was and Al-Harthy, 2015). Several studies argue that students with a high level of metacognition are able to decide what they need to learn, and can also control their thinking processes and act in ways that will help them achieve their intended goals. In addition, when a course of study or a topic area emphasizes different metacognitive practices from those they know, they are able to develop reflexive problem-solving strategies (Al-Harthy, Was and Hassan, 2015; Balashov et al., 2020; Rahman and Hussan, 2017; Efklides, 2011; Jaleel and Premachandran, 2016; Joseph, 2010; Lee et al., 2012; Liu and Liu, 2020; Mahdavi, 2014; Shubber, Udin and Minghat, 2015; Sutiyo and Sukarno, 2019; Tok, Özgan and Döş, 2010). Metacognitive ability also makes students aware of their learning progress; they are thus able to reflect on what they have accomplished and decide how they need to go about completing their learning tasks, a process which requires the use of mental skills such as planning, monitoring and evaluation (Efklides, 2011; Wiley and Guss, 2007; Hong, Bernacki and Perera, 2020; Jaleel and Premachandran, 2016; Joseph, 2010; Miller and Geraci, 2011; Santelmann, Stevens and Martin, 2018; Sutiyo and Sukarno, 2019).

A good deal of research has examined the relationship between students' metacognition and their attainment of academic goals, and has shown clearly that greater use of metacognitive skills is associated with an improved awareness of what students are studying. It has also been linked with greater attainment of their learning goals, improved reading comprehension, and enhanced independent learning skills (Al-Harthy, Was and Hassan, 2015; Coutinho, 2007; Jaleel and Premachandran, 2016; Rahman and Hussan, 2017; López-Vargas Ibáñez-Ibáñez and Racines-Prada, 2017; Meniado, 2016; Moir, Boyle and Woolfson, 2020; Shubber, Udin and Minghat, 2015; Sutiyo and Sukarno, 2019; Zhao, 2014). As far back as 1983, Brown et al. (1983) had demonstrated significantly that several metacognitive strategies, including self-regulation, planning, evaluating, and monitoring, are relevant to reading comprehension. Baker and Brown (1984) argued similarly that anyone engaging in reading comprehension must be able to process their cognitive activities, and that most of this involves metacognition. Another interesting point arising from the research is that metacognitive scaffolding seems to lower the cognitive load during the time that an individual is involved in learning tasks (López-Vargas Ibáñez-Ibáñez and Racines-Prada, 2017); by the same token, experiencing learning anxiety during a problem-solving process might lead to metacognitive blindness (Sari Faradiba et al., 2019).

In science education, studies have indicated a positive association between metacognitive awareness and student achievement (Hong, Bernacki and Perera, 2020; Oyelekan, Jolayemi and Upahi, 2019). Metacognition has also been linked to improvements in problem-solving skills (Akben, 2020; Aurah, Cassady and McConnell, 2014), in reflective thinking skills (Antonio, 2020), in science inquiry learning (Tang et al., 2016), in comprehension of science texts (Wang and Chen, 2014; Wang et al., 2014), and in performance on exams (Casselman and Atwood, 2017). There have been other interesting findings; if metacognitive training is carried out continually throughout a semester, it is more likely to improve students' ability to assess their test scores (Al-Harthy, Was and Hassan, 2015; Casselman and Atwood, 2017), and the use of metacognitive prompts during test-taking improves student test scores (Aurah, Cassady and McConnell, 2014). Research also shows that students with high test scores are better able to accurately predict their scores, an important metacognitive skill, than are lower-performing students (Hawker, Dysleski and Rickey., 2016). While students are actually taking a test, they use a range of metacognitive strategies to answer test questions; these include eliminating incorrect options, underlining the clues found in the question text, and re-examining their answers. The metacognitive strategies used vary according to the nature and features of the test items (e.g. narrative, figures and graphics) (Diken, 2020). However, in spite of the growing body of research supporting the positive impact of metacognition on learning, some studies indicate that students do not regularly practice meta-cognitive skills while actually carrying out learning tasks (McCabe, 2011; Santelmann, Stevens and Martin, 2018; Siagian, Saragih and Sinaga 2019; Saenz, Geraci and Tirso, 2019). This could be partly because there is little focus on these skills within the classrooms where they study, and a lack of coverage of metacognition in the curriculum materials used (Jaleel and Premachandran, 2016; Joseph, 2010). Overall, though, research shows that

metacognitive mental skills characterize high-performing achievers and more advanced students (Larkin, 2006). Other research also reports, interestingly, that metacognition develops with practice and also through interaction with others, and that it is these factors which impact individuals' consciousness of their cognitive processing (Balashov et al., 2020; Larkin, 2006).

There are several general learning theories which have a bearing on the role of metacognitive thinking, which is sometimes seen as a kind of private speech that takes place in children's minds. One of these is Vygotsky's sociocultural theory, which stresses the importance of private speech to the development of learning. Another is Piaget's cognitive theory, which emphasizes the importance of meta-thinking in the comprehension of abstract concepts and phenomena; this meta-thinking is a type of metacognition that happens in a later stage of a learner's development (Bates, 2019). A third theoretical perspective that helps to explain the association between learning and metacognitive skills is the cognitive acceleration theory proposed by Shayer and Adey (2002), and heavily reliant on the ideas introduced by Piaget and Vygotsky. A key principle of cognitive acceleration theory is the emphasis on asking learners to explain their thinking process to their peers, telling them how they solve the problems at hand. This lays the ground for the belief that social interaction accelerates learning (Shayer and Adey, 2002), with the group conversation allowing learners to articulate how they think, organize their thoughts, and benefit from others' techniques of tackling different problems, so that they come to visualize their thinking in a sophisticated way (Oliver and Venville, 2015). Other research also shows that the social construction of metacognition is best done while students are actually engaging in the task, rather than when reflecting on their thinking after the task has been completed (Larkin, 2010).

Purpose of study

Understanding the cognitive factors which affect Omani students' performance in the TIMSS has become particularly important to science education research in the country; metacognition is one of these factors, and, if investigated, will provide a better understanding of its role in student test performance in general. It is with this purpose in mind that the current study explores the differences in metacognitive awareness perceptions of students with high and low scores in TIMSS-like science tests. Also, although there have been a growing number of studies investigating student metacognition while they carry out learning tasks, studies investigating the association between student metacognition during test taking and their performance on tests have been very rare, especially in the area of science education. To the knowledge of the authors, there has been no study that explored the association between student metacognition and performance in TIMSS; the current study is an attempt to address this gap in the research literature.

The main research question of the current study is therefore:

What are the differences in the metacognitive awareness perceptions of students with high and low scores on TIMSS-like science tests?

Three sub-questions stem from this main research question:

1. *Do metacognitive perceptions differ for students with high and low scores in TIMSS-like science tests for Grades Five and Nine?*

2. *Do metacognitive perceptions differ for students with high and low scores in lower-level questions of TIMSS-like science test for Grades Five and Nine?*

3. *Do metacognitive perceptions differ for students with high and low scores in higher-level questions of TIMSS-like science test for Grades Five and Nine?*

Materials and Methods

Participants and Context

The participants were 937 Omani students, 478 in Grade Five and 459 in Grade Nine. The participants were from eleven schools located in three important governorates in Oman. The Omani school system is composed of three stages: Cycle I (Grades 1-4), Cycle II (Grades 5-10) and Cycle III (Grades 11 and 12). The study proposal went through an ethics checking review by both the funding body and the Ministry of Education. After their approval was obtained, the schools conducted their own ethics review before approving the participation of their teachers and students; they also obtained parental consent required for the students who would be in the study.

Instruments

Metacognitive awareness perceptions

The current study used the Metacognitive Awareness Inventory (MAI) created by [Schraw and Dennison \(1994\)](#), and a widely used research instrument. The MAI contains four sections, each of which addresses one type of metacognitive skill: planning, information management strategies, debugging strategies and evaluation. The original instrument contained 52 items, but this was reduced to 22 because the original was thought to be too lengthy for young children, and may have negatively affected the data collected. The shorter version had a balanced number of items in each section. The content validity of the selected items was validated by a panel of seven science educators and educational psychologists, who assessed its appropriateness to measure the metacognitive awareness perceptions of young school students. The items were then translated into Arabic, with the translation verified by two psychologists fluent in both Arabic and English. The modified instrument was then piloted on 120 students, and the calculated Cronbach Alpha coefficient was 0.95.

TIMSS-like tests

As our aim was to conduct the test in the study in the same way as the actual TIMSS test is conducted, multiple versions of the test were designed; the actual tests are administered using separate but matching booklets that are randomly assigned to students. We followed the TIMSS Framework ([Mullis and Martin, 2017](#)) and designed 18 versions of a TIMSS-like science test for Grade Nine and 20 versions of a Grade Five test. The tests were written by fifteen science educators who were trained by an international expert to design TIMSS-like questions. The tests were then reviewed by six local TIMSS assessment experts and by an international expert; they were then piloted on 1,163 students. The resulting Cronbach alpha reliability coefficients ranged between 0.661 and 0.885 with an average of 0.779 for Grade Nine, and between 0.655 and 0.885 with an average of 0.778 for Grade Five. These values were found to be acceptable when compared to the reliability values for the actual TIMSS science tests ([Martin, Mullis and Hooper, 2016](#)). More details about the construction of the test, its items, the validation of the matching versions, and other details can be found in [Al-Balushi, Al-Harthy and Almehrzi \(2022\)](#).

Data collection

The instruments were uploaded into a mobile application designed specially to collect the data needed for this study; the reader can find more details about this application elsewhere ([Al-Balushi, Al-Harthy and Almehrzi, 2022](#)). The mobile application, called the Trends in Oman Science Study (TOSS), was designed by the Sas for Entrepreneurship Center under the Omani Ministry of Transport, Communications and Information Technology; it was piloted on 120 students in order to ensure that there were no technical or administrative malfunctions. The study also hired twelve science teachers as research assistants; their role was to administer the study instruments in their classrooms in each of the selected schools. The administration of TIMSS-like test lasted for 40 minutes, while the administration of the metacognitive awareness perceptions instrument lasted for 10 minutes.

Data Analysis

We used means and standard deviations to describe participants' scores in the four sections of the metacognitive awareness perceptions instrument: planning, information management strategies, debugging strategies and evaluation. We also used the Multivariate Analysis of Variance (MANOVA) to answer the research questions and to discover whether there were any differences between high- and low-scoring students in the four sections of the metacognitive awareness perceptions instrument.

Results

Tables 1-4 illustrate the results of the study, and show significant Wilks' Lambda values for all MANOVA analyses conducted on the data. The findings also indicate that there were significant differences in metacognitive awareness perceptions between high- and low-scoring students, showing that, in both Grades Five and Nine, students with higher overall performances on the TIMSS-like test also had higher metacognitive awareness perceptions. When data was analysed separately for performance on lower-level and higher-level test questions, the results were found to be the same.

Table 1.
Means and standard deviations of metacognitive awareness perceptions for Grade Five

| Metacognitive skill | TIMSS-like level | Total test score | | Lower-level questions | | Higher-level questions | |
|------------------------|------------------|-------------------------|------|-------------------------|------|-------------------------|------|
| | | Low(n=235), High(n=241) | | Low(n=253), High(n=223) | | Low(n=243), High(n=233) | |
| | | M | SD | M | SD | M | SD |
| Planning | Low | 3.50 | 0.96 | 3.55 | 0.97 | 3.53 | 0.98 |
| | High | 3.80 | 0.93 | 3.78 | 0.93 | 3.79 | 0.91 |
| Information management | Low | 3.42 | 1.02 | 3.47 | 1.02 | 3.47 | 1.01 |
| | High | 3.77 | 0.93 | 3.74 | 0.93 | 3.73 | 0.94 |
| Debugging | Low | 3.35 | 0.97 | 3.40 | 0.98 | 3.39 | 0.97 |
| | High | 3.69 | 0.88 | 3.67 | 0.88 | 3.66 | 0.89 |
| Evaluation | Low | 3.44 | 1.00 | 3.49 | 1.00 | 3.50 | 0.99 |
| | High | 3.82 | 0.89 | 3.80 | 0.89 | 3.78 | 0.91 |

Table 2.
MANOVA results of between-subjects effects for metacognitive awareness perceptions and TIMSS-like total performance of Grade Five (df= 1, 475)

| Metacognitive skill | Effect | Total test score ^a | | | Lower-level questions ^b | | | Higher-level questions ^c | | |
|------------------------|-------------|-------------------------------|-------|---------|------------------------------------|-------|---------|-------------------------------------|-------|---------|
| | | MS | F | p-value | MS | F | p-value | MS | F | p-value |
| Planning | performance | 10.69 | 11.95 | 0.001 | 6.32 | 6.99 | 0.008 | 7.98 | 8.87 | 0.003 |
| | error | 0.89 | | | 0.90 | | | 0.90 | | |
| Information management | performance | 14.10 | 14.89 | 0.000 | 8.94 | 9.33 | 0.002 | 8.20 | 8.55 | 0.004 |
| | error | 0.95 | | | 0.96 | | | 0.96 | | |
| Debugging | performance | 14.26 | 16.58 | 0.000 | 9.23 | 10.61 | 0.001 | 9.17 | 10.53 | 0.001 |
| | error | 0.86 | | | 0.87 | | | 0.87 | | |
| Evaluation | performance | 16.79 | 18.80 | 0.000 | 11.61 | 12.85 | 0.000 | 9.70 | 10.68 | 0.001 |
| | error | 0.89 | | | 0.90 | | | 0.91 | | |

a: Wilks' Lambda= 0.96, F= 5.16, P= 0.000

b: Wilks' Lambda= 0.97, F= 3.44, P= 0.009

c: Wilks' Lambda= 0.97, F= 3.07, P= 0.016

Table 3.
Means and standard deviations of metacognitive awareness perceptions for Grade Nine

| Metacognitive skill | TIMSS-like level | Total test score | | Lower-level questions | | Higher-level questions | |
|------------------------|------------------|-------------------------|------|-------------------------|------|-------------------------|------|
| | | Low(n=217), High(n=239) | | Low(n=223), High(n=233) | | Low(n=217), High(n=239) | |
| | | M | SD | M | SD | M | SD |
| Planning | Low | 3.60 | 0.98 | 3.64 | 0.99 | 3.63 | 0.96 |
| | High | 3.97 | 0.69 | 3.94 | 0.68 | 3.94 | 0.74 |
| Information management | Low | 3.58 | 1.01 | 3.62 | 1.03 | 3.58 | 0.97 |
| | High | 4.04 | 0.67 | 4.02 | 0.64 | 4.04 | 0.71 |
| Debugging | Low | 3.50 | 0.98 | 3.58 | 1.01 | 3.52 | 0.96 |
| | High | 3.97 | 0.69 | 3.91 | 0.69 | 3.95 | 0.73 |
| Evaluation | Low | 3.51 | 1.00 | 3.53 | 1.02 | 3.54 | 0.98 |
| | High | 3.93 | 0.68 | 3.92 | 0.65 | 3.90 | 0.72 |

Table 4.
MANOVA results of between-subjects effects for metacognitive awareness perceptions and TIMSS-like total performance of Grade Nine ($df=1, 454$)

| Metacognitive skill | Effect | Total test score ^a | | | Lower-level questions ^b | | | Higher-level questions ^c | | |
|------------------------|-------------|-------------------------------|-------|---------|------------------------------------|-------|---------|-------------------------------------|-------|---------|
| | | MS | F | p-value | MS | F | p-value | MS | F | p-value |
| Planning | performance | 15.27 | 21.49 | 0.000 | 10.69 | 14.83 | 0.000 | 10.70 | 14.84 | 0.000 |
| | error | 0.71 | | | 0.72 | | | 0.72 | | |
| Information management | performance | 23.80 | 33.17 | 0.000 | 18.68 | 25.63 | 0.000 | 23.80 | 33.17 | 0.000 |
| | error | 0.72 | | | 0.73 | | | 0.72 | | |
| Debugging | performance | 25.43 | 35.70 | 0.000 | 12.74 | 17.20 | 0.000 | 21.50 | 29.81 | 0.000 |
| | error | 0.71 | | | 0.74 | | | 0.72 | | |
| Evaluation | performance | 20.46 | 28.57 | 0.000 | 17.01 | 23.50 | 0.000 | 14.56 | 19.97 | 0.000 |
| | error | 0.72 | | | 0.72 | | | 0.73 | | |

a: Wilks' Lambda= 0.92, F= 9.73, P= 0.000

b: Wilks' Lambda= 0.94, F= 7.21, P= 0.000

c: Wilks' Lambda= 0.93, F= 9.06, P= 0.000

Discussions

The findings of the current study showed that the metacognitive awareness of the higher-performing participants in Grades Five and Nine was consistently and significantly higher than that of the lower-performing participants. This was the case for the overall test scores, as well as for the scores in lower-level questions and the scores in higher-level questions. These findings emphasize the importance of metacognitive awareness in student test performance on both lower-level and higher-level questions. These findings also confirm the existence of a undeniable association between metacognition and academic performance, which has been emphasized consistently by previous research (Efklides, 2011; Wiley and Guss, 2007; Hong, Bernacki and Perera, 2020; Jaleel and Premachandran, 2016; Joseph, 2010; Mahdavi, 2014; Miller and Geraci, 2011; Santelmann, Stevens and Martin, 2018; Sutiayatno and Sukarno, 2019; Tok, Özgan and Döş, 2010). This and other studies have come to a number of conclusions about the role of metacognitive thinking in test-taking. The findings of the current study indeed indicate that answering TIMSS test items is a cognitively demanding process, and that metacognitive thinking skills are essential for students taking these tests. Looking at the issue from a practical point of view, Zimmerman and Moylan (2009) have argued that such demanding contexts require test-takers to use their initiative and to be self-regulated, resourceful and persistent, all of which require the use of metacognitive skills. It has also been argued by proponents of the social cognitive model of self-regulation that test-takers engage in a three-phase cyclical mental process. These phases are the forethought phase, the performance phase and the self-reflection phase, and all require metacognitive abilities if they are to be successful. For instance, during the performance phase, test-takers must use self-observation strategies such as time management, imagery that enhances the processing of information into the memory system, and self-instruction; failure to mobilise these metacognitive strategies could result in poor test performance (Panadero and Alonso-Tapia, 2014). The current study provides added evidence that strong levels of metacognitive processing are an essential factor for students to perform well in the TIMSS science test; lack of these metacognitive skills is a key factor in reducing their ability to conduct the mental processes required to succeed in the test.

Science education literature offers little information about the link between students' metacognitive awareness and their performance in examinations, and we are aware of no study that has specifically investigated this association in the context of student performance in international science tests such as TIMSS. However, research in other areas might help to explain our findings, and their linking of the performance of high-achieving students to their metacognitive awareness. A number of previous research studies suggest that the possession of a high level of metacognitive awareness allows students to reflect on their thinking and monitor its progress; it also helps them to control their thinking processes and direct them towards achieving the goals for which they strive (Efklides, 2011; Jaleel and Premachandran, 2016; Joseph, 2010; Larkin, 2006; Mahdavi, 2014; Sutiayatno and Sukarno, 2019; Tok, Özgan and Döş, 2010). Thus, since researchers have widely reported a positive association between metacognition and

both science achievement (Hong, Bernacki and Perera, 2020; Larkin, 2006; Oyelekan, Jolayemi and Upahi, 2019) and performance on science examinations (Casselman and Atwood, 2017), it is plausible to conclude that the high level of metacognitive awareness of the higher-scoring students in the current study contributed to their strong performance in the TIMSS-like science tests. Students with high metacognition have been shown to approach test questions by eliminating incorrect options, underlining the clues found in the question text, re-examining their answers, and using a range of metacognitive strategies to respond to the specific features of the test items, whether these involve narrative, figures or graphics (Diken, 2020); all of these features frequently characterise TIMSS test items (Mullis and Martin, 2017). Research also shows that metacognition helps learners better comprehend science texts (Wang and Chen, 2014; Wang et al., 2014), which would again help TIMSS test-takers, given that a number of the test items involve reading a short passage before answering related questions. In addition, students with good metacognitive skills are better able to assess the prior knowledge they retrieve from long-term memory during a test, and can mediate the construction of meaning in working memory (Wang and Chen, 2014), skills which gain them better results. Metacognition also increases the ability to conceptualize and think about a variety of abstract scientific concepts and phenomena, a skill which constitutes a major learning challenge for many novice learners, (Al-Balushi and Martin-Hansen, 2019). According to Piaget's theory of cognition, meta-thinking is a core metacognitive process and is also essential to comprehending abstract concepts and phenomena (Bates, 2019); students with high metacognitive awareness are therefore in a better position to process science test questions involving a high level of abstraction.

Conclusions, Recommendations & Limitations

The current study contributes to the literature by exploring the difference in metacognitive awareness perceptions between students with high and low scores on TIMSS-like science tests; this subject, and the important association between metacognition and TIMSS science test-taking, had not been specifically studied before. The current study reports that high-achieving students had a significantly higher level of metacognitive awareness than was present in their low-achieving counterparts. This very clear finding indicates that it is crucial for science educators to explore different ways to support student metacognition. Fortunately, there is already a significant body of research on the subject. A number of studies indicate that metacognition can be enhanced through practice, especially during social interaction with peers (Adey, 1999; Larkin, 2006, 2010; Oliver and Venville, 2015; Shayer and Adey, 2002). There are numerous examples of instructional methods that have been shown to enhance student metacognition, including cognitive acceleration through science education (CASE), thinking aloud, self-report checklists, interaction with peers, whole classroom dialogue, the Know-What-Learned (KWL) model, design-based science learning and reflection reports (Adey, 1999; Durley and Ge, 2019; Efkides, 2011; Wiley and Guss, 2007; Joseph, 2010; Miller and Geraci, 2011; Oliver and Venville, 2015; Tas, Aksoy and Cengiz, 2019; Whitebread, Grau and Somerville, 2018).

Other studies have addressed the question of how to improve student performance during actual test-taking; suggestions include the use of metacognitive prompts such as reflecting on test questions through self-monitoring, evaluation and explanation. Other types of prompts may include encouraging students to connect the current questions to their prior knowledge, to reflect on a problem before attempting to solve it, and to think of the best strategy to solve the problem being faced (Aurah, Cassady and McConnell, 2014). Metacognitive prompts may also be programmed and provided to learners electronically during tests through computer-based scaffolding (Shubber, Udin and Minghat, 2015; Tang et al., 2016). Another suggestion for enhancing metacognitive awareness is to continually request students to predict their test scores and to reflect on the accuracy of their predictions: this can be helpful because an individual's ability to predict their performance is seen as an important test of metacognitive monitoring (Casselman and Atwood, 2017; Hawker, Dysleski and Rickey, 2016).

Pre-test training has also been suggested to help students to perform better in tests. One method is to have students reflect – before the test - on their ability to solve questions related to the main topics on the course. Pre-test training has also been proved to be successful when an online medium is used to host metacognitive reflective prompts; this is done throughout the semester, and students respond to the prompts before taking any type of test, short quizzes as well as mid and final exams (Casselman and Atwood, 2017). Curriculum materials could also be redesigned to scaffold for better metacognition; one method is the use of refutation text structure, which has been shown to involve and develop metacognition (Tippett, 2010; Wang and Chen, 2014).

Overall, then, it is evident that metacognitive training needs to be embedded in science curriculum

guidelines, instructional methods and learning materials, and we recommend that science teachers, as well as curriculum and materials designers, be made aware of the importance of including meta-cognitive training to support students' academic achievement. However, further research is needed to explore the impact of metacognitive training on student performance in specific science examinations such as TIMSS.

One limitation of the current study is the fact that it depends on a quantitative method for obtaining its data, namely a self-report metacognitive awareness perceptions inventory. Richer data could be provided by supporting this with qualitative data collection methods; these could include think-aloud protocols, portfolio analysis, and classroom observation, all of which could form part of a follow-up study of metacognition in science learning.

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Conflict of interests

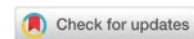
The authors declare no conflict of interest.

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Belief in Information Conspiracy and Personality Traits of Generations X and Y

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Abstract: The article presents the results of comparing the belief in information conspiracies in connection with personality traits among representatives of Generations Y and X, nationalities – the Russians and the Kumyks. We call information conspiracies those that are presented in the information space and are presented as close to reality. Therefore, users who get acquainted with information conspiracies do not doubt and believe in them. The sample was presented by the Russian university students and middle-aged working people. The questionnaire of conspiracy mentality (CMQ) (Bruder, Haffke) and the FPI technique (Farenberg, Zarg and Gampel) have been applied. It was revealed that the older the generation, the more it believes in the state conspiracy; generations have stable beliefs about the presence of a political conspiracy; the representatives of the Kumyk group are more prone to exaggeration of the importance of conspiracy than the group of the Russians generation Y; the personality trait “irritability” correlates with the scale of belief in public conspiracy; there was a negative dependence of emotional lability and belief in a political conspiracy. The results are compared with the data of foreign studies on the samples of representatives of the USA, Great Britain, Turkey, Germany. It was concluded that it is possible to observe cultural and intergenerational differences in expression of conspiracy mentality. Representatives of Generation Y believe more in political and public conspiracies. Representatives of Generation X believe more in public conspiracy and secret organizations.

Keywords: online teaching, English for Specific Purposes, computer-mediated learning, synchronous conferencing, synchronous online teaching, teaching methods.

Introduction

The great interest of scientists to the problems of quality of life, psychological well-being, social capital stimulates the interest to phenomena, namely, the belief in conspiracies, conspiratorial mentality, impeding the well-being of people in society. The scientific significance of measuring the indicators of the belief conspiracy is increased by the fact that it has a prognostic potential. For example belief in pharmaceutical conspiracy can predict the refusal from vaccination. In today’s world, there is increasing evidence that there are stable individual differences in people’s propensity to believe in conspiracy theories (Dyrendal, Kennair and Bendixen, 2021). It is shown that if a person believes in one conspiracy theory, he will also be more likely to believe in other conspiracy theories (Swami et al., 2011; Green and Douglas, 2018). This has led some researchers to the assumption that the alignment of specific conspiracy theories depends more on individual differences with a certain tendency to adopt such a belief and that there is a general conspiracy mentality or conspiratorial mentality. Belief in conspiracies is belief in an implausible description of an event or situation. This term was originally formulated by S. Moscovici, who defined conspiracy as something which unites representatives of different religions, parties or ethnicities by an indissoluble secret tie (Moscovici, 1987). The object of such an alliance is incitement, revolution in the life of society, perversion of the values of civil society, exacerbation of crises, promotion of defeat, and so on (Moscovici, 1987, p. 154). Entin believes that “for people with this mentality, conspiracy is the only model of change in history, and conspiracy theories are the only form of historical explanation” (Entin, 2000, p. 70). We believe that conspiracy theory is one of the explanatory models of disruption of the stability of society along with others.

Swami, et al. (2011), Bruder, et al. (2013) reflect the cross-cultural aspect of conspiracy theory.

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Bruder, et al. (2013) argue that the cross-cultural aspect of conspiracy theory is poorly studied, except for the examination of the UK and Austria described by Swami and others in 2011 (Bruder et al., 2013; Swami, et al., 2011). In this context, Bruder, et al. (2013) created a questionnaire of the conspiratorial mentality (CMQ), which was tested in a large international study covering the cultures of North America, Western Europe (the UK, Ireland, Germany) and the Middle East (Turkey). They hypothesized that individual characteristics and cultural factors interact when a person comes to believe in a particular conspiracy theory, and this has an impact on his attitudes and behavior. In particular, researchers have shown that subcultures within the national groups are differently susceptible to belief in conspiracy theories. For example, African, American, and Latin American communities in the United States are particularly inclined to endorse conspiracy theories, claiming that HIV is spread to destroy certain ethnic groups (Ross et al., 2006).

Modern research has expanded the palette of research. They can distinguish gender, clinical, cognitive, prognostic, behavioral aspects of the problem. Van der Tempel and Alcock (2015), using the scale GCB (Brotherton, French and Pickering, 2013), on a group of the Canadian students, showed that belief in conspiracy and the detection of a hyperactive agent reliably predicted schizotypy. At the same time, it was found out that women are more prone to believe in the supernatural. Shapiro et al. (2016) questioned 1427 Canadian parents and found out that belief in conspiracy is negatively associated with the willingness to vaccinate their children.

Lamberty, Hellmann and Oeberst, (2018) demonstrated in a study that a higher level of conspiracy mentality can predict voting behavior for a more conservative party candidate. In Italy, researchers Leone et al. (2018) showed that the style of avoiding attachment due to an emphasis on self-confidence, his motivation to suppress psychological stresses and a Manichaeian view of the world based on a neat distinction between good and evil would be associated with a belief in conspiracy.

In our study (Pishchik, 2017) it was found out that Russian managers have a certain feature. The less critical thinking they manifest, the more they believe in conspiracies, but at the same time, the ability to draw logical conclusions and justify their response, is associated with the belief that there is a real threat from aliens from other planets. Ståhl and Van Prooijen (2018) explain that analytical thinking is associated with a less tendency to believe in various conspiracy theories and paranormal phenomena, but only among people who strongly value epistemological rationality. In the study by Wood and Gray (2019) it was found out a strong correlation of right-wing authoritarianism with the belief in conspiracy theories and the influence of intergroup support on this belief.

Kowalski and Gawęda (2021) highlighted the mediating role of metacognitive escapes, cognitive attention syndrome in the manifestations of conspiracy beliefs. Dyrendal, Kennair and Bendixen (2021) proved that schizotypal personality measurements, strange beliefs and paranoid ideas were predicted by various intermediaries, and their influence on belief in conspiracy theories was completely mediated. Hattersley et al. (2022) showed how belief in plausible and implausible conspiracy theories is heterogeneously related to several aspects of reasoning, including information samples, reasoning style (intuitive versus reflexive reasoning) and confirmation bias.

As we can see, the authors are looking for predictive components of belief in conspiracies. The search continues to build an explanatory model of conspiracy (Beemster, Bijleveld and Treur, 2021) with a tendency to look more for reasons in the personal qualities of respondents, culture and to a lesser extent to address to situational factors.

The research presents little generational approach to the problem of studying the belief in conspiracies in respondents belonging to different groups of generations. Each generation has its own special values. They can influence the adherence of belief in conspiracy. This fact determined the purpose of our study - to demonstrate the differences in adherence to conspiracy theories among the representatives of the generations of the two national groups.

Materials and Methods

In our study we had the following participants: 4 groups of Russian generations (2 groups of Generation Y – student youth and 2 groups of Generation X – working middle-aged people). They belong to two nationalities – the Kumyk (Dagestan, Russia) and the Russian (Rostov-on-Don, Russia), the total number is 350 people aged between 19 and 23 and between 25 and 35. The CMQ questionnaire (Bruder et al., 2013) and the FPI technique (Farenberg, Hampel, and Selg 2001) were conducted.

The CMQ method is aimed at identifying ideas (conspiracies) that people believe in. In this method, there are 5 statements that need to be assigned a coefficient in accordance with how much the subject

agrees or disagrees with this statement. As a result, faith in the state, political, public, in secret actions, in secret organizations are revealed.

The Freiburg Personality Questionnaire FPI is designed to diagnose states and personality traits that are of paramount importance for the process of social adaptation and regulation of behavior. The FPI questionnaire contains 12 scales; Form B differs from the full form only by half the number of questions. The total number of questions in the questionnaire was 114.

The data were statistically processed using the t-criterion of differences, correlation analysis. We have made assumptions: H1 – it is possible to detect differences in belief in conspiracies, personal characteristics between students – Generation Y and older working people – Generation X. H2 – it is possible to find a relationship between certain types of belief in conspiracies and the personality traits of representatives of Generations X and Y.

Results

The results were recorded by types of belief in conspiracy. The results are shown in Figure 1.

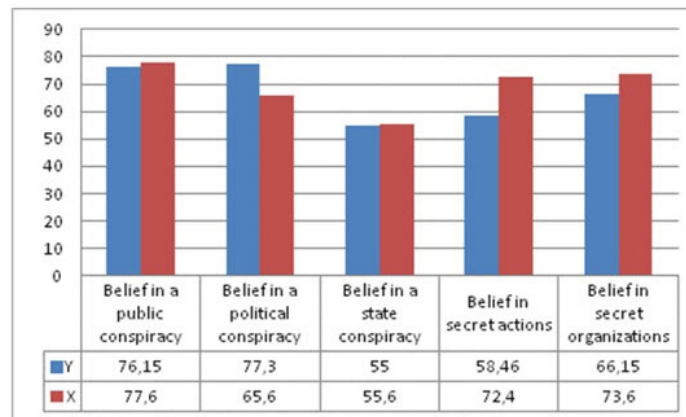


Figure 1. Indicators of faith in conspiracy of generations

There were significant differences found between the indicators of belief in political conspiracy ($t=-0,857$, $p>0,34$) and secret societies ($t=-0,781$, $p>0,22$) between Generations Y of the two national groups. The belief in political conspiracy ($t=-0,631$, $p>0,04$) significantly differed in the groups of generations X of the two nationalities. The results are shown in Table 1.

Table 1.

Average values and significance of the differences in the types of belief in conspiracies of generations

| Belief in conspiracies | Gen. | M | SD | W | W ($\alpha=0,01$) | W ($\alpha=0,05$) | t (U) | $p\leq 0,01$ | $p\leq 0,05$ |
|----------------------------------|------|------|-------|------|---------------------|---------------------|-------|--------------|--------------|
| Belief in a political conspiracy | Y | 77,3 | 67,4 | 0,96 | | | | | |
| | X | 65,6 | 33,1 | 0,91 | | | 0,85 | 0,71 | 0,02 |
| Belief in secret societies | Y | 58,4 | 31,36 | 0,95 | | | | | |
| | X | 72,4 | 23,05 | 0,92 | 0,87 | 0,8 | 0,78 | 2,71 | 2,02 |

As you can see, generations have stable beliefs about the existence of political conspiracy. Apparently, the sphere of politics in the views of the studied groups is not so stable and carries a threat.

In the group of the Russian, significant differences were found between generations on the scale of belief in the state conspiracy ($t=-1,375$, $p>0,01$). Thus, the older the generation, the more it believes in the state conspiracy, perhaps this is the influence of the restructuring experienced in the country.

In the Kumyk group, significant differences were found between generations on the scales of belief in political conspiracy ($t=-1,447$, $p>0,31$), belief in state conspiracy ($t=-1,105$, $p>0,01$) and public conspiracy ($t=-2,698$, $p>0,01$). The data obtained allow to assert that the Kumyk group (youth), (middle-aged) are more likely to exaggerate the significance of conservatism than the Russian group (youth), (middle-aged). It can be assumed that the Kumyk group of youth is more susceptible to doubts in terms of stability and reliability of stability in life.

The following results were obtained on personality traits in the groups, which are presented in Figure 2.

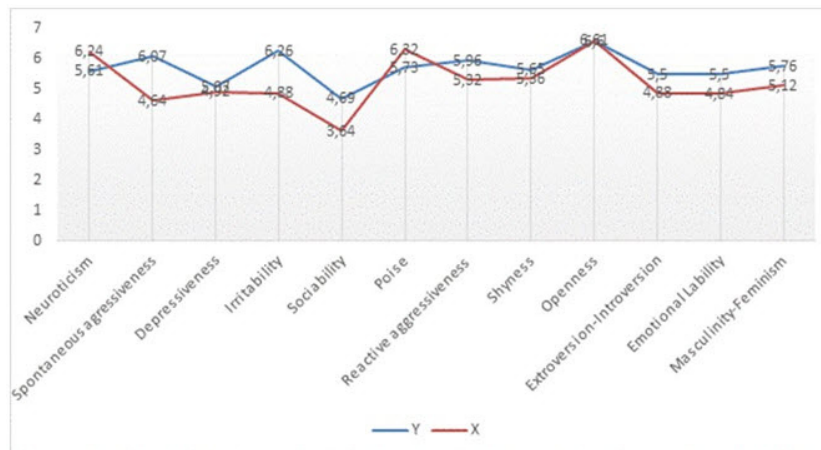


Figure 2. Expression of personality traits in generation groups

However, these results are different from those of Bruder, et al. (2013). According to their data, the representatives of the United States ($M=6.3$; $SD=2.0$) and Great Britain/Ireland ($M=6.3$; $SD=1.9$) had average indicators of conspiratorial mentality. The Turkish participants ($M=7.3$; $SD=2.1$) had a conspicuously higher conspiratorial mentality than all other groups ($DS>0.58$), while the German participants had a lower one than the other groups ($M=5.9$; $SD=2.1$). As it can be seen, representatives of different cultures are committed to conspiratorial mentality.

The comparison of personality traits and belief in conspiracies was of interest. In a sample of respondents, we found out a strong correlation between indicators of emotional lability and scales of belief in public conspiracy ($r=0.52^{**}$) and belief in secret societies ($r=0.32^*$). The personality trait of irritability correlated with the scale of belief in public conspiracy ($r=0.62^*$). In the group of the Kumyk generation X there was a negative dependence of emotional lability and belief in political conspiracy ($r=-0.92^{**}$). The scale balance was negatively correlated with belief in secret societies ($r=-0.84^*$).

Discussions

The obtained results of differences in belief in conspiracies among the Kumyks and the Russians differ from the data of Bruder, et al. (2013). According to their data, representatives of the USA ($M=6.3$; $SD=2.0$) and Great Britain/Ireland ($M=6.3$; $SD=1.9$) had average indicators of a conspiratorial mentality. The Turkish participants ($M=7.3$; $SD=2.1$) had a significantly higher conspiratorial mentality than all other groups ($DS>0.58$), while the German participants had it lower than the other groups ($M=5.9$; $SD=2.1$). As you can see, representatives of different cultures are committed to a conspiratorial mentality.

Poise was negatively correlated with the belief in secret societies in the Kumyk group. A study (Green and Douglas, 2018) found out that a higher degree of anxiety is more likely to adhere to conspiracy beliefs.

We found a stable correlation between indicators of emotional lability and scales of belief in a public conspiracy. This result is combined with a study by Georgiou, Delfabbro and Balzan (2019), who showed that psychopathological factors (schizo-type and tendency to delusion) were the strongest predictors of belief in conspiracies.

If our respondents are committed to the belief in conspiracies, this may indicate a manifestation of bias in reasoning in the general field (Ermakov and Belousova, 2021; Hattersley et al., 2022).

To reduce the belief in conspiracies of students, it is necessary to develop critical thinking. We can get acquainted with such an experience in study (Almulla, 2018).

Conclusions

In our study, we examined the current state of the problem of belief in conspiracies of representatives of certain generations. We realized that belief in conspiracies is an explanatory model of events in the world, bringing confidence. There is evidence of a personal and cultural predisposition to believe in

conspiracies. There are methods for determining the belief in conspiracies in various countries. We have tested our methodology for identifying the types of belief in conspiracies. Thus, it is possible to observe the cultural and intergenerational differences in expression of conspiratorial belief in conspiracies. The belief in the conspiracy theory can partly act as an indicator of increasing levels of anxiety in society, social instability, which is especially evident in situations of various social crises. In the future, we would like to increase the sample of research in representatives of generations and national groups.

Acknowledgements

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Conflict of interests

Author declare no conflict of interest.

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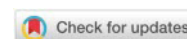
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Inter-Faculty Cooperation in English Language Teaching Using Educational Comic Strips on Geoforensics – A Pilot Study

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Abstract: The paper deals with the research and promotion of inter-faculty cooperation in the field of foreign language teaching. By focusing on educational comic strips as an underutilised language strategy at university level, we have tried to reduce or completely eliminate the tensions and uncertainties that accompany the learning or teaching of a new academic field. The study explores how a particular narrative from geoforensic practice is transformed into adapted educational comic strips. The focus then turns to the application of educational comic strips in language classes, and how six lecturers at two different faculties and their students in the first year of study perceive that application and respond to the challenges of teaching/learning in this way. Two surveys were conducted in order to obtain more precise data on the quality of the comic strips as a teaching/learning activity: the former, a qualitative survey of lecturers, and the latter, a quantitative survey of students. The results of the research indicate that even when the area of exploration such as geoforensics and comic strips is somewhat unknown for both teachers and students, the authenticity of material, the quality of preparation, the conscious and explicit participation of all sides, all potentially lead to new forms of good practice and positive linguistic outcomes.

Keywords: inter-faculty cooperation, educational comic strips, English language, geoforensics.

Introduction

In order for teaching to be good, it is necessary to use good strategies and activities. However, strategies and activities alone do not constitute good teaching per se. We know that the value of teaching rests on routine, experience, personal development and constant re-examination. However, when it comes to interdisciplinary areas, in order for successful teaching to take place, it is our firm belief that it is necessary that the teacher or teachers combine their own classroom experience with the experience of teachers with the same practice and develop a new combination of experience, informed thinking and openness to change. It is then a path towards a higher order of routine, growth, monitoring and professional judgment.

Higher education has induced new fields of cooperation and new ways of teaching that enable students to cross the boundaries of their academy in an easy and meaningful way. The growing literature has offered concepts of collaborative and intercultural learning, along with interdisciplinary concepts, using theorists with a wide range of expertise all of whom have commented and written extensively on utilization of educational comic strips as a form of innovative and yet-to-be fully incorporated in an ELT classroom (Britton, 1970; Apostel et al., 1972; Klein, 1990, 1996; Kline, 1995; Aram, 2004; Schmidt, 2008, 2011; Krohn, 2010; Frodeman, 2010; Killick, 2012; Parr, 2012; Parr, 2012; Maki, 2016; Seddon, 2016; Townsin and Walsh, 2016).

It is notable from our experience that higher education institutions rarely promote inter-faculty cooperation within the same country in the field of foreign language as an educational challenge. The common practice of teaching the same foreign language activity at two completely different faculties – in our case two universities (the University of Criminal Investigation and Police Studies and the University of Belgrade, Faculty of Mining and Geology) – is a situation where the heterogeneity of lecturers, students and teaching materials may potentially lead to tension and uncertainty (Bammer 2013: 100). Our initial

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attempt is to design such teaching materials that will enable our language teachers and students to communicate across academic disciplines in an inexhaustible and generative way. Our goal is to test the range of innovative activities focusing on the application of the comic strip in a language learning classroom in order to develop the best possible teaching quality, exchange our knowledge and experience, develop an even distribution of knowledge and practice in this field and to rely on programs which do not involve movement across national borders but the movement of institutions into an affiliated educational system 'at home'.

Inter-faculty cooperation: geoforensics and criminal studies

The progress of forensic science began dramatically with the popularity of television series in the 1990s (CSI, Silent Witness, etc.). Their popularity has also influenced the growing interest in educational programs in which young people could potentially pursue their careers in academic programs related to the study of forensics or geoforensics mimicking their favourite actors on television. Since forensics has become a part of everyday speech today, it can be said that forensic scientists are crucial in providing scientific evidence in criminal and civil investigations. Although forensic scientists use a number of scientific techniques to investigate and determine even the smallest details, geoforensic scientists are the only experts who can properly detect materials of geological origin. Thus, geologists are often asked to transfer or communicate results, advice and recommendations from their geological exploration to different recipients, such as the police, politicians, policy makers, the public, the media, and the judiciary. For this reason, it is of central importance for them to avoid the failure to communicate their message precisely, accurately and clearly. According to Donnelly "if the correct message is not conveyed properly, or is misunderstood, or misinterpreted, the consequences can be catastrophic" (Donnelly, 2008: 1). It is noted that for geologists the communication of information can be more difficult than the investigation itself. This is because many of these investigations apply highly sophisticated scientific techniques, geological terminology and specific technical jargon that – when combined with the cultural and language barriers, social, political, religious and economic constraints that often exist – put a geologist in a very difficult position. In other words, conveying the geological data for the recipient to understand means translating it into many 'Englishes' or sublanguages that exist within the multi-layered social strata. Thus, bearing this in mind, the comic strip may be used as an activity created to mimic the real-life situations in which a geologist may find himself and mitigate the initial encounter with something perceived as unknown language-wise.

Materials and Methods

This research study focuses on the assumption of applicability of educational comic strips at two faculties, as well as on summarizing the first results of this collaborative approach from two perspectives – the teachers' perspective and the students' perspective. From the point of view of language, work on comic strips should shed light on possible forms of vocabulary work as well as communicative skills exercises. It is assumed that the respondents, both the teachers and the students, will show openness and understanding for the new form of work in order to be able to adequately adapt to the newly set goals of innovation. When it comes to inter-faculty cooperation, we assume that the respondents will show readiness to cooperate, openness to improving the work on comic strips through suggestions, personal experiences and understanding of all the novelties that learning situations bring about.

Although it is not common to use different instruments in a single study, we have decided in favour of two different kinds of research – a qualitative for teachers and a quantitative for students – since the latter is considered more appropriate for the first-year students. With this in mind, the following hypotheses were set:

Hypothesis 1 postulates that, as educational comic strips contain two forms of expression, artistic and verbal, they can effectively engage students in active reading and thinking.

Hypothesis 2 postulates that learning vocabulary and communication is more entertaining and beneficial for adult students when it is based on educational comic strip material.

Hypothesis 3 postulates that comic strips can refresh communication skills and improve science literacy when operated via inter-faculty cooperation.

In order to be able to participate in this study, both the teachers and students had to be familiar with educational comic strip as one type of teaching material. The particular comic strip which was used in class before giving the questionnaires to teachers and students is given hereinbelow. This comic strip was

created by one of the teachers and was used in class with the students at both universities. Therefore, both the teachers and the students who participated in this study were familiar with the teaching material.

Geology Mystery Files: The Case of Pollen Helping to Solve a Murder

Source: https://www.lsu.edu/science/geology/news/current_news/2015/babydoe.php

What started as a nice summer walk for one Massachusetts lady and her dog on 25 June, 2015, turned into the beginning of an investigation into the dreadful murder of a two-year-old. After the lady's dog sniffed a plastic bag and the woman discovered the remains of an unrecognisable toddler, she immediately called the police.

The child was badly decomposed and bloated, but the autopsy didn't reveal any signs of injury. Due to the body's long exposure to water, the police were unable to collect the girl's fingerprints and identify her. They started calling her Baby Doe.

The police made various efforts to find out who Baby Doe was and what had happened to her. They combed through the missing children's database, conducted many tests for toxins, cleaning materials, drugs, and alcohol in the girl's body, and eventually managed to reconstruct a photo of the victim.

That's where the geoforensics team joined the investigation. Dr Andrew Laurence, an experienced palynologist, and his student assistant, Shannon Ferguson, carefully searched the girl's hair and clothes for any signs of pollen and other forensic clues about the girl's location before she was dumped in the garbage.

Dr Laurence and Ferguson conducted a chemical processing to isolate pollen grains and examine them. They found traces of pine, soot, and some rare pollen types in all samples, which helped them determine the girl had spent time near Boston prior to her murder.

The discovery didn't pinpoint the killer, but it greatly helped the police narrow down their search and increase search efforts in the area. They released the computer-generated image of the girl to the local public and soon received many calls with sometimes helpful leads.

The most helpful clue came from a person called Michael Sprinsky in September 2015. He told the police his friend, Rachelle Bond, confessed to him that her boyfriend killed her daughter, Bella Bond, who turned out to be "Baby Doe".

The mother and her boyfriend, both drug users, were charged with the murder of Bella Bond and were found guilty two years later.

Figure 1. Example of a geoforensic text

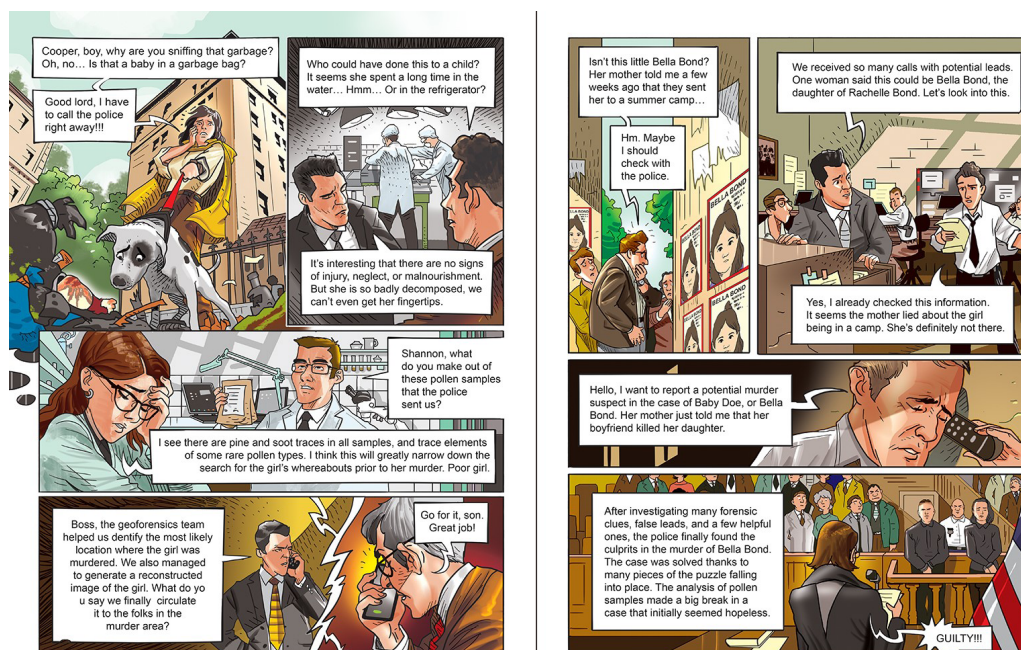


Figure 2. Example of a comic strip used in a language classroom

Research sample no. 1 - Teachers

The first part of the study – the qualitative study – included six language professors at two different faculties, with a total of 205 years of experience between them. The average length of service of the respondents is slightly over 29 years, which implies maturity, practice and enthusiasm. Apart from work experience, further background information is that all respondents have either active or passive knowledge of at least two more foreign languages and that two professors are also court interpreters.

Instrument no. 1

The purposely designed open-ended questionnaire used with teachers in this study comprised two parts, the first consisted of six questions and the second involved one table. The questions were connected with the above-mentioned hypotheses, and the suitability of comic strips in language teaching via innovative language activities. By using a qualitative content analysis, core beliefs and experiences were identified. The questionnaire was anonymous, with no time and length limits, which contributed to the validity of the study as professors gave honest and comprehensive answers.

Results of the qualitative study

1. Question – To what extent do you think that the use of educational comic strips is a useful educational activity in the dual learning of English and geoforensics?

“I think that the use of comic strips in general and educational comic strips in particular, is very useful. Above all, I think it is very difficult for current generations to read longer texts because they are used to shorter text messages combined with auditory or visual content.”

“I believe that any quality and innovative activity that is not related to classical learning with a textbook and notebook encourages learning a foreign language, including the specific language and jargon of the given profession.”

“Through this approach, students have the opportunity to simultaneously master professional terminology in English and their mother tongue. We often witness that, in the absence of adequate knowledge or adequate translations of foreign professional terms, we get naturalised versions of English terms, which greatly harms the mother tongue.”

2. Question – To what extent do you think that educational comic strips contribute to scientific and rational thinking?

“This comic strip specifically relates to pollen sample analysis, which students should be familiar with from another subject, so the comic strip really encourages thinking and the use of previously acquired knowledge from another academic field.”

“Like other teaching materials, educational comics will have a stimulating effect on some students, while others may remain indifferent or may even consider it inadequate, unserious, and uninteresting, and this is an observation from personal experience. It happened to me that one group of students accepted innovative educational material with enthusiasm, while another even resented it, despite being students of the same generation at the same faculty.”

“Since the comic strip illustrates a situation from real life, with possible real dialogues, students are given the opportunity to anticipate the development of the situation while reading the comic strip and think about possible conclusions based on the data they have at the moment.”

3. Question – To what extent do you think educational comic strips contribute to vocabulary learning?

“Comic strips as a form are not very rich in text, so the text that they do contain can be a good basis for students to create additional content, which absolutely expands the knowledge of vocabulary.”

“Educational comic strips facilitate the acquisition of vocabulary because the verbal content is accompanied by an illustration, so that it is memorised faster and more permanently.”

“To a large extent – the very concept of comic strips, in which students must actively participate in the creation of content, encourages participants to look for new, adequate words and terms that are appropriate in a given context. At the same time, modern technology (using online dictionaries) should be available to them.”

“It is known that vocabulary is best learned through fun and interesting teaching content, which this comic certainly is. Thus, a very subtle introduction of new vocabulary, as here, gives the student the opportunity to understand the meaning of new words from the context, create their own associations and thus better ensure word memory.”

4. Question – In your opinion, which communication strategies do you think educational comic strips encourage?

Here, the answers can be summed up as follows: asking questions is a very important communicative strategy at all times: a) first of all it implies feeling free to ask questions if something is not clear about the task, b) and then enquiring about the content of the comic strip, unknown words, etc. In the exercise of filling in the missing parts, students are expected to present their ideas to colleagues and the professor openly and logically. This additionally encourages interpersonal communication which is ideal for group or pair work. In this way, listening to and respecting the opinions of other students is properly conducted. Public speaking skills encourage students to speak clearly, and to feel free to address the audience in a more than one way. Interview skills help students learn to ask adequate and concise questions related

to a given topic. Persuasion skills enable students working in a group or pair to correct each other by making them see the situation differently. Analytical and logical presentation skills are greatly improved by the comic strip, because it instructs students to analyse drawings, interpret them, follow the sequence of events and present the content in a logical order.

5. Question – In your opinion, how often should an educational comic strip be used in teaching?

“Not too often, because any exercise that is overexploited becomes boring. The recommendation might be to use it more often in lessons or areas that are difficult for students, so that the content can be presented through comics in a more acceptable way to learn.”

“The answer cannot be given precisely, because it depends on many parameters. First, it depends on the total number of hours of a language course, and then on how students react to this form of work. Perhaps it is best to find a balance in such a way that out of the total number of topics, only a certain number would be processed in this way, with the choice falling on those topics that are more difficult for students.”

“Any kind of audio-visual stimulus is welcome in foreign language teaching, and should be a more common practice in classes (depending on the technical possibilities in the classroom).”

6. Question – To what extent do you think that this type of inter-faculty cooperation is useful?

“This type of cooperation is a great way to exchange ideas, and maybe to encourage some of us who may not have dared to start creating some similar material.”

“Based on personal experience, I can say that some teachers see themselves exclusively as ‘reproducibles’ and do not want to try their hand at creating teaching materials.”

“This is a good example of the synergy of two educational institutions whose goal is to encourage the learning of the language for specific purposes in a more effective way.”

“This kind of cooperation would greatly help language teachers and keep them up to date with current trends and thus give students the up-to-the-minute terms and expressions.”

As mentioned earlier, the following table is a part of the research in which the participants were invited to suggest exercises that they thought could be used with an educational comic strip. Their responses were summed up in Table 1 as follows:

Table 1
Activities suggested by the participants

| | |
|-----|---|
| 1. | Both texts are read in order to gain a sense of narrative and image. |
| 2. | Speech bubbles have been erased in the comic, and students fill them in based on the text. |
| 3. | In the text, some sentences or parts of sentences have been deleted and students try to complete them on the basis of the comic strip. |
| 4. | Students alternately fill in either text or comics. |
| 5. | Students create a small thesis report. |
| 6. | Students present a chronological sequence of events (police or geological perception). |
| 7. | A role-play activity related to some specific situations. |
| 8. | The role-play activity can be realised in the following class, in order to give students the opportunity to prepare to ‘act out’ the text (diction, correct pronunciation of key words, etc.). This can also allow students to adapt the ‘script’ and insert some details (new characters) that are not in the comics (while following the plot and not disturbing the logical sequence of events) so that in a larger group, more students can be involved in this activity. |
| 9. | Presentation of evidence by geoforensic scientists in court |
| 10. | Students may be asked to devise a different outcome or to complete a comic strip (if we omit the last picture or the last couple of pictures). |
| 11. | Word formation exercise based on the text of the comic strip. |

Discussion of the teachers' answers

The first hypothesis was related to the suitability of educational comic strips based on geoforensics as a new scientific field and it encompassed questions 1 and 2. Based on the fact that comics can reduce the cognitive load associated with complex reasoning because they can present important information in a simpler and more symbolic way than equivalent academic texts, the researchers concluded that the use of comic strips can significantly improve foreign language teaching in the following way: illustrations are easier to process than the text; texts provide a wide variety of real life examples; innovative activities are preferred to routine tasks. According to this logic, illustrations facilitate the creation of mental models and help with understanding the complexity of both content and linguistics.

The second hypothesis pertained to the acquisition of vocabulary and improvement of communication skills and it comprised questions 3 and 4. The results of the research suggest that comic strips are stimulating in a multitude of ways, but above all through active participation and critical and creative speaking. Experienced teachers who have tried this method with students find that it brings remarkable progress if the students are introduced into a kind of input-output circle, otherwise the impact of comic strips is limited. In other words, our idea is to minimise the stereotypical teaching of science and language, and at the same time use multidisciplinary teaching as much as possible, but the measure of success will greatly depend on the cultural habits of our students as lovers of comic strip art.

The third hypothesis, which deals with cooperation between two faculties, involves questions 5 and 6. The results of this research suggest, but do not fully prove, that the effects of educational comic strips are welcomed, that they provide powerful motivation for professors to establish themselves as teacher-researchers. The acceptance of cooperation is clearly demonstrated in the willingness to mutually design appropriate activities that can be improvised around the text and comics in order to develop all of the students' linguistic abilities. Equally important is that by means of innovative comic strips students' overall scientific literacy can be improved in an unpressured and spontaneous way.

Research sample no. 2 - Students

The second part of the study included 44 student respondents in this survey, 35 from the Faculty of Mining and Geology and nine from the University of Criminal Investigation and Police Studies. Respondents have mainly three levels of English language proficiency, from B1 to C1. Consequently, it is assumed that respondents will have an unequal evaluation when it comes to the application of new forms of language learning.

Instrument no. 2

A special closed-ended questionnaire was used, which included six questions, two for each hypothesis. A Likert scale with values (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree was used. The questionnaire was anonymous in order to contribute fully to the validity of the study. Students were given 30 minutes to complete the questionnaire which was offered to them in November, 2021. Students were instructed to make their answers as precise as possible which is crucial for the success of the study. The questionnaire and the summary of students' answers are given in Table 2 below.

Table 2
Questionnaire and summary of students' answers

| Questions | 1 (Strongly disagree) | 2 (Disagree) | 3 (Neither agree nor disagree) | 4 (Agree) | 5 (Strongly agree) |
|---|-----------------------|--------------|--------------------------------|---------------|--------------------|
| 1 The educational comic is a useful reading resource. | 4 (9.1%) | 6 (13.6%) | 9 (20.5%) | 12 (27.3%) | 13 (29.5%) |
| 2 The examples in the comics are easy to remember. | 5 (11.4%) | 4 (9.1%) | 12 (27.3%) | 14 (31.8%) | 9 (20.5%) |
| 3 The educational comic is inspiring in exploring alternative opinions. | 5 (11.4%) | 4 (9.1%) | 8 (18.2%) | 10 (22.7%) | 17 (38.6%) |
| 4 The educational comic brings new opportunities for discussion and debate. | 5 (11.4%) | 3 (6.8%) | 5 (11.4%) | 18 (40.9%) | 13 (29.5%) |
| 5 The educational comic is a multidisciplinary narrative. | 2 (4.5%) | 3 (6.8%) | 11 (25%) | 10 (22.7%) | 18 (40.9%) |
| 6 The educational comic can refresh class work. | 5 (11.4%) | 2 (4.5%) | 7 (15.9%) | 11 (25%) | 19 (43.2%) |

Results

The students evaluated reading in this way: a large number of students (question 1: 29.5% strongly agree and 27.3% agree, referring to the usefulness of reading criminal stories along with scientific comic strips) answered in favour of the benefits of reading. The development of this concept carries the risk that freshmen students are unreflective receivers very often prone to manipulation and exposed to hateful speech and offensive behaviour when it comes to crime stories.

As for question 2, referring to the ease of remembering, 52.3% of the students either strongly agree or agree that texts and illustrations provide motivational and engaging stimuli for reading.

The answers to questions number 3 and 4 respectively (in the former 61.3% either agree or strongly agree, and in the latter 70.4% either agree or strongly agree) suggest that students find comic strips a good basis for discussion and debate which at the same time offers the possibility to look for alternative opinions.

The answers to questions 5 and 6 are also prevalingly positive (for the former 63.6% either strongly agree or agree, and for the latter 68.2% either strongly agree or agree), in other words students like this multidisciplinary narrative and find it refreshing in a classroom.

Discussion

Based on the overall results of the study, the researchers concluded that the use of educational comic strips has the potential to significantly improve the foreign language learning repertoire. Educational comic strips can reduce cognitive load via illustrations and simplified narrative, while remaining useful to read.

The offered texts may afford learners the chance to discover the possibility of safe reading with a wide variety of styles, facilitating them to recognise the scientific, ideological, and professional aspects of the given narratives, and shielding them from being spoonfed with information by dubious entities. Additionally, geoforensics and criminal stories combined with comic strips encourage learners to take control of their reading, gain different academic and practical perspectives on life and professions, and deepen their understanding of an ethical approach. Therefore, the first hypothesis that comic strips can effectively engage students in active reading and thinking (as they contain both artistic and verbal forms of expression) has been confirmed.

When it comes to the second hypothesis pertaining to the more enjoyable learning of language and communication via educational comic strips, students assessed (within questions 3 and 4) that real

life examples adequately serve the purpose of work-place-related language based on their needs and expectations. The brevity of the extracts is decisive as short passages both teach the language and educate students to develop as global citizens as they can easily communicate the attained vocabulary, since learning vocabulary is not only about training, but also requires the application of what is learnt.

Lastly, when it comes to the third hypothesis which encompasses question 5 and 6, the students evaluated positively both of the assumed aspects of refreshing English classes via educational comic strips and improving literacy by means of interdisciplinary and interfaculty cooperation. Even though such interdisciplinary and inter-faculty goals and practice are not prominent in ESP, we try quite naturally and rightly to encourage the use of texts and educational tools and techniques that address students' professional and academic areas of interest. The attempted model of teaching and learning that is offered in this research addresses the suitability and ways of integrating not only real-life cases and stories, but also different genres and registers that are likely to contain subject matter with the potential to appeal to workplace-oriented students.

Conclusion

The research published in this paper dealt with issues related to the use of educational comic strips based on geoforensics in English language teaching at two different faculties. Starting from the assumption that real-life stories and authentic cases can be motivating and engaging, broadly expanding students' cultural, academic and professional context, the educational effects of educational comic strips are yet to be explored in specialised language teaching.

The results of this small-scale pilot study obtained by applying a qualitative survey for teachers, and a quantitative survey for students, confirmed the initial three hypotheses regarding educational comic strips: the first related to their suitability in effectively engaging students in reading and thinking; the second to their adequacy in enhancing students' language and communicative skills; the third to refresh learning/teaching by means of innovative teaching materials. The respondents showed positive attitudes, openness, adaptability and curiosity in a potentially unknown and insufficiently researched form of work. While the teachers perceived new functions of stories and real-life worlds within the classroom to be further developed, the students showed readiness to cooperate in the areas where science, logical reasoning, artistic imagery and intercultural issues play a role.

Although inter-faculty interaction seems fragile and challenging with heterogeneous educational disciplines, an attempt has been made to create a common repertoire of practice and educational resources that will potentially allow for further enriched learning and teaching, starting with the application and utilization of the comic strip. We believe that artifacts that have been produced on this occasion and by which individuals contribute to the work they are engaged in are key to the interconnection of higher education professionals with similar expertise.

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Conflict of interests

The authors declare no conflict of interest.

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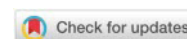
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The High School Students Attitudes towards Peers with Blindness

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Abstract: The purpose of this study was to investigate the attitudes of high school pupils toward peers with blindness. Using the CATCH-scale (Chedoke-McMaster Attitudes towards Children with Handicaps), 218 high school students' attitudes were assessed. High school students generally had a positive attitude towards students with blindness. The total scores on the CATCH- scale was a little higher for female students, but with no statistically significant difference ($p > .05$). Generally, the implications of this research suggest that regular schools must implement coexistence programs that will lead to even better attitude in inclusive settings.

Keywords: attitude, peers with blindness, high school students, inclusive education, regular school.

Introduction

Worldwide inclusive education practices have started an intensive development in recent years (Alnahdi, 2020). Moreover, in our country full inclusive education will start from the school year 2022/23. Namely, according to the Macedonian education policy all students with disabilities must be included in regular schools. There will not be any more special schools, only Research centers. In North Macedonia schools are compulsory, publicly funded, and free of charge to everyone from primary to higher education (from 5 till 18 years old).

Although inclusive education for children with disabilities is now widely accepted, it is still challenged by negative peer attitudes (Godeau et al., 2010). But, many studies have shown that when children with typically development spend time and are educated with children with disabilities, they have more positive attitudes towards them (Çiçek-Gümüş and Öncel, 2020). Also, when students have a positive attitude toward their friends with disabilities, it can help their inclusion, but a negative attitude might limit inclusive education (Ketovuori et al., 2010).

Objective

Despite what has been discovered from cross-sectional research concerning low peer acceptance of students with disabilities in inclusive education, there is still a lack of evidence about students' attitudes toward students with blindness. Most researches have examined attitudes towards disability in general, rather than attitudes toward a specific type of disabilities. However, no study has been conducted to measure the attitudes of Macedonian high school students towards their peers with blindness. Therefore, the goal of this study is to analyze their attitudes and to determine whether gender, school grade, and interaction with a person with blindness have a significant effect on these attitudes.

Materials and Methods

Participants

The study's sample contained 218 high school students ranging between the ages of 15 to 18. 54,1% (118) female and 45,9% (100) male, which were randomly selected from seven North Macedonian high schools. The research was approved by the principals of these high schools.

Instrument

The CATCH scale was used to examine high school students' attitudes towards peers with blindness.

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This scale is divided into three subscales: a) an affective subscale containing emotional remarks about student with disabilities (e.g. 'I would be afraid of a disabled child') b) a behavioral subscale providing examples of what students would do to help a student with disabilities (e.g. 'In class I wouldn't sit next to a disabled child'), and finally, c) a cognitive subscale comprising verbal statements of belief concerning children with disabilities (e.g. 'Disabled children can make new friends') (King et al., 1989; Bossaert and Petry, 2013). It has 36 items in total, 12 in each component, with an equal amount of positively and negatively phrased statements (De Laat, Frierksen and Vervloed, 2013). The items are randomly organized, with positive and negative statements alternating. A 5-point Likert scale is used to rate the CATCH-scale, with values ranging from 0 (strongly disagree) to 4 (strongly agree). Items with negative wording were scored in reverse. The points range from 0 to 40 since the final scores are calculated by adding together all the individual scores, dividing the total by the number of items, and multiplying by 10.

According to Rosenbaum et al. (1986), "a higher score means a more positive attitude" (p. 521). CATCH uses a general term (e.g. 'a disabled child') as the attitude object. Unlike other scales, this scale does not differentiate between attitudes toward different types of disabilities. For this study, the word "child with disability" was changed to "student with blindness" because teens do not want to be classified as a "child"; moreover, in the questionnaire was specified that they should consider peers their age. In addition, demographic information of participants, as well as their 'disability knowledge', was collected.

Procedure

All students filled out the CATCH scale independently and anonymously. They were given careful instructions about how to complete the questionnaire.

Results

Table 1 provides an overview of the sample's demographic characteristics. High school students were also asked to rate their general knowledge about peers with blindness - min 1 (absolute no knowledge), and max 5 (complete knowledge). From the results, it's obvious that they have partial knowledge about students with blindness (M=3.12; SD=1.062). On the next question about how they got that knowledge: 39 (17,9%) of them answered from personal experience or contact with a person with blindness; 129 (59,2%) from reading; 22 (10,1%) school and 28 (12,8%) mention others.

Table 1
Demographic characteristics of students

| Demographic Variables | Groups | n | % |
|-----------------------------------|---------------------|-----|------|
| Gender | Male | 100 | 45,9 |
| | Female | 118 | 54,1 |
| Grade | I | 70 | 32,1 |
| | II | 38 | 17,4 |
| | III | 73 | 33,5 |
| | IV | 37 | 17 |
| Knowledge of peers with blindness | 1 (absolute no) | 11 | 5 |
| | 2 (no) | 52 | 23,9 |
| | 3 (partially yes) | 81 | 37,2 |
| | 4 (yes) | 48 | 22 |
| | 5 (completely yes) | 26 | 11,9 |
| How they got informed | personal experience | 39 | 17,9 |
| | reading | 129 | 59,2 |
| | school | 22 | 10,1 |
| | other | 28 | 12,8 |

All responses to items on the CATCH scale were classified into three categories: disagree, neutral, and agree. Strongly agree, as well as strongly disagree, were included in agree and disagree categories respectively. The results of these 36 questions are shown in the next tables divided in 3 subscales (Affective subscale, Behavioral subscale and Cognitive subscale).

Table 2
Affective subscale

| Items | Disagree | Neutral | Agree | M (SD)* |
|---|-------------|------------|-------------|--------------|
| 1. I wouldn't worry if a student with blindness sat next to me in class | 35 (16,1%) | 33 (15,1%) | 150 (68,8%) | 2.88 (1.309) |
| 6. I feel sorry for student with blindness | 17 (7,8%) | 45 (20,6%) | 156 (71,6%) | 1.01 (1.034) |
| 10. I would be afraid of a student with blindness | 131 (60,1%) | 25 (11,5%) | 62 (28,4%) | 2.44 (1.474) |
| 13. I would like to have a student with blindness live next door to me | 37 (17%) | 91 (41,7%) | 90 (41,3) | 2.27 (1.026) |
| 15. I would be happy to have a student with blindness for a special friend | 39 (17,9%) | 65 (29,8%) | 114 (52,3%) | 2.40 (1.161) |
| 18. I would not like a friend with blindness as much as my other friends | 143 (65,6%) | 44 (20,2%) | 31 (14,2%) | 2.82 (1.266) |
| 21. I would be pleased if a student with blindness invited me to his house | 37 (17%) | 49 (22,5%) | 132 (60,5%) | 2.58 (1.122) |
| 23. I would feel good doing a school project with a student with blindness | 28 (12,9%) | 70 (32,1%) | 120 (55%) | 2.61 (1.095) |
| 26. Being near someone who has blindness scares me | 159 (73%) | 34 (15,5%) | 25 (11,5%) | 3.06 (1.167) |
| 28. I would be embarrassed if a student with blindness invited me to his birthday party | 138 (63,3%) | 38 (17,4%) | 42 (19,3%) | 2.68 (1.356) |
| 31. I would enjoy being with a student with blindness | 28 (12,8%) | 87 (39,9%) | 103 (47,3%) | 2.43 (1.001) |
| 34. I feel upset when I see a student with blindness | 103 (47,3%) | 43 (19,7%) | 72 (33%) | 2.31 (1.369) |

*Mean (Standard Deviation)

The most notable responses from the affective subscale (Table 2) were questions 18, 26, 1, and 6. Namely, results showed that 159 (73%) of students stated they disagree that they would be afraid of students with blindness. One hundred and forty (65.6%) of them stated they would not like a friend with blindness as much as their other friends. Student participants also agree that they feel sorry for students with blindness (n=156; 71,6%) and they wouldn't worry if a student with blindness sat next to them (n=150; 68,8%).

Table 3
Behavioral subscale

| Items | Disagree | Neutral | Agree | M (SD)* |
|---|-------------|------------|-------------|--------------|
| 2. I would not introduce a student with blindness to my friends | 156 (71,5%) | 30 (13,8%) | 32 (14,7%) | 3.07 (1.214) |
| 4. I wouldn't know what to say to a student with blindness | 119 (54,6%) | 51 (23,4%) | 48 (22%) | 2.53 (1.141) |
| 7. I would stick up for a student with blindness who was being teased | 4 (1,8%) | 22 (10,1%) | 192 (88,1%) | 3.33 (0.785) |
| 9. I would invite a student with blindness to my birthday party | 11 (5%) | 25 (11,5%) | 182 (83,5) | 3.22 (0.919) |
| 11. I would talk to a student with blindness who I didn't know | 68 (31,2%) | 54 (24,8%) | 96 (44%) | 2.20 (1.303) |
| 16. I would try to stay away from a student with blindness | 180 (82,6%) | 33 (15,1%) | 5 (2,3%) | 3.30 (0.816) |
| 20. In class I wouldn't sit next to a student with blindness | 149 (68,3%) | 39 (17,9%) | 30 (13,8%) | 3.02 (1.197) |
| 22. I try not to look at someone who is blind | 116 (53,2%) | 61 (28%) | 41 (18,8%) | 2.53 (1.082) |
| 25. I would invite a student with blindness to sleep over at my house | 34 (15,6%) | 56 (25,7%) | 128 (58,7%) | 2.58 (1.201) |
| 29. I would tell my secrets to a student with blindness | 62 (28,4%) | 42 (19,3%) | 114 (52,3%) | 2.29 (1.328) |
| 32. I would not go to a student with blindness house to play | 143 (65,6%) | 42 (19,3%) | 33 (13,1%) | 2.82 (1.212) |
| 35. I would miss recess to keep a student with blindness company | 124 (56,9%) | 52 (23,8%) | 42 (19,3%) | 1.30 (1.202) |

*Mean (Standard Deviation)

The frequency of responses to the behavioral subscale (Table 3) indicated that most of the participants disagree with the statement: "I would try to stay away from a student with blindness." (82,6%) and "I would not introduce a student with blindness to my friends." (71,5%). At the same time, they agree that they would stick up for a student with blindness who was being teased (88,1%) and will invite peers with blindness to their birthday party (83,5%).

Table 4
Cognitive subscale

| Items | Disagree | Neutral | Agree | M (SD)* |
|---|-------------|-------------|-------------|--------------|
| 3. Students with blindness can do lots of things for themselves | 31 (14,2%) | 53 (24,3%) | 134 (61,5%) | 2.60 (0.989) |
| 5. Students with blindness like to play | 24 (11%) | 51 (23,4%) | 143 (65,6%) | 2.80 (1.121) |
| 8. Students with blindness want lots of attention from adults | 19 (8,7%) | 29 (13,3%) | 170 (78%) | 0.94 (1.050) |
| 12. Students with blindness don't like to make friends | 179 (82,1%) | 36 (16,5%) | 3 (1,4) | 3.23 (0.805) |
| 14. Students with blindness feel sorry for themselves | 80 (36,7%) | 101 (46,3%) | 37 (17%) | 2.34 (1.049) |
| 17. Students with blindness are as happy as I am | 27 (12,4%) | 85 (39%) | 106 (48,6%) | 2.46 (0.975) |
| 19. Students with blindness know how to behave properly | 27 (12,4%) | 36 (16,5%) | 155 (71,1%) | 2.68 (1.101) |
| 24. Students with blindness don't have much fun | 137 (62,8%) | 37 (17%) | 44 (20,2%) | 2.62 (1.217) |
| 27. Students with blindness are interested in lots of things | 20 (9,2%) | 35 (16%) | 163 (74,8%) | 2.99 (1.000) |
| 30. Students with blindness are often sad | 69 (31,7%) | 77 (35,3%) | 72 (33%) | 1.89 (1.129) |
| 33. Students with blindness can make new friends | 10 (4,6%) | 42 (19,3%) | 166 (76,1%) | 3.00 (0.882) |
| 36. Students with blindness need lots of help to do things | 58 (26,6%) | 75 (34,4%) | 85 (39%) | 1.79 (1.172) |

*Mean (Standard Deviation)

When considering the answers on the cognitive subscale (Table 4), 78% of the students agree that students with blindness want lots of attention from adults, and 82,1% claimed that they did not agree with the statement that students with blindness do not want to make friends.

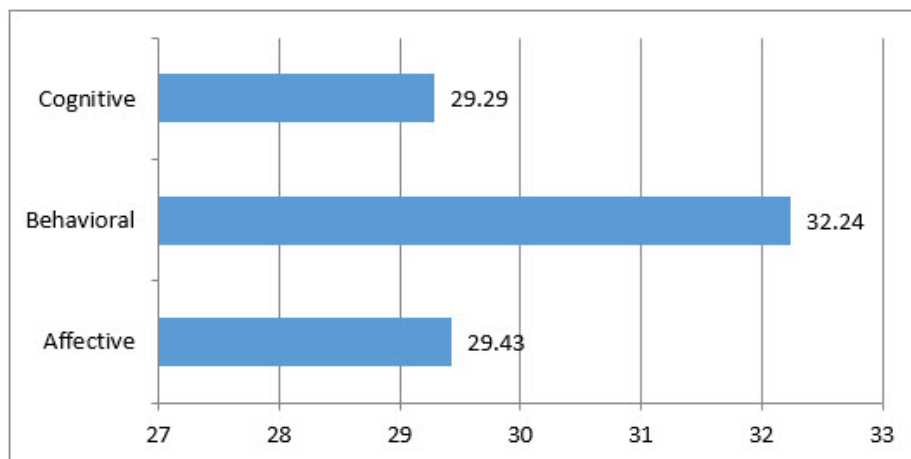


Figure 1. Mean score on CATCH subscales

Higher school students' attitudes towards students with blindness were generally positive (M=30.32, SD=4.689). The mean score on the behavioral subscale (M=32.24, SD=5.508) was the highest while the one on cognitive was the lowest (M=29.29, SD=2.856), which shows they do not necessarily understand a child with blindness (Figure 1).

Table 5
Gender

| Subscale | Female M (SD) | Male M (SD) | T | P |
|-------------|------------------|----------------|--------|------|
| Affective | 29.91 (5.776) | 28.95 (5.643) | -1.234 | .219 |
| Behavioral | 31.90 (5.347) | 32.59 (5.669) | .910 | .364 |
| Cognitive | 29.98 (3.211) | 28.61 (2.502) | -3.475 | .001 |
| Total CATCH | 30.59 (4.778) | 30.05 (4.601) | .845 | .398 |

CATCH scores on subscales are shown in Table 5 for both groups, for female (n=118) and male participants (n=100). The Student's t-test was used to compare data between groups. Between the male students and the female students, there were no significant differences in the mean scores on affective, behavioral, and total CATCH scores. But, mean scores on the cognitive subscale as a whole were significantly different (29.98 vs 28.61; p=0.001). Namely, female students have more positive beliefs about children with blindness.

Table 6
Interaction with person with blindness

| Dimensions | No (n=179) | Yes (n=39) | T | p |
|-------------|---------------|---------------|-------|------|
| | M (SD) | M (SD) | | |
| Affective | 25.58 (3.125) | 30.29 (5.813) | 4.843 | .000 |
| Behavioral | 29.34 (3.920) | 32.83 (5.595) | 4.584 | .000 |
| Cognitive | 27.11 (2.874) | 29.83 (2.768) | 5.344 | .000 |
| Total CATCH | 27.34 (3.306) | 30.98 (4.725) | 4.517 | .000 |

Findings suggest that students who reported having contact or interaction with person with disability (n=38) recorded higher scores on CATCH than those who reported that they did not have contact or interaction with person with disability (n=179). An independent samples t-test suggests a significant difference between the scores on the whole CATCH scale, as well as the three subscales (Table 6).

Table 7
One-way ANOVA for significant difference between subscales and schools grade

| | Subscale | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|----------------|-----|-------------|-------|------|
| Affective | Between Groups | 178.834 | 3 | 59.611 | .579 | .629 |
| | Within Groups | 22021.221 | 214 | | | |
| | Total | 22200.055 | 217 | 102.903 | | |
| Behavioral | Between Groups | 311.536 | 3 | 103.845 | 1.193 | .313 |
| | Within Groups | 18630.538 | 214 | | | |
| | Total | 18942.073 | 217 | 87.059 | | |
| Cognitive | Between Groups | 603.517 | 3 | 201.172 | 2.305 | .078 |
| | Within Groups | 18679.515 | 214 | | | |
| | Total | 19283.032 | 217 | 87.287 | | |

Table 7, the ANOVA test shows that students from different school grade have no significantly differently score on CATCH subscales: affective (F= .579, p= .629); behavioral (F=1.193, p= .313) and cognitive (F=2.305, p= .078).

Discussions

In studies conducted on students from different countries, their attitudes towards peers with disabilities have proved to be positive. Unfortunately, there aren't many studies that examine attitudes toward a particular disability, such as blindness (Nikolarazi and De Reybekiel, 2001; De Laat, Freriksen and Vervloed, 2013). In line with most of those studies, this study also shows that high school students have positive attitudes towards peers with blindness.

The attitudes of individuals toward people with disabilities are frequently impacted by a variety of factors. Since an attitude may be thought of as a multidimensional construct comprising of affection, behavior, and cognition, also it is a subject to change and modification (De Laat, Freriksen and Vervloed, 2013). Age, culture, gender, religion, self-esteem, and whether or not one knows a disabled person are the most researched factors that might affect attitude. Several studies have shown that when attitudes are compared based on gender, girls' attitudes are more positive than boys'. In this research gender seems to affect only the positive cognitive components of attitudes toward peers with blindness, specifically female students have statistically a more positive attitude than male students on the cognitive subscale. Interestingly, male students have a more positive attitude on the behavioral subscale.

There are studies that show that having a friend with a disability and interacting with a person with a disability or a family member with a disability has a positive effect on children's attitudes (Armstrong et al., 2016). Also, in this CATCH study, the scores were significantly higher in students who had contact or interaction with a blind person than in those who did not.

The last question was whether school grades have a significant effect on the attitudes toward students with blindness. The results showed no age effect on the attitudes of high school students towards peers with blindness.

Conclusions

Hutzler (2003) found attitudes play a significant role in the success of inclusive classroom, which indicates the importance of creating positive attitudes between students with and without disabilities. As Helen Keller noted, a famous deaf-blind writer, "the chief handicap of the blind is not blindness, but the attitude of seeing people towards them" (Vasileiadis and Doikou-Avliidou, 2018).

Implementing coexistence programs is one strategy to influence typical students' attitudes of their peers with disabilities (Vasileiadis and Doikou-Avliidou, 2018). These programs mostly involve students with typically developing, with a lesser proportion also including pupils who have the same disability (Mu, Siegel and Allinder, 2000). In the practice, the main goals of well-known programs like "special friend" or "peer buddy" are to promote social contact, eliminate discrimination, and change attitudes (Vasileiadis, Koutras and Stagiopoulos, 2021).

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Conflict of interests

The author declares no conflict of interest.

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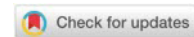
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Cyber Socialization Engagement and Dark Tetrad of Personality among Young University Students

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Abstract: The article considers the relationship between the cyber socialization engagement and the Dark Tetrad of personality (Machiavellianism, narcissism, psychopathy, and sadism). The cyber socialization engagement was understood, according to the author's concept, as having constructive and destructive components. The study purpose was to identify correlation and deterministic relationships between indicators of the cyber socialization engagement and the Dark Tetrad among young university students. The sample included 424 students from Russian universities. For measurements, «The cyber socialization engagement questionnaire» and «The Short Dark Tetrad Scale» were used. It has been established that the relationship between the indicators of the cyber socialization engagement and the Dark Tetrad has a qualitatively heterogeneous character – from the complete absence of connections to mutual determination. The strongest mutual determination is associated with the everyday sadism: it increases the destructive engagement in cyber socialization, explaining 12% of the total variance, and the latter, in turn, increases the severity of sadism (10.5%). It is advisable to take into account the revealed connections between the general cyber socialization engagement and the Dark Tetrad of the personality when organizing psychological support for the socialization of students in the context of expanding social interactions carried out in cyberspace.

Keywords: cyber socialization engagement, constructive engagement, destructive engagement, Dark Tetrad of personality, young university students.

Introduction

The focus of our research is determined by the integration of three research areas, characterized by the concepts of «the cyber socialization engagement», «the Dark Tetrad of personality» and «the young university students».

In the modern world, young people, as in all times, assimilates the social experience accumulated by previous generations, including ideas about social norms and rules, abilities and skills of a social interaction, heterogeneous social relations, etc. Such processes in a generalized form are traditionally called socialization.

At the same time, modern socialization has an important new component, which is called cyber socialization and is associated with that part of socialization processes that are carried out using digital technologies, i.e., in fact, through various interactions carried out in a specific part of the space of human existence – cyberspace (see, e.g., [Lenkov and Rubtsova, 2022](#)). At the same time, the contribution of cyber socialization to the total array of socialization processes has been rapidly increasing in recent years, including under the influence of such force majeure factors as the COVID-19 pandemic. According to [Easa and Bazzi \(2021\)](#), the pandemic has caused a significant lack of the socialization among university students. At the same time, the authors have in mind traditional socialization, and not its specific cyber component. Therefore, the results of their work, taking into account the sharp increase in the activity of young people in cyberspace recorded in many studies during the pandemic, can be interpreted as another significant shift in the relationship between traditional socialization and cyber socialization in favor of the

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latter.

Cyber socialization in one or another of its aspects has actually been studied for a long time. However, two fundamental difficulties stand in the way of such a study. The first of them is theoretical, related to the debatability of the central construct used to describe this phenomenon: along with the concept of cyber socialization (see [Lenkov and Rubtsova, 2019, 2022](#); [Lenkov, Rubtsova and Efremova, 2019](#)), many other competing concepts are used here, such as digital socialization (e.g., [Kim, 2015](#)), virtual socialization ([Saeed and Hassan, 2020](#)), Internet socialization ([Honnekeri et al., 2017](#)), media socialization ([Milenkova, Peicheva and Marinov, 2018](#)), and others. The second difficulty is methodical, associated with measuring tools for determining the severity of certain processes of cyber socialization, their representation in the life of a particular person, i.e., what we call the cyber socialization engagement.

As a result, the cyber socialization engagement, including among university students, has so far been studied mainly:

- in philosophical and theoretical perspectives (R. M. Aysina, S. Livingstone, V. A. Pleshakov, T. Poell, G. U. Soldatova, A. E. Voiskunsky, B. Zizek, etc.);
- either using primary methods that do not have a reliable psychometric justification, such as questioning ([Honnekeri et al., 2017](#); [Kim, 2015](#)), structured interviews and focus groups ([Milenkova, Peicheva and Marinov, 2018](#)), qualitative interviews (e.g., [Smith, Hewitt and Skrbiš, 2015](#)), etc.;
- either taking into account only certain, rather narrow aspects of the cyber socialization engagement, such as motivation or the nature of the use of the Internet (e.g., [Smith, Hewitt and Skrbiš, 2015](#)), smartphones ([Servidio, Griffiths and Demetrovics, 2021](#)), social networks ([Casale, Musicò and Spada, 2021](#); [Kircaburun, Jonason and Griffiths, 2018](#)) and instant messengers ([Casale, Musicò and Spada, 2021](#); [Honnekeri et al., 2017](#); [Saeed and Hassan, 2020](#)), such specific negative manifestations of destructive cyber socialization as cyberbullying and cyberstalking ([Kircaburun, Jonason and Griffiths, 2018](#)), cybervictimization ([Shoib et al., 2022](#)), various cyberaddictions (see, for example, ([Casale, Musicò and Spada, 2021](#); [Siah et al., 2021](#)), cyberloafing ([Metin-Orta and Demirtepe-Saygili, 2021](#)), etc.

Similar methods and directions of research are widely demanded today. At the same time, the situation changed fundamentally after [Lenkov, Rubtsova and Efremova \(2019\)](#) developed a questionnaire of the cyber socialization engagement, which underwent extensive psychometric testing. This questionnaire does not replace or exclude other methods for studying the cyber socialization engagement, including those mentioned above. However, it provides for the fulfillment of two important requirements for taking the appropriate research positions:

- approach the understanding of cyber socialization from a generalized view point, integrating private manifestations of cyber socialization;
- operationalize this point of view, moving from philosophical and general theoretical reasoning to quantitative analysis and the construction of specific empirically based psychological models.

The next important aspect of the field of study is related to personality structures. Cyber socialization, like traditional socialization, is associated with the formation of specific personal properties that reflect the assimilation of social experience by the individual. It is quite natural to try to identify the role and place of such specific structures in the overall structure of the personality, in particular, to establish their relationship with the well-known basic personality structures, of which we will focus on only one. This is the structure known as the Dark Tetrad of personality and combines features of Machiavellianism, narcissism, primary (non-clinical) psychopathy, and everyday sadism ([Neumann, Jones and Paulhus, 2021](#); [Paulhus et al., 2021](#)), where the addition of the feature of sadism is a relatively new extension of the more traditional Dark Triad, which has been extensively studied for at least at least the last twenty years (see [Kircaburun, Jonason and Griffiths, 2018](#); [March and Marrington, 2021](#); [Moor and Anderson, 2019](#); [Siah et al., 2021](#)). It should also be noted that each of the four properties of the Dark Tetrad has been separately studied in psychology for a much longer time, but it is the identification of their coordinated structure that is of fundamental importance here.

Finally, another point specifying our field of study is the selection of young university students as subjects. This choice is due to the following reasons. Firstly, university students are to a significant extent involved in cyber socialization due to the very specifics of the organization of the educational process, especially in the context of the recent COVID-19 pandemic. Secondly, young students are already representatives of the digital generations, for whom the first acquaintance with computers and gadgets occurs, as a rule, even at preschool age; this factor, accordingly, also increases their cyber socialization engagement; therefore, we have limited the age of students to 35 years.

In relation to our research area as a whole, it can be stated that the relationship between the cyber socialization engagement and the Dark Tetrad (as well as the Triad) of the personality has been studied to date only fragmentarily, taking into account certain aspects of the cyber socialization engagement.

This applies to studies performed both on samples of university students and on other samples. For example, [Servidio, Griffiths and Demetrovics \(2021\)](#) studied the relationship between the Dark Triad and problematic smartphone use, on a sample of Italian smartphone users aged 18 to 38; [Kircaburun, Jonason and Griffiths, 2018](#) on a sample of students from Turkish universities, we studied the relationship between the traits of the Dark Tetrad, problematic use of social networks, cyberbullying and cyberstalking; [Wright et al. \(2020\)](#) studied on a sample of adolescents the relationship between the traits of the Dark Triad and cyberbullying, etc.

Thus, the relationship between the Dark Tetrad of personality and the general structure of the cyber socialization engagement has not been sufficiently studied to date, and this fact determines the relevance of our study.

The purpose of the study was to identify the relationship between indicators of the cyber socialization engagement and the Dark Tetrad of personality among young university students. Achieving this goal meant getting answers to the following research questions:

- Are there any correlations between the indicators of the cyber socialization engagement and the Dark Tetrad of personality?
- Do the factors of the Dark Tetrad of personality have a significant influence on the indicators of the cyber socialization engagement?
- Do the factors of the cyber socialization engagement have a significant influence on the personality traits of the Dark Tetrad?
- How can one generalize the links between the indicators of the cyber socialization engagement, on the one hand, and the properties of the Dark Tetrad of personality, on the other?

Materials and Methods

The conceptual framework of the study forms concepts that operationalize the concepts of the cyber socialization engagement and the Dark Tetrad of personality.

The cyber socialization engagement was understood in accordance with the author's concept, in which cyber socialization is a specific component of the overall socialization process, determined by interactions with actors of various nature (other people, computer programs, virtual immersive environments, artificial intelligence systems, etc.) carried out in cyberspace ([Lenkov and Rubtsova, 2019](#)); herewith the psychological structure of the cyber socialization engagement includes subsystems of constructive and destructive engagement ([Lenkov, Rubtsova and Efremova, 2019](#)). For measurements, we used «The cyber socialization engagement questionnaire», which includes 27 items and two scales: 1) a scale of the constructive engagement in cyber socialization (hereinafter referred to as Constructive engagement), containing 21 items and including three subscales – constructive motivation (Motivation, 6 items), constructive personal position (Position, 7 items), and competence of the cyber socialization (Competence, 8 items); 2) a scale of destructive engagement in cyber socialization (Destructive engagement, 6 items) ([Lenkov, Rubtsova and Efremova, 2019](#)). The reliability of scales and subscales for internal consistency (Cronbach's alpha) was in the study sample (N=424): 0.798 for Constructive engagement, 0.687 for Motivation, 0.733 for Position, 0.724 for Competence, 0.667 for Destructive engagement.

The Dark Tetrad of personality was considered in accordance with the concept by Paulhus et al., operationalized using «The Short Dark Tetrad (SD4) questionnaire» ([Neumann, Jones and Paulhus, 2021](#); [Paulhus et al., 2021](#)), which we used in the Russian translation made in 2020 by the administration of the [PsyTests.org](#) website (URL: <https://psytests.org/darktriad/sd4r.html>, last accessed 2022/03/15). This questionnaire contains 28 items and 4 scales (9 items each) corresponding to the features of the Dark Tetrad: 1) Machiavellianism, 2) narcissism, 3) psychopathy (primary, non-clinical), 4) sadism (domestic, ordinary, everyday). The reliability of the scales was (N=424): 0.457 for Machiavellianism, 0.740 for narcissism, 0.747 for psychopathy, 0.759 for sadism.

Sampling and data processing. The sample included 424 students representing 8 universities from five cities in Russia, aged 17 to 35 (M=22.39, SD=3.938), included: 275 females and 149 males, 252 bachelor students and 172 master students. According to the research procedure, students independently completed Google forms or printed questionnaires. Data collection was carried out between September 2021 and March 2022.

Data analysis was performed using the IBM SPSS Statistics for Windows package (IBM Corp., Armonk, NY, USA). To identify influences, we used one-way ANOVA and effect size η^2 (eta-square) (see [IBM Corp., 2021](#)). The eta-square was also calculated for the results of the Mann-Whitney test according

to the method by Fritz, Morris and Richler (2012).

Results

Descriptive statistics of the cyber socialization engagement and the Dark Tetrad of personality (Table 1) showed that for a number of scales, skewness and kurtosis indicators demonstrate deviations from the normal distribution. In this regard, we used (for generality – for all scales) Spearman's correlations (see Table 2), and for pairwise intergroup comparisons – the Mann-Whitney test (see Table 3). At the same time, in the analysis of influences with the selection of three groups (see Table 4-5), we used analysis of variance (one-way ANOVA), i.e., in fact, a parametric method, which, nevertheless, has a high resistance to noted deviations from normality (see Blanca et al., 2017).

Significant correlations were found between the Dark Tetrad and the cyber socialization engagement: for Machiavellianism, positive correlations with Motivation, Constructive engagement, and Destructive engagement; for narcissism, positive correlations with Motivation, Competence, and Constructive engagement; for psychopathy, as well as for sadism, it is negatively correlated with Position but positively correlated with Destructive engagement (see Table 2).

Table 1
Descriptive statistics (N=424)

| Scales | Min/Max | M | SD | Skewness | Kurtosis |
|-------------------------|---------|-------|-------|----------|----------|
| Motivation | 6/24 | 13.70 | 3.803 | 0.103 | -0.453 |
| Position | 10/28 | 21.39 | 4.020 | -0.494 | -0.314 |
| Competence | 6/32 | 22.17 | 5.170 | -0.359 | -0.262 |
| Constructive engagement | 28/81 | 57.26 | 9.576 | -0.432 | 0.116 |
| Destructive engagement | 0/19 | 5.33 | 3.627 | 0.833 | 0.776 |
| Machiavellianism | 12/32 | 22.25 | 3.522 | 0.005 | 0.129 |
| Narcissism | 7/33 | 20.92 | 4.908 | -0.209 | -0.249 |
| Psychopathy | 7/35 | 16.62 | 5.392 | 0.408 | -0.080 |
| Sadism | 7/31 | 14.63 | 5.259 | 0.702 | -0.141 |

Note. Standard error for skewness is equal 0.119, for kurtosis is equal 0.237.

Table 2
Spearman's correlations (N=424)

| Scales | Motivation | Position | Competence | Constructive engagement | Destructive engagement |
|------------------|------------|----------|------------|-------------------------|------------------------|
| Machiavellianism | 0.112* | 0.010 | 0.095 | 0.095* | 0.178** |
| Narcissism | 0.099* | 0.031 | 0.106* | 0.118* | -0.075 |
| Psychopathy | 0.042 | -0.157** | 0.026 | -0.022 | 0.336** |
| Sadism | -0.021 | -0.245** | 0.016 | -0.092 | 0.365** |

Note. * $p < 0.05$, ** $p < 0.01$

As can be seen from Table 3, females and males did not differ statistically in terms of age and a number of other indicators. At the same time, the expressiveness of a constructive personal position is significantly higher in women, and in men – the competence of cyber socialization, Machiavellianism and sadism. However, these differences are not large: for them, the influence of sex explains from 1.7% to 6.3% of the total variance (see Table 3). Therefore, further, when describing the verification of deterministic relationships, we will present the results for the sample as a whole, noting the specifics that were encountered in the analysis for the male and female groups.

Table 3
Comparison of means for groups of females (n=275) and males (n=149)

| Scales | Means for groups | | Mann-Whitney test | | |
|-------------------------|------------------|-------|-------------------|--------------|----------|
| | Females | Males | Z | p | η^2 |
| Age | 22.53 | 22.13 | -0.746 | 0.456 | 0.001 |
| Motivation | 13.57 | 13.94 | -1.113 | 0.266 | 0.003 |
| Position | 21.81 | 20.62 | -2.694 | 0.007 | 0.017 |
| Competence | 21.56 | 23.30 | -3.626 | 0.000 | 0.031 |
| Constructive engagement | 56.95 | 57.85 | -1.510 | 0.131 | 0.005 |
| Destructive engagement | 5.32 | 5.36 | -0.197 | 0.844 | 0.000 |
| Machiavellianism | 21.77 | 23.13 | -3.539 | 0.000 | 0.030 |
| Narcissism | 20.97 | 20.84 | -0.270 | 0.787 | 0.000 |
| Psychopathy | 16.45 | 16.93 | -1.028 | 0.304 | 0.002 |
| Sadism | 13.63 | 16.47 | -5.154 | 0.000 | 0.063 |

Note. Values $p < 0.05$ are shown in bold.

An analysis of the influence of the Dark Tetrad factors on the cyber socialization engagement on the sample as a whole (see Table 4) and in groups showed that the narcissism factor does not have a significant effect. On the sample as a whole, the Machiavellian factor increases the constructive motivation, but at the same time increases a fundamentally different, alternative indicator – destructive engagement. In groups of females and males the influence of Machiavellianism on constructive motivation was not significant (for females, $F=2.910$, $p=0.056$; for males, $F=1.424$, $p=0.244$), while the effect on destructive engagement was confirmed (for females $F=5.360$, $p=0.005$, $\eta^2=0.038$, for males $F=4.176$, $p=0.017$, $\eta^2=0.054$).

The psychopathy factor on the sample as a whole increases destructive engagement, but in the groups this effect was not significant (for females, $F=0.513$, $p=0.599$; for males, $F=3.028$, $p=0.051$). In addition, for males, in contrast to females and the sample as a whole, psychopathy reduced the constructive personal position ($F=3.821$, $p=0.024$, $\eta^2=0.050$). The sadism factor turned out to be the most loaded in terms of the considered influences: it reduces the constructive personal position and constructive engagement, and also significantly increases the destructive engagement.

Table 4
ANOVA for factors of the Dark Tetrad (N=424)

| Dependent variable | ANOVA results | | | Means | | Post hoc test | |
|---------------------------------|---------------|--------------|----------|-------|-------|---------------|--------------|
| | F | p | η^2 | Group | M | Groups | p |
| Factor: Machiavellianism | | | | | | | |
| Motivation | 3.813 | 0.023 | 0.018 | 1 | 13.34 | 1-2 | 0.954 |
| | | | | 2 | 13.46 | 1-3 | 0.037 |
| | | | | 3 | 14.57 | 2-3 | 0.048 |
| Destructive engagement | 8.882 | 0.000 | 0.040 | 1 | 4.34 | 1-2 | 0.014 |
| | | | | 2 | 5.48 | 1-3 | 0.000 |
| | | | | 3 | 6.27 | 2-3 | 0.169 |
| Factor: psychopathy | | | | | | | |
| Destructive engagement | 19.888 | 0.000 | 0.086 | 1 | 13.34 | 1-2 | 0.954 |
| | | | | 2 | 13.46 | 1-3 | 0.037 |
| | | | | 3 | 14.57 | 2-3 | 0.048 |
| Factor: sadism | | | | | | | |
| Position | 17.347 | 0.000 | 0.076 | 1 | 22.65 | 1-2 | 0.096 |
| | | | | 2 | 21.68 | 1-3 | 0.000 |
| | | | | 3 | 19.65 | 2-3 | 0.000 |
| Constructive engagement | 7.048 | 0.001 | 0.032 | 1 | 58.84 | 1-2 | 0.695 |
| | | | | 2 | 57.97 | 1-3 | 0.003 |
| | | | | 3 | 54.42 | 2-3 | 0.009 |
| Destructive engagement | 28.663 | 0.000 | 0.120 | 1 | 3.92 | 1-2 | 0.010 |
| | | | | 2 | 5.00 | 1-3 | 0.000 |
| | | | | 3 | 7.32 | 2-3 | 0.000 |

Notes. Multiple comparisons were performed according to the Games-Howell post hoc test (see IBM Corp., 2021). The table shows only cases where a significant effect was found ($p < 0.05$). Values $p < 0.05$ are shown in bold. No significant influence was found: the Machiavellianism factor on Position ($F=0.492$, $p=0.612$), Competence ($F=1.556$, $p=0.212$), and Constructive engagement ($F=2.271$, $p=0.104$); narcissism factor – on Motivation ($F=2.669$, $p=0.070$), Position ($F=0.976$, $p=0.378$), Competence ($F=2.192$, $p=0.113$), Constructive engagement ($F=2.682$, $p=0.070$), and Destructive engagement

($F=1.151$, $p=0.317$); psychopathy factor – on Motivation ($F=0.183$, $p=0.833$), Position ($F=2.095$, $p=0.124$), Competence ($F=0.018$, $p=0.982$), and Constructive engagement ($F=0.272$, $p=0.762$); sadism factor – on Motivation ($F=0.470$, $p=0.625$), and Competence ($F=1.776$, $p=0.171$).

Analysis of the influence of the cyber socialization engagement on the features of the Dark Tetrad on the sample as a whole (Table 5) and in groups showed that the factor of constructive motivation does not have a significant effect. The factor of a constructive personal position increases Machiavellianism, but only when moving from low values of the position to medium ones; at the same time, this factor reduces sadism, and also reduces psychopathy on the general sample and in the group of females ($F=3.202$, $p=0.042$, $\eta^2=0.023$), in contrast to the group of males, where such an effect was not significant ($F=2.161$, $p=0.119$). The cyber socialization competence factor on the general sample increases narcissism, but only when moving from low to medium values of competence; at the same time, this effect was not significant in the groups (for females, $F=2.071$, $p=0.128$; for males, $F=1.707$, $p=0.185$).

The factor of constructive engagement on the general sample increases Machiavellianism and narcissism, but in groups this effect was not significant: on Machiavellianism for females $F=2.288$, $p=0.103$; for males $F=2.907$, $p=0.058$; on narcissism for females $F=2.275$, $p=0.078$; for males $F=3.004$, $p=0.053$. The factor of destructive engagement increases Machiavellianism in the general sample (see Table 5) and in females ($F=3.287$, $p=0.039$, $\eta^2=0.024$), in contrast to the group of males, where this effect was not significant ($F=1.564$, $p=0.213$). In addition, both in the general sample and in groups, the factor of destructive engagement greatly increases psychopathy and sadism: on psychopathy for females $F=13.651$, $p=0.000$, $\eta^2=0.091$; for males $F=11.116$, $p=0.000$, $\eta^2=0.132$; on sadism for females $F=16.620$, $p=0.000$, $\eta^2=0.109$; for males $F=10.168$, $p=0.000$, $\eta^2=0.122$.

Table 5
ANOVA for factors of the cyber socialization engagement (N=424)

| Dependent variable | ANOVA results | | | Means | | Post hoc test | |
|--|---------------|-------|----------|-------|-------|---------------|-------|
| | F | p | η^2 | Group | M | Groups | p |
| Factor: Position | | | | | | | |
| Machiavellianism | 5.345 | 0.005 | 0.025 | 1 | 21.50 | 1-2 | 0.004 |
| | | | | 2 | 22.79 | 1-3 | 0.386 |
| | | | | 3 | 22.12 | 2-3 | 0.260 |
| Psychopathy | 5.203 | 0.006 | 0.024 | 1 | 17.40 | 1-2 | 0.656 |
| | | | | 2 | 16.86 | 1-3 | 0.007 |
| | | | | 3 | 15.19 | 2-3 | 0.029 |
| Sadism | 11.400 | 0.000 | 0.051 | 1 | 16.05 | 1-2 | 0.079 |
| | | | | 2 | 14.68 | 1-3 | 0.000 |
| | | | | 3 | 12.78 | 2-3 | 0.003 |
| Factor: Competence | | | | | | | |
| Narcissism | 3.267 | 0.039 | 0.015 | 1 | 20.03 | 1-2 | 0.168 |
| | | | | 2 | 21.09 | 1-3 | 0.029 |
| | | | | 3 | 21.56 | 2-3 | 0.680 |
| Factor: Constructive engagement | | | | | | | |
| Machiavellianism | 3.736 | 0.025 | 0.017 | 1 | 21.45 | 1-2 | 0.029 |
| | | | | 2 | 22.48 | 1-3 | 0.038 |
| | | | | 3 | 22.58 | 2-3 | 0.969 |
| Narcissism | 5.118 | 0.006 | 0.024 | 1 | 19.69 | 1-2 | 0.028 |
| | | | | 2 | 21.15 | 1-3 | 0.007 |
| | | | | 3 | 21.71 | 2-3 | 0.608 |
| Factor: Destructive engagement | | | | | | | |
| Machiavellianism | 4.598 | 0.011 | 0.021 | 1 | 21.35 | 1-2 | 0.048 |
| | | | | 2 | 22.38 | 1-3 | 0.008 |
| | | | | 3 | 22.78 | 2-3 | 0.568 |
| Psychopathy | 24.170 | 0.000 | 0.103 | 1 | 14.04 | 1-2 | 0.000 |
| | | | | 2 | 16.57 | 1-3 | 0.000 |
| | | | | 3 | 19.02 | 2-3 | 0.000 |
| Sadism | 24.754 | 0.000 | 0.105 | 1 | 12.58 | 1-2 | 0.010 |
| | | | | 2 | 14.21 | 1-3 | 0.000 |
| | | | | 3 | 17.32 | 2-3 | 0.000 |

Notes as in Table 4, except for the list of cases of no significant effect. No significant influence was found: the Motivation factor – on Machiavellianism ($F=2.687$, $p=0.069$), narcissism ($F=1.754$, $p=0.174$), psychopathy ($F=1.680$, $p=0.188$), and

sadism ($F=0.566$, $p=0.568$); the Position factor on narcissism ($F=0.491$, $p=0.612$); the Competence factor on Machiavellianism ($F=1.977$, $p=0.140$), psychopathy ($F=0.395$, $p=0.674$), and sadism ($F=0.867$, $p=0.421$); the Constructive engagement factor on psychopathy ($F=0.041$, $p=0.960$) and sadism ($F=1.303$, $p=0.273$); the Destructive engagement factor on narcissism ($F=1.262$, $p=0.284$).

Thus, numerous correlational and deterministic links were revealed between the indicators of the cyber socialization engagement and the Dark Tetrad of personality. At the same time, the influence of a number of factors turned out to be ambivalent, and the nature of the identified relationships shows their qualitative heterogeneity.

Discussions

To discuss the results, it is advisable to arrange them, highlighting three qualitatively different types of relationships between the cyber socialization engagement and the Dark Tetrad of personality. Firstly, for a number of indicators, neither correlation nor deterministic relationships were found: Machiavellianism and competence, narcissism and personal position, narcissism and destructive engagement, psychopathy and constructive motivation, psychopathy and competence, psychopathy and destructive engagement, sadism and constructive motivation, sadism and competence.

Secondly, in a number of cases, the presence of only one type of relationship, either correlational or deterministic, was revealed. Thus, narcissism positively correlates with constructive motivation, but there are no significant influences between them. Personal position has a positive effect on Machiavellianism (explaining 2.5% of the variance), but the correlation between them is not significant. Sadism has a negative impact on constructive engagement (3.2%), but the correlation between them is not significant.

Thirdly, for many cases, the presence of both correlation and deterministic relationships was revealed. In the direction of determination, such cases are heterogeneous. In one case, the Dark Tetrad determines the cyber socialization engagement: Machiavellianism and constructive motivation are positively correlated, herewith Machiavellianism increases motivation (1.8%). In a number of cases, the cyber socialization engagement determines the features of the Dark Tetrad: Machiavellianism and destructive engagement correlate positively, while the engagement increases Machiavellianism (1.7%); narcissism and the cyber socialization competence are positively correlated, herewith the competence increasing narcissism (1.5%); narcissism and the constructive engagement are positively correlated, herewith the engagement increasing narcissism (2.4%); psychopathy and the constructive personal position are negatively correlated, herewith the position reduces psychopathy (2.4%). Finally, in a number of cases, indicators of the cyber socialization engagement and the features of the Dark Tetrad are mutually determined: Machiavellianism and destructive engagement correlate positively and have a weak positive effect on each other; psychopathy and destructive engagement are positively correlated, herewith psychopathy increasing such engagement (8.6%), and engagement, in turn, significantly increasing psychopathy (10.3%); sadism and a constructive personal position correlate negatively and have a negative impact on each other (5-8%); sadism and destructive engagement are positively correlated, herewith sadism significantly increasing the destructive engagement (12%), which in turn significantly increases sadism (10.5%).

It is also advisable to order the obtained results in another way – according to the considered features of the Dark Tetrad. So, Machiavellianism positively correlates in the general sample with constructive motivation, constructive engagement, but, at the same time, with destructive engagement (see Table 3). In terms of determination, Machiavellianism increases both constructive motivation (on the sample as a whole) and destructive engagement (on the sample and in groups). Such ambivalence shows the content complexity and heterogeneity of the construct «Machiavellianism». Perhaps, in the operationalization used, the manifestations of Machiavellianism were mixed, related to the ability to achieve one's goals with the help of other people in a way that, on the one hand, is constructive, does not harm them, is directed to their benefit (as, for example, a good teacher, coach, psychotherapist), and on the other – destructive, causing damage to other people, selfishly ignoring their own interests. An indirect confirmation of this is the determination on the part of the cyber socialization engagement (see Table 5): the severity of Machiavellianism is increased by the factors of the constructive personal position (2.5%) and the constructive involvement (1.7%), as well as the factor of the destructive involvement (2.1%).

Narcissism is positively correlated with constructive motivation, competence, and the constructive engagement (see Table 3), which contradicts the fact that narcissism is a dark personality trait. However, in terms of determination, narcissism does not have a significant impact on the indicators of the cyber socialization engagement (see Table 5). It is possible that narcissism and related indicators of cyber

socialization depend on factors common to them that have remained latent. The identification of such factors constitutes another prospect for further research.

Unlike the previous one, psychopathy correlates negatively with a constructive position and positively with destructive engagement (see Table 3), i.e., unequivocally justifies its belonging to dark personality traits. The same role was confirmed in terms of determination: psychopathy increases destructive engagement (significantly in the sample as a whole and almost significantly in the group of males, where $p=0.051$) and reduces the constructive personal position (only in the group of males).

Sadism has also confirmed its dark nature. Sadism correlates negatively with constructive attitude and positively with destructive engagement (see Table 3). In terms of determination, sadism increases destructive engagement and reduces constructive position, and, unlike psychopathy, both on the sample as a whole and in groups.

A direct comparison of the above findings with the results of other authors is difficult, because the study of the connections between the Dark Tetrad and the general cyber socialization engagement in was carried out, apparently, for the first time. At the same time, one can directly compare, for example, the results showing differences in the Dark Tetrad features between males and females. In our study of young university students, males showed higher expression of only two features of the Dark Tetrad – Machiavellianism and sadism. In turn, [Paulhus et al. \(2021\)](#), the authors of the SD4 questionnaire, when developing it, found that the severity of all the features of the Dark Tetrad was higher in males on a sample of students from the University of British Columbia (Canada) representing various ethnic groups (European Heritage, East Asian, and other) (*ibid*, p. 212). Thus, our results only partly agree with these results. The most likely reason for this seems to us to be cross-cultural differences.

There is also a view point that criticizes the existing Dark Tetrad/Triad questionnaires. For example, [Katz et al. \(2022\)](#) prove that such questionnaires are not invariant with respect to sex, in connection with which the authors propose an alternative approach to the operationalization of the Dark Triad features. However, from our view point, similar claims can be made to any diagnostic tools that reveal differences between males and females. The approach proposed in the cited article has the advantage of simplifying the comparison of mixed samples, but its cost is too high, since the actual differences due to biological sex and gender are lost.

Many of our results agree qualitatively with the results of other authors, but only indirectly, because compared studies considered only particular manifestations of the cyber socialization engagement. We restrict ourselves to only three examples.

Our study found that sadism and a destructive engagement in cyber socialization are interrelated and mutually determined. This result is indirectly consistent with the findings of [Greitemeyer and Sagioglou \(2017\)](#) who, in a longitudinal study, found that sadism and preference for violent video games are interdetermined: everyday sadists are more likely than others to play violent video games, and repeated exposure to violent video games predicts everyday sadism over time.

Our study found that Machiavellianism positively correlates with destructive engagement in cyber socialization and has a positive effect on it. [Kircaburun, Jonason and Griffiths \(2018\)](#) obtained on a sample of Turkish university students that Machiavellianism positively correlates with problematic social media use, cyberbullying, cyberstalking, and cybertrolling and has a positive effect on the last three indicators.

[Moor and Anderson \(2019\)](#) analyzed 26 different studies and concluded that of all the Dark Tetrad traits, psychopathy is most closely associated with antisocial online behaviors, Machiavellianism and everyday sadism are also associated with such behaviors, although to a lesser extent, and narcissism is the least associated. Our study found that for young university students, Machiavellianism, psychopathy and sadism are positively correlated with a destructive engagement in cyber socialization and have a positive effect on it, while narcissism does not show such a connection or such an influence. However, in contrast to the study by [Moor and Anderson \(2019\)](#), the leader in the relationship with a destructive engagement is not psychopathy, but sadism (for psychopathy, $\rho=0.336$, $\eta^2=0.086$; for sadism, $\rho=0.365$, $\eta^2=0.120$). Thus, our results agree only partially with those of [Moor and Anderson \(2019\)](#).

We note also that some of these discrepancies may be due to cross-cultural differences that have been repeatedly identified earlier for the connections between the dark side of the personality and particular aspects of cyber socialization. For example, as [Wright et al. \(2020\)](#) found, cyberbullying is associated with narcissism among Chinese and Indian adolescents, and Machiavellianism among Indian adolescents.

Conclusions

The results obtained answered all the research questions posed and allow us to draw the following general findings:

1. For young university students, the structures of the general engagement in cyber socialization and the Dark Tetrad of personality have a wide range of qualitatively heterogeneous relationships, including three types:

1) complete lack of connections (psychopathy and a constructive motivation, sadism and the cyber socialization competence, etc.);

2) the presence of connections of only one type: for example, sadism reduces a constructive engagement in cyber socialization, although the correlation between them is not significant;

3) the presence of both correlation and determination: for example, the strongest correlation, as well as mutual determination (explaining more than 10% of the variance with influence in each direction) was found between sadism and the destructive engagement in cyber socialization.

2. The determining influence on the cyber socialization engagement is exerted by all the features of the Dark Tetrad, with the exception of narcissism: Machiavellianism increases the destructive engagement, as well as a constructive motivation, which is paradoxical; psychopathy, like sadism, increases the destructive engagement.

3. On the other hand, all indicators of the cyber socialization engagement have a determining influence on the Dark Tetrad features, with the exception of a constructive motivation: a constructive personal position reduces psychopathy and sadism, but slightly increases Machiavellianism; the competence of cyber socialization somewhat increases narcissism; a constructive engagement in cyber socialization increases Machiavellianism and narcissism; a destructive engagement increases the severity of Machiavellianism and, especially strongly, psychopathy and sadism.

4. A number of differences between males and females were revealed in the nature of the relationship between the Dark Tetrad features and indicators of the cyber socialization engagement, as well as in the severity of these features and indicators. For example, Machiavellianism, sadism, and the cyber socialization competence are more pronounced in males, while females have higher constructive personal position.

It is advisable to continue the study, first of all, in the direction of clarifying a number of identified contradictory points: for example, the specifics of the results obtained in groups of males and females, the ambivalent influence of Machiavellianism and a constructive personal position, an unexpected increase in Machiavellianism under the influence of a constructive engagement in cyber socialization, etc.

The practical significance of the study lies in the fact that its results substantiate the need for joint monitoring and taking into account the Dark Tetrad features and indicators of engagement in cyber socialization (both constructive and destructive), which are closely interconnected and can have a significant impact on socialization, personal and professional development of young university students. In particular, the results obtained show that it is hardly effective to prevent the formation of dark personality traits without taking into account the nature and degree of a student engagement in cyber socialization.

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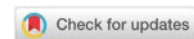
Conflict of interests

The authors declare no conflict of interest.

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Investigating Factors M-Learning Acceptance and Use for Distance Learning Students in Higher Education

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Abstract: Many research has been conducted to examine the acceptance factors to use mobile learning (m-learning) for regular students. During the COVID-19 most of the higher education institutions around the world were converted to m-learning especially for regular students, in order to continue supporting the educational stage for these students. This situation, allow researches to tested the use of m-learning for regular students while they are studying in distance learning environment. However, limited researches, especially in developing countries, have been tested the acceptance factors to use m-learning for distance learning students. In this study the behavioral intention to use mobile learning (m-learning) were examined as well as the m-learning factors that affecting its acceptance amongst the distance learning students were outlined. The study framework was depended on the model of Unified Theory of Acceptance and Use of Technology (UTAUT). A quantitative approach was used to analyze the data that collected from a random sample of 154 male and female participants from Saudi universities. The results indicated that significant factors influencing distance learning students' behavioral intention include quality of service, effort expectancy, facilitating conditions, gender, educational level, and type of device. The regulations governing distance learning programs and the implementation of mobile learning by Saudi universities under the direction of the Ministry of Higher Education are having a good impact and encouraging widespread use of m-learning.

Keywords: distance learning, UTAUT, higher education, m-learning, user acceptance, Saudi Arabia.

Introduction

Nowadays, the necessity for online learning is increasing quickly, and was given a fillip in the pandemic of Covid-19, when regular educational service delivery was prevented in most contexts. This compelled educational institutions to hastily adopt e-learning methods and platforms, with varying degrees of success and challenges. However, the development of online learning capabilities has been underway for decades, accompanied by identification of numerous prerequisites for effective deployment in practice (Colleges, 2017). Advanced digital technologies are increasingly essential in all dimensions of life, but their application in education remains relatively limited (Qashou, A., 2021). However, advanced learning techniques have been developed, including methods of learning through mobile devices, palmtops, laptops, and private media players) as a result of the fast growth of information networks and the Internet (Moya and Camacho, 2021; Tan, G. et al., 2012; Pedro, Barbosa and Santos, 2018). The rapid consumer-driven development of mobile technologies has allowed people to access information on the move, and enabled the potential facilitation of online learning methods (Al Masarweh, 2019; Yu-Lin Jeng. et al., 2010). The appearance of new educational technology helps society to gain experience and knowledge broadly by using mobile technologies, which has mainly been driven by the commercial potential of such technologies, but which offers promise for innovative solutions in education (Vallejo-Correa, Monsalve-Pulido and Tabares-Betancur, 2021).

M-learning is a modern learning model formed by employing technological mobile mechanisms and wireless technology to assist in collaborative and approachable education at all stages, from primary to postgraduate education, which will be the next generation in distance learning and e-learning approaches, since it revolutionizes the capabilities of ubiquitous learning (anytime, anywhere) (Al-Nawayseh, M. et al., 2019; Al Masarweh, 2018; Motiwalla, L.F., 2007; Jouicha, Burgos and Berrada, 2022).

Mobile-based applications for learning as being one of the fastest developing mobile technologies

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in education, with particular advantages in eliminating many barriers to traditional educational service delivery formats (e.g., geographical or financial barriers) (Johnson, L. et al., 2016). Modern revolutions in mobile devices have simplified the exchange of information in mobile applications. This permits mobile students to access a broad diversity of highly expanded learning resources (Tan, G. et al., 2012).

Smartphone use is increasingly universal among university learners, and their use as a supportive-learning technology in the education process can supply and deliver learning between students globally. This wide spread of smart devices on educational institutions offers a new scope to merge traditional learning with m-learning (Anshari, M. et al., 2017). Empirical research attests that smart devices can expedite university learners' access to teaching resources through the Internet, ability to handle group tasks and assignments, and even to interact with instructors (Syafar and Husain, 2017).

The reason behind the particular popularity of mobile/smart devices among other potential e-learning tools is that they are relatively inexpensive in comparison with PCs, and being "mobile" they are easy to handle, as well as being simple to use (Tan, G. et al., 2012; Syafar and Husain, 2017; Syafar, F. et al., 2017). However, mobile devices in themselves, along with any learning technology, are useless without the support of high-quality mobile learning applications and learning resources per se, which can meet user needs with regard to learning objectives (e.g., curriculum content and examination relevance) (Almaiah, Jalil and Man, 2016; Almaiah and Man, 2016; Arain, A. et al., 2019).

In order to bridge the gap between inherently advanced mobile technologies and the practical achievement of learning goals, researchers have studied e-learning phenomena of information technology assumptions by using theoretical models, such as UTAUT model, which is used to categorize mobile learning students' approval on the use and acceptance of technologies in relation to their principles and behavioral purposes of use. Much of this research has considered the elements of mobile learning approval, such as cultural, social, facilitating conditions, and cost (Abu-Al-Aish and Love, 2013; Alahmari, 2017; Althunibat, 2015; Mohammadi, 2015).

UTAUT-based research indicates that the following components affect the interactive purpose and use of conduct to implement online and mobile learning: effort anticipation, performance anticipation, quality of service, the inspiration of lecturers, and personal creativity (Abu-Al-Aish, A. et al., 2013; Al Masarweh, 2018). Building on this consensus, the current study seeks to analyse student acceptance of m-learning for Saudi students in higher educational institutions, a context where such research has hitherto been lacking.

Distance Learning

Distance learning is any shape of teaching and learning assisted by the use of computer networks based on information technology (Daniel, 2020). It can also be known as a method of delivering knowledge electronically, with using suitable computer applications and the Internet for data communication. Recently, distance learning has expanded along two main avenues: the Individual Flexible Teaching Model (IFTM) and the Extended Classroom Model (ECM) (Gabriska and Pribilova, 2021). IFTM permits learners to begin their lessons at any time, choose customized special environments, and interact with their lecturers and colleagues through specific tools. ECM arranges learners into groups, expects them to gather at a local study place, and lets them exploit some interactive technologies like video conferencing to facilitate their mutual interactions (Mergany, Dafalla and Awooda, 2021).

Because of the fast growth of technology, classes can now use different types of media to deliver educational services and content to students in different locations, to meet the educational requirements of larger or more geographically diffuse student populations. Interactive video, print materials, satellite telecommunication, broadcast television, electronic mail, multimedia computer technology, broadcast radio, and computer conferencing have all been used to help teacher-student interactions, albeit mainly in the narrow context of providing feedback to distant learners. Although the methods by which distance learning is applied vary among countries and particular context, distance education programs in general depend on technologies that are currently available, or are considering investment in such technologies, because of their increasing cost-effectiveness (Al-Fahad, 2009). The goals of distance learning as a complementary way of delivering classes include granting degrees to students, tackling illiteracy in developing countries, providing training opportunities for economic growth, and enriching the curriculum in non-traditional schools (Sarrab, Al-Shihi and Rehman, 2013).

Such contexts exist around the world, but became immediate and pressing issues during the Covid-19 pandemic, when latent resources were suddenly shut off for most educational services due to social distancing public health requirements. Montenegro's education system moved through various phases from the beginning of the virus. During the first stage, distance learning started to be used in all schools and universities. At this point, Viber groups were created by lecturers, teachers, and tutors to

send students sufficient literature and guidance. After that, the education system was switched to Google Classroom applications. Class teachers were required to organize their classrooms by subject and by class, facilitating distance learning. Additionally, state TV channels offered services to enable students to learn at home, providing video tutorials with material delivered by educators from various subjects (Gabriska and Pribilova, 2021).

Simultaneously, seminars were arranged for all Montenegrin tutors and teachers to train them on how to use Microsoft Teams (Gabriska and Pribilova, 2021), which provides modern, high-quality workspaces, particularly for team environments in virtual work organizations, and this platform outmatched Skype and Viber for such uses in the Covid-19 e-learning context, being available in 181 countries and 18 languages (Alahmari, 2017).

Logically, M-learning is the current method for distance and E-learning technology. The most important features of distance learning are the time and distance shifting between tutor and learners. E-learning proposes new approaches for distance learning which depend on computer and net technologies (Abu-Al-Aish, A. et al., 2013).

Mobile Learning

Several previously deployed M-learning frameworks and models are analysed and compared in this section. The following characteristics are listed in Table 1 as the distinctions between prior frameworks: the method used to develop the model, the presence of deployment stages, the key components used, sustainability reflection, validation and assessment, and link with e-learning (Daniel, 2020; Mostakhdemin-Hosseini, A., 2009).

Table 1
Frameworks Evaluation for M-Learning

| Framework | M-learning Framework (Koole, M., 2006) | Framing M-learning Model (FRAME) (Koole, M.L., 2009; Barker, A., Krull, G. and Mallinson, B., 2005) | Proposed a M-learning Theoretical Model in Developing Countries (Ng, W. and Nicholas, H., 2012) | A model of m-learning Sustainability in Schools (Raman, A. and Don, Y., 2013) |
|---------------------------------|--|--|--|--|
| Approach used | Depends on the data, which collected from Helsinki University. (Venkatesh, V. et al. 2003) | the outcome of conjunction of human learning capabilities, mobile technologies, and social communication | Literature review | Data gathered using questionnaires, observations, and focus groups |
| Main elements used | – Education elements – Network and devices resources – Prototyping | M-learning is the interchange between device, learner, and social dimensions | – M-learning procedures – Traditional learning and e-learning systems – Communication infrastructure | – Interrelations between participants and with devices – Trust and support between participants – M-learning community |
| Model evaluation and validation | The paradigm was evaluated with real users (staff and students) | No | No | Model tested by pre- and post-questionnaires, focus group interviews, and interviews |
| Sustainable | No | No | No | Some sustainability |
| Deployment stages | No | No | No | No |
| e-learning system Relation | e-learning Related | No | e-learning Related | No |

The earlier frameworks or models for m-learning are not examined specific stages deployment for m-learning. Moreover, a limited discussion on sustainability issues has been conducted to ensure that m-learning systems would be continuously improved and assessed after deployment. Building a schema that detects the earlier deployment success factors for m-learning and provides assistance for after-deployment sustainability is therefore necessary (Venkatesh, V. et al., 2003).

Unified Theory of Acceptance and Use of Technology

The UTAUT paradigm defines the acceptance of technology depending on eight technology acceptance models, the most widely used of which are use behavior (UB), facilitating conditions (FCs), social factors (SFs), effort expectancy (EE), behavioral intentions (BI), and performance expectancy (PE)

(Venkatesh, 2000). Behavioral intention is affected directly by effort expectancy, Performance expectancy, and social factors, whereas, use behavior is ancillary impacted by facilitating conditions. All of these aspects are fundamentally determined by behavioral intention, which is the main underlying concern of UTAUT (Venkatesh, 2000). Furthermore, other aspects might affect the structure for example age of the user, user experience, voluntariness of use, and gender. The UTAUT paradigm thus interprets technology use behavior based on behavioral intention. The eight factors of technology are established, which related interpreters of behavioral intention, illustrate in Figure 1.

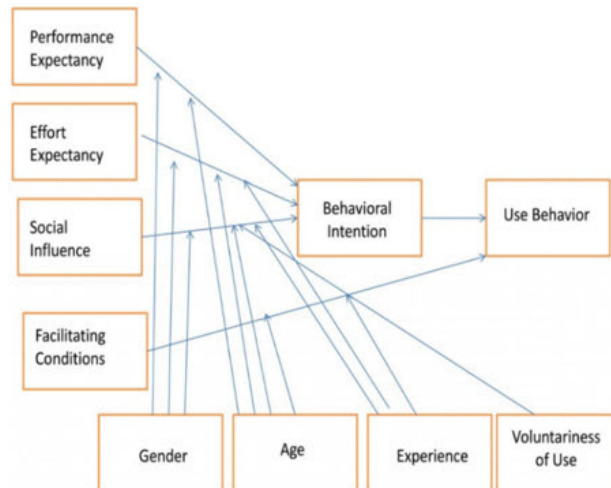


Figure 1. The model of UTAUT (Venkatesh, V. et al., 2003).

Performance Expectancy (PE)

Performance expectancy can be understood as the people think level that they can achieve their tasks with the aid of ICT (Venkatesh, 2000). In terms of PE, e-learning can be a huge support for e-learners, by enabling them to complete learning events more expediently, and novel technological solutions in themselves can inspire learning, educational skills, and production. PE thereby influences behavioral intention to control the E-learning system favourably.

Effort Expectancy (EE)

The level of smoothness that related to the information systems and their administration is referred to as effort expectancy (Alshurideh, 2010). Based on previous research, concepts about EE relate to users' individual objectives and proficiency in relation to the associated tools (Salloum and Shaalan, 2018). Particular e-learning applications (if not the concept in general) are usually relatively new for most learners and educators, because it is believed that EE is behavioral intention key component to use e-learning systems. Individual acceptance of e-learning is influenced by the usability and simplicity of technology, which also has an impact on behavioral intention more broadly. Consequently, EE has a convenient effect on behavioral intent to use an e-learning system.

Social Influence (SI)

Social influence can be described as the impact that the opinions or experiences of others on the way in which an individual understands and conceptualizes how technologies should be handled (Alshurideh, 2010). Empirical studies based on the UTAUT have reported that people's intention to use new e-learning technological solutions is heavily affected by SI, which can be understood as word-of-mouth or peer pressure (Jogezai, N. et al., 2021; Abbas, 2021). Accordingly, SI affects behavioral intention to utilize an e-learning system favourably.

Facilitating Conditions (FC)

Facilitating conditions pertain to the ambience and infrastructure in which technologies are deployed, relating to environmental and behavioral influences that shape user deployment of tools. The designer of the UTAUT paradigm found that FC is a very valuable factor influencing the use of information systems (Yu, 2012). The level of which people think technical and organizational infrastructures are latently accessible to adopt and ongoing usage of novel technologies is what FC refers to; any social, behavioral, and personal factors conducive to e-learning system use do not guarantee successful use without commensurate FC, including materials, individual support, and training for improving knowledge

and familiarity, as well as access to the system of e-learning itself. Accordingly, FC will have a major and favourable impact on students' utilization of the e-learning system.

Use Behavior (UB)

Use behavior refers to the pattern or routine of people handling ICT, which is affected by behavioral intention and assisting prerequisites (Yu, 2012). In other words, the behavior of learners to use information technology has been influenced by their intention and interest of it's used, and the accessibility of equipment and facilities to provide this intention.

Behavioral Intention (BI)

Behavioral intention was originally developed as an expansion of the Theory of Reasoned Action (TRA) (Moya, M. et al., 2017). BI is described as a theory to clarify the motivational influences that shape behavior. This theory pertains to the attempts and efforts expected from users seeking to execute specific tasks. It is shaped by personal factors regarding the individual's intention to perform something.

Research Framework and Hypotheses

This research adopts the UTAUT framework in order that explore the main elements of behavioral intention of using m-learning and its challenges for distance learning students in Saudi universities. It investigates the main factors affecting behavioral intention among 154 male and female distance learning students. Many research studies have used a similar approach to study regular students in higher education, but limited research has been conducted on distance learning students, particularly in developing countries. for the reason of customize the main scope of the research intention, participants' demographic information was included in this research to find out if the participants' demographic have any significant impact between the participants.

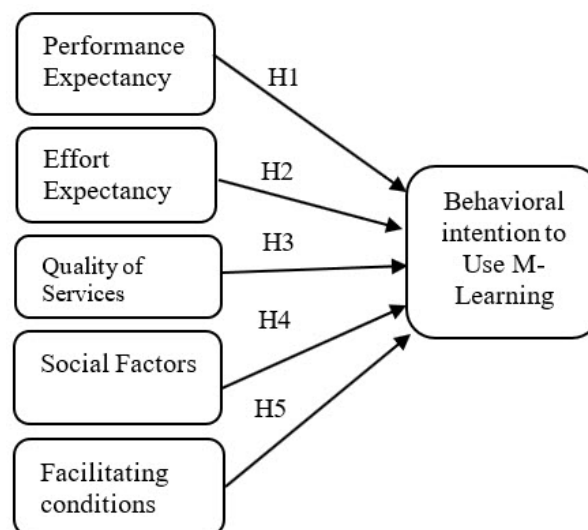


Figure 2. Research framework.

H1: Behavioral intention to use m-learning (BI) is significantly affected by performance expectancy (PE).

H2: Behavioral intention to use m-learning (BI) is significantly affected by effort expectancy (EE).

H3: Behavioral intention to use m-learning (BI) is significantly affected by quality of services (QoS).

H4: Behavioral intention to use m-learning (BI) is significantly affected by social factors (SFS).

H5: Behavioral intention to use m-learning (BI) is significantly affected by facilitating conditions (FCS).

H6: Gender has significantly affected on m-learning acceptance for distance learning students.

H7: Educational level has significantly affected on m-learning acceptance for distance learning students.

H8: Type of devices in using has significantly affected on m-learning acceptance for distance learning students.

Materials and Methods

A quantitative approach was adopted, which provided statistical results related to the research scope, by systematic and empirical investigation of the gathered numerical information, which was statistically analysed. The data was gathered from a survey based on previous studies, designed to target distance learning students in Saudi higher education institutions. Five public universities which provide distance learning programs were selected: King Abdulaziz University, Taiba University, Umm Al Qura University, University of Tabuk, and Imam Mohammad Ibn Saud Islamic University. An online questionnaire was prepared using Google Forms in both English and Arabic languages, which helped the participants to understand the theme of this research. Furthermore, the participants had to be experienced in using technological aspects of m-learning services as provided by their universities. Inclusion criteria for the randomly selected students included that all of them had been enrolled in distance learning programs, and that they were sufficiently familiar with the use of technology and mobile devices due to the nature of these programs, which depend on the use of technology and mobile devices. Moreover, the researcher analysed the m-learning orientation delivered by these universities, to ensure that students were provided with adequate knowledge, courses, training videos, and guidelines for using technology and mobile devices. A pilot study was conducted among 28 students at King Abdulaziz University to obtain feedback and test the readiness of the instrument, and based on the feedback received some minor modifications were made to the instrument, after which it was implemented with the study sample.

Data Collection

University administrators were contacted by email in order to share the survey with their students, with an explanation of the study nature and the link of online survey. Moreover, the data was collected from 154 participants, who voluntarily completed the survey by clicking on the Google Forms link via the invitation email. The data for 154 participants was analysed using SPSS. The sample size was sufficient in order to represent the opinions of distance learning students towards the intention of using m-learning (Lai, 2017). The demographics of this study were based on three factors: gender, education level, and type of device. In terms of gender, there were 93 and 62 male and female participants (respectively). The vast majority of respondents ($n = 151$) were in the third to fifth years of their programs. Concerning the type of device used for online learning, all respondents selected mobile devices. The survey section concerning demographic features was analysed using percentages and frequencies; the section directly relating to students' level of acceptance and behavioral intention factors asked participants to rate items using a five-point Likert scale.

Questions Examining Factors in Level of Acceptance and Behavioral Intention

The survey, second part, included questions that related to examine the investigating of acceptance level, based mainly on a previous instrument (Yu, 2012; Abbad, 2021), with some additional modifications to meet the objectives of this study. Table 2 illustrates the statements that participants rated using the Likert scale.

Table 2
Questions to Explore the Level of Acceptance

| Item | Measures | N items |
|------|--|---------|
| PE1 | Learning by mobile phone is useful in my studies | 6 |
| PE2 | The use of m-learning enables me quickly to achieve learning tasks | |
| PE3 | The use of m-learning increases the productivity of my learning | |
| PE4 | The use of m-learning increases learning engagement | |
| PE5 | Learning performance does not ameliorate by Using m-learning | |
| PE6 | M-learning improves is the way to collaborate with teachers and colleagues | |
| EE1 | It is easy for me to use m-learning | 4 |
| EE2 | It is difficult to operate learning applications by using mobile phones | |
| EE3 | I find that learning with a mobile phone does not require much effort | |
| EE4 | My interaction with the m-learning system is clear and understandable | |
| QoS1 | It is important for m-learning services to increase the quality of learning | 5 |
| QoS2 | A reliable and accurate m-learning service is what I prefer | |
| QoS3 | Safe use of mobile learning services is important to me | |
| QoS4 | Focusing on surfing the Internet and obtaining information is important in mobile learning | |
| QoS5 | it is difficult to communicate with the lecturer in m-learning system | |
| SF1 | in case my lecturers recommended me to use m-learning, I will most likely do | 3 |
| SF2 | in case my colleagues advise me to use m-learning, I will most likely do | |
| SF3 | in case my college advise me to use m-learning, I will most likely do | |
| FC1 | In general, my institution supports m-learning | 5 |
| FC2 | Generally, the m-learning has been supported (infrastructure, policies, etc.) by country | |
| FC3 | The m-learning resources are available to use | |
| FC4 | I don't have the skills for using m-learning | |
| FC5 | Whenever I encounter a problem with an m-learning technology, I can get support | |
| BI1 | In my studies, I intend to use mobile learning | 5 |
| BI2 | I probably will frequently use m-learning | |
| BI3 | In the future, I plan to use my mobile services more | |
| BI4 | Using m-learning systems is interested, I will like it | |
| BI5 | I will motivate others students for using m-learning systems | |

Results

Statistical Analysis of the Reliability and Suitability of Study Model

The Cronbach's alpha coefficients for all variables were between (0.711-0.861), which it is more than the required threshold (0.6) (Table 3), indicating the stability of the tool used in this study (Benitez, J. et al., 2020).

Table 3
Results of Cronbach's Alpha Coefficients

| | Cronbach's α coefficients | N paragraphs |
|------------------------------|----------------------------------|--------------|
| Independent variables | | |
| Performance expectancy | 0.711 | 6 |
| Effort expectancy | 0.732 | 4 |
| Quality of services | 0.794 | 5 |
| Social factors | 0.826 | 3 |
| Facilitating conditions | 0.811 | 5 |
| Mobile use | 0.861 | 23 |
| Dependent variable | | |
| Behavioral intention | 0.752 | 5 |

In order to ensure that there was no significant multiple linear connection between the dimensions of the independent variable, the correlation coefficients between them were examined. The results shown in Table 4 reveal that the greatest correlation was (0.738), showing that there was no significant multiple

linear correlation between the independent variables (values below 80% indicate that the sample was free from this issue) (Hair, Howard and Nitzl, 2020).

Table 4
Pearson Correlation Between Independent Variables

| Variable | PE | EE | QS | SFs | FCs |
|----------|--------|--------|--------|--------|-----|
| PE | 1 | | | | |
| EE | .691** | 1 | | | |
| QS | .230** | .217** | 1 | | |
| SFs | .678** | .397** | .231** | 1 | |
| FCs | .711** | .521** | .302** | .738** | 1 |

** Correlation is significant at the 0.01 level (2-tailed).

Key

Performance Expectancy (PE), Effort Expectancy (EE), Quality of services (QS), Social Factors (SFs), Facilitating Conditions (FCs), Behavioral Intention (BI)

Participances Demographic and the Usage of Mobile Device

The characteristics of participants demographic and usage of mobile device is illustrated Table 5, including cumulative percentages, percentages, and frequencies for each category. The majority of participants were male (60.4%), and most were in their fourth and third years (42.2% and 35.1%, respectively). Mobile phones were the most commonly used devices to access m-learning resources during their distance learning (57.1%), followed by laptops (31.8%).

Table 5
Participants' Demographic Characteristics

| | | Items | | | N = 154 | |
|--------------------------|----------|-----------|------|------------|---------|--|
| Variable | Category | Frequency | % | Cumulative | | |
| Gender | Male | 93 | 60.4 | 60.4 | | |
| | Female | 61 | 39.6 | 100.0 | | |
| Educational level (year) | 5+ | 32 | 20.8 | 20.8 | | |
| | 4 | 65 | 42.2 | 63.0 | | |
| | 2 | 3 | 1.9 | 64.9 | | |
| | 3 | 54 | 35.1 | 100.0 | | |
| Type of device | Laptop | 49 | 31.8 | 31.8 | | |
| | Mobile | 88 | 57.1 | 89.0 | | |
| | Tablet | 17 | 11.0 | 100.0 | | |

Results for Independent and Dependent Variables

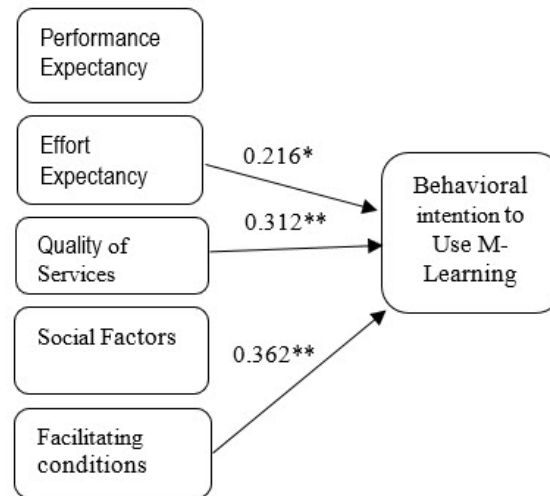
The means, standard deviations, and degrees of acceptance of m-learning are illustrated in Table 6. It can be seen that the studied Saudi distance learning students held positive attitudes towards using m-learning (3.75). The highest scores for m-learning factors were for facilitating conditions (3.99), followed by performance expectancy (3.96), and social factors (3.90). Medium acceptance was reported for effort expectancy (3.66) and quality of services (3.52). The behavioral intention for students to use m-learning also achieved a high score (3.68), indicating positive attitudes and a high degree of willingness.

Table 6
Level of M-Learning Acceptance

| N | Construct | Mean | SD | Level |
|---|-------------------------------|------|------|----------|
| 1 | Performance Expectancy (PE) | 3.69 | .683 | High |
| 2 | Effort Expectancy (EE) | 3.66 | .587 | Moderate |
| 3 | Quality of services (QS) | 3.52 | .430 | Moderate |
| 4 | Social Factors (SFs) | 3.90 | .813 | High |
| 5 | Facilitating Conditions (FCs) | 3.99 | .685 | High |
| 6 | Behavioral Intention (BI) | 3.68 | .640 | High |
| | Average | 3.75 | .493 | High |

Regression Analysis for UTAUT Construct

Regression analysis has been used in order to examine the association between the five model elements and the BI towards using m-learning. Figure 3 illustrates the β -value for the used elements.



* Significance at $p \leq 0.05$, ** Significance at $p \leq 0.01$

Figure 3. β -value Graphical representations.

Discussions

Hypotheses Testing Results (H1-H5)

Multiple regression has been used to test hypotheses (H1-H5). Table 7 illustrates the results of the statistical testing for the hypothesis model, represented by a set of independent variables (social factors, effort expectancy, facilitating conditions, performance expectancy, and quality of services) and the dependent variable (behavioral intention). The outcomes indicate that FC, QoS, and EE had a significant impact on behavioral intention (with beta values of 0.326, 0.312, and 0.216, respectively), with a statistically significant p-value of less than (0.05). This means that there are differences in facilitating conditions between the distance learning students, although all participants were capable to use m-learning as a main application to communicate during their distance learning experience. This confirms findings in other countries worldwide concerning m-learning during the Covid-19 crisis (Afandi, 2022). However, the beta values for the dimensions PE and SF were statistically insignificant (<0.05).

The current study's findings on social factors disagree with the results of previous studies, which may be attributable to the distance learning students in this study having only one way (i.e., distance learning) to undertake their studies in the Covid-19 context. Regular students (i.e., under normative situations) are more affected by social factors pertaining to the use of m-learning that seems to be linked to the greater variety of choices and options open to them (Afandi, 2022; Nikolopoulou, Gialamas and Lavidas, 2020).

Based on the above, the results confirm the hypotheses of: (H2) effort expectancy (EE) significantly affects behavioral intention to use m-learning (BI); (H3) quality of services (QoS) significantly affects behavioral intention to use m-learning (BI); (H5) facilitating conditions (FCS) significantly affect behavioral intention to use m-learning (BI). There is no statistically significant evidence to support H1 or H4.

Table 7
Testing Hypotheses H1-H5

| Hypothesis | Result | Conclusion |
|---|---|---------------|
| H1: (BI) is significantly affected by (PE) | Insignificant | Not supported |
| H2: (BI) is significantly affected by (EE)) | Significant (β -value= 0.216, $p=0.022 < 0.005$) | Supported |
| H3: (BI) is significantly affected by (QS) | Significant (β -value=0.312, $p=0.000 < 0.001$) | Supported |
| H4: (BI) is significantly affected by (SFs) | Insignificant | Not supported |
| H5: (BI) is significantly affected by (FCs) | Significant (β -value=0.362, $p=0.001 < 0.001$) | Supported |

Hypotheses Testing Results (H6-H8)

This study one-sample T-test was used to test H6, and one-way analysis of variance (ANOVA) in order to test H7 and H8. Table 8 shows the results, which indicate that the T- and F-values are not significant ($p < 0.05$). Therefore, the students' gender, educational level, and type of devices using in m-learning have no substantive impacts on m-learning acceptance. This means that the distance learning students are homogenous with regard to their m-learning user behavior for distance learning, evidencing that the nature of distance learning programs can assume commensurate levels of technical skills and resources to use m-learning resources.

Table 8
Testing Hypotheses H6-H8

| Analysis Factor | df | t | Sig. (2-tailed) | Result |
|-------------------|-----|-------|-----------------|---------------|
| Gender | 152 | 0.975 | 0.331 | Not supported |
| Educational level | 3 | 2.065 | 0.107 | Not supported |
| Device type | 2 | 1.234 | 0.294 | Not supported |

Conclusion

This study examined a variety of m-learning adoption and acceptance issues in relation to the UTAUT paradigm. According to the findings, Saudi public university distance learning students have good latent readiness and positive attitudes toward using m-learning to further their academic objectives. This is in light of the key elements identified by the UTAUT model. Examining UTAUT model-based components on behavioral intention to employ m-learning indicated positive effects. When evaluating the questionnaire findings, it was discovered that performance expectancy, social factors, and facilitating conditions all received high scores. The findings of this study also provided support for three of the five hypotheses. The findings of the T-test and ANOVA tests provided a distinct viewpoint on the impact of various factors on the use of mobile learning, showing that gender, educational level, and the types of used devices have no appreciable effects on students' attitudes toward m-learning.

Overall, the findings indicate that the regulations governing distance learning programs and the implementation of mobile learning by Saudi universities under the direction of the Ministry of Higher Education are having a good impact and encouraging widespread use of m-learning.

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Conflict of interests

The authors declare no conflict of interest.

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Students' Acceptance of Mobile Augmented Reality Applications in Primary and Secondary Biology Education

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Abstract: Augmented reality is often indicated as a usable educational technology that can be integrated into biology classes to overcome the shortcomings of traditional teaching (such as lack of visualization of abstract teaching content, students' low participation and interest in classes, and their insufficient understanding of complex topics). Mobile applications with augmented reality experience mode have the potential to be used in online, blended/hybrid, and in-person teaching, which is particularly important during emergencies. This study's purpose was to determine primary and secondary school students' acceptance of augmented reality content in commercial mobile applications that can be used as a supplement in biology teaching. A total of 188 students (from schools included in this research) completed the online questionnaire. The results showed that the majority of students perceived mobile augmented reality applications as useful and easy to use, had a positive attitude, and expressed intention to use this educational technology if given the opportunity. The importance of prior evaluation regarding educational usability and performance is highlighted since technical quality (of used mobile applications) had a strong positive effect on perceived usefulness and perceived ease of use. There were no statistically significant differences between female and male and primary and secondary students, but students with prior experience with augmented reality rated perceived usefulness higher. Despite positive results, we need to raise our concerns regarding the reliability of using mobile augmented reality in biology education due to the lack of usable free content and the frequent cancellation of authoring tools and applications.

Keywords: augmented reality, biology teaching, mobile application, Technology Acceptance Model, technology-enhanced learning.

Introduction

A lot of biology learning materials are abstract and difficult to understand due to the complexity of life concepts, especially if the learning content is microscopic or not available for direct observation (Chang, Chung and Huang, 2016; Nurhasanah, Widodo and Riandi, 2019; Wang et al., 2022). Therefore, digital visualization technologies have become essential for biology education since special equipment (such as high-tech microscopes) is often not affordable for educational institutions (Erbaş and Demirel, 2019; Jenkinson, 2018).

The current COVID-19 pandemic highlighted the need for digital resources that can be used in blended, hybrid, and online K-12 teaching (Crompton et al., 2021). Still, in order to successfully organize technology-enhanced learning solutions (e.g., using digital technologies for presenting knowledge differently, creating active hands-on learning activities, and providing solutions for evaluation of acquired knowledge), teachers need to have skills in using digital tools, as well as a certain level of smart pedagogical competences (Daniela, 2021).

Despite much broader availability of immersive technologies (such as augmented reality [AR] and virtual reality [VR]) to educational institutions in recent years, adoption is lagging. However, due to the ongoing pandemic, the potential of using VR and AR content in blended/hybrid learning has been emphasized (García Estrada and Prasolova-Førland, 2022).

In the literature (Chang, Chung and Huang, 2016; Chien et al., 2019; Erbaş and Demirel, 2019;

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Fuchsova and Korenova, 2019; Hung, Chen and Huang, 2017; Hwang et al., 2016; Jenkinson, 2018; Lu and Liu, 2015; Safadel and White, 2019; Wang et al., 2022; Weng et al., 2020; Yapıcı and Karakoyun, 2021), AR is often indicated as a relatively new and usable technology for biology (including ecology) teaching and learning at all levels of education. Yavuz et al. (2021) pointed out mobile AR (MAR) applications (apps) as affordable and sustainable for massive adoption in different areas (including education). According to Laine (2018, p. 2), MAR can be defined as “a type of AR where a mobile device (smartphone or tablet) is used to display and interact with virtual content, such as three-dimensional (3D) models, annotations, and videos, that are overlaid on top of a real-time camera feed of the real world”. Using mobile devices to integrate AR content in in-person or remote educational settings is more accessible and less expensive than with other types of AR hardware (such as smart glasses, headsets, AR projection systems, etc.) since most students already have appropriate smartphones (Nurhasanah, Widodo and Riandi, 2019).

Although still limited and content-specific (Erbaş and Demirel, 2019), the body of literature concerning the use of AR in biology (including ecology) education is constantly growing. On the one hand, several studies have shown that AR can positively affect students' achievement in biology and ecology in formal and informal learning settings (Hwang et al., 2016; Lu and Liu, 2015; Nurhasanah, Widodo and Riandi, 2019). On the other hand, a number of studies didn't find any significant difference in students' academic achievement (learning outcomes) between AR and traditional learning materials or other digital aids (Chang, Chung and Huang, 2016; Chien et al., 2019; Erbaş and Demirel, 2019; Hung, Chen and Huang, 2017; Wang et al., 2022; Weng et al., 2020). Still, Chang, Chung and Huang (2016) reported better knowledge retention, Wang et al. (2022) reported a reduction in students' cognitive load, and Chien et al. (2019) and Weng et al. (2020) reported statistically higher scores in the experimental group (that used the AR technology) on questions related to higher levels of Bloom's revised taxonomy (such as the level of analyzing). Also, the majority of analyzed studies reported benefits of AR regarding students' motivation, self-efficacy, satisfaction, and/or participation in biology lessons.

According to Nurhasanah, Widodo and Riandi (2019, p. 482), the use of AR in biology classes “will undoubtedly attract more students' interest in school”. Similarly, Hung, Chen and Huang (2017) pointed out that AR may not be superior compared to other aids and teaching materials, but it is at least equally effective and can help students learn biology, spark their interest, and reduce classroom boredom. In addition, Lu and Liu (2015) emphasized that learning activities with AR can be especially helpful for low academic achievement students, and Chang, Chung and Huang (2016) indicated students' opportunity to experience constructivist learning as one of the most important advantages of using AR in schools.

Dengel et al. (2022) pointed out that teachers should be capable of designing their AR experiences and indicated five accessible AR authoring toolkits for educational purposes (Vuforia Studio, BlippAR, AWE, AR Media Studio, and Areeka). However, teachers often lack specific knowledge and skills to develop or customize their own digital materials, such as AR experiences (Daniela, 2021; Mota et al., 2018). Also, Daniela (2021, p. 714) emphasized that it is not clear “how much effort the teacher should put into developing the materials”. Fuchsova and Korenova (2019) suggested a few commercial biology-themed MAR apps that are affordable and appropriate for teaching. Still, using so-called “off-the-shelf” apps in learning environments is not a straightforward process since available immersive experiences need to be evaluated first and matched with teaching content and lesson goals (Stojšić et al., 2019b). For example, Dreimane and Daniela (2021) analyzed 41 MAR apps (from the App Store) related to the anatomy of the human body, but only seven met the selection criteria. The same authors believe that commercial MAR apps can be successfully integrated into the learning process (but before all else teachers need to understand the educational potential and limitations of those apps) and proposed an evaluation framework with 19 criteria divided into three groups: (a) technological performance, (b) information architecture, and (c) educational value (Dreimane and Daniela, 2021).

Besides the availability of MAR apps (both custom and off-the-shelf) to biology teachers and students and their usability, graphics quality, and effectiveness, it is also important to assess the acceptance of those apps. According to Yavuz et al. (2021, p. 1), acceptance of MAR is “one of the factors influencing its adoption”. Yapıcı and Karakoyun (2021) conducted a case study with prospective biology teachers and the result showed that future biology teachers had mostly positive views about the use of AR in biology teaching. Although limited in scope, previous studies (Fuchsova and Korenova, 2019; Hung, Chen and Huang, 2017; Hwang et al., 2016; Safadel and White, 2019) also suggested that the majority of students accept AR and have positive attitudes (perceptions) regarding the use of this technology for biology learning. However, we did not find studies that deal with determining primary and/or secondary students' acceptance of commercially available MAR apps (for biology learning) during pandemic teaching.

The purpose of the study and used research model

The purpose of this study was to determine primary and secondary students' acceptance of free commercial MAR apps that can be used as a supplement in biology teaching/learning, as well as to identify potential variables that influence acceptance.

In the literature (Balog and Pribeanu, 2010; Cabero-Almenara, Fernández-Batanero and Barroso-Osuna, 2019; Huang and Liaw, 2018; Huang, Liaw and Lai, 2016; Mailizar and Johar, 2021; Wojciechowski and Cellary, 2013), students' acceptance of AR, VR, and other immersive technologies in educational settings was often researched using the Technology Acceptance Model (TAM; Davis, 1989; Davis, Bagozzi and Warshaw, 1989). According to Trivunović and Kosanović (2021), the TAM model provides insights into the reasons for acceptance and use of technology in teaching and learning processes. In other words, the TAM constructs (factors) explain the complexity of the process of technology acceptance by the user (in our case the student).

In the present study, we used an adjusted and shortened version of the AR Acceptance Model (based on the TAM model) proposed by Cabero Almenara, Barroso Osuna and Llorente Cejudo (2016). On the basis of the used research model (Figure 1), the following hypotheses were formulated:

- H1. Technical quality has a positive effect on perceived usefulness.
- H2. Technical quality has a positive effect on perceived ease of use.
- H3. Perceived ease of use has a positive effect on perceived usefulness.
- H4. Perceived ease of use has a positive effect on attitude toward use.
- H5. Perceived usefulness has a positive effect on attitude toward use.
- H6. Perceived usefulness has a positive effect on intention to use.
- H7. Attitude toward use has a positive effect on intention to use.

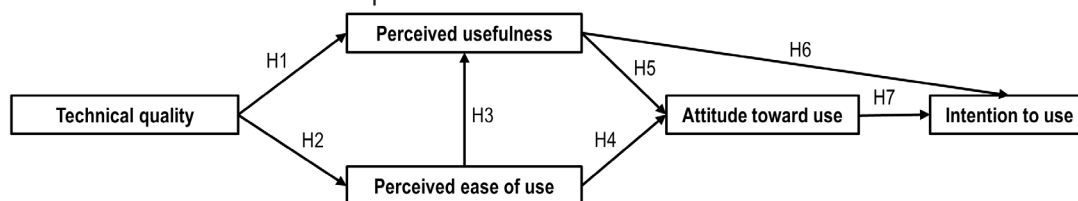


Figure 1. Research model (based on Cabero Almenara, Barroso Osuna and Llorente Cejudo, 2016).

In addition, but in line with the research purpose, we formulated the following research questions:

- RQ1. Does gender influence differences in students' acceptance of MAR apps?
- RQ2. Does prior achievement in biology (grade at the end of the first semester) influence differences in students' acceptance of MAR apps?
- RQ3. Does the type of school (primary or secondary) influence differences in students' acceptance of MAR apps?
- RQ4. Does prior experience with AR influence differences in students' acceptance of MAR apps?

We decided to formulate research questions instead of hypotheses since there are no sufficient and conclusive results from previous studies regarding the influence of investigated variables (gender, biology grade at the end of the first semester, type of school, and prior experience with AR) on students' acceptance of the educational use of AR technology.

Materials and Methods

In this research, mobile apps with AR experience mode were used to complement students' knowledge acquisition of certain biological teaching content. At the time we started our research, there was a need for digital solutions that could help students' better understanding of biology learning materials since the classes were shorted to 30 minutes due to pandemic measures (with only half of the students in the classroom). The research was conducted during the second semester of the 2020-2021 school year through four stages.

In the first stage, we were looking for AR content in free commercial mobile apps that could be used in biology classes. The search didn't include MAR apps that are only for iOS devices (e.g., iPad and iPhone) since in the Republic of Serbia the majority of schools', teachers', and students' owned devices (tablets and smartphones) are Android-based.

In the second stage, we checked the performance and graphics quality of the AR experience mode

(of biology-related content) in found MAR apps, as well as used the heuristic questionnaire proposed by Radu (2014) to evaluate those apps. After the evaluation process, we were left with only a few MAR apps (EON-XR, Expeditions [the app is no longer available], Edmentum AR Biology, and WWF Free Rivers) that we tried to match with the teaching content in different grades of the primary and secondary school biology curriculum.

In the third stage, the integration process was planned and realized following steps from the AR/VR integration model proposed by Stojišić et al. (2019a). For instance, the steps included evaluation of school infrastructure and availability of necessary devices (teachers' and students' owned smartphones and tablets), as well as taking security measures and preparing students to use MAR apps.

In the fourth stage, the selected biology-related AR content was included in some biology classes (in both in-person and online groups) as an additional part of activities created by the second author (biology teacher). For example, the EON-XR app was employed with the teaching content related to nutrition and the human digestive system. At the end of this research (end of the second semester), the students were offered to fill in an online questionnaire. Participation was voluntary and anonymous.

Participants

Three state primary schools (two rural and one urban) and one urban state secondary school in the Republic of Serbia took part in this research. A total of 188 students (from schools included in this research) completed the online questionnaire correctly and timely. Participants' characteristics are presented in Table 1.

Table 1
Participants' descriptive characteristics (N = 188)

| Variables | n | % |
|---|-----|-------|
| Gender | | |
| female | 111 | 59.04 |
| male | 77 | 40.96 |
| Biology grade (at the end of the first semester) | | |
| insufficient (1) | 1 | 0.53 |
| sufficient (2) | 15 | 7.98 |
| good (3) | 24 | 12.77 |
| very good (4) | 53 | 28.19 |
| excellent (5) | 95 | 50.53 |
| Type of school | | |
| primary | 127 | 67.55 |
| secondary | 61 | 32.45 |
| Prior experience with AR | | |
| yes | 103 | 54.79 |
| no | 85 | 45.21 |

Instrument

An online questionnaire in the Serbian language was created (with Google Forms) as the instrument for this research. The first part of the questionnaire contained questions related to students' demographics and school information (e.g., gender, type of school, biology grade at the end of the first semester, etc.). The second part of the questionnaire included a five-point Likert-type scale (from 1 – strongly disagree to 5 – strongly agree) with 19 items grouped to measure five TAM constructs (technical quality, perceived usefulness, perceived ease of use, attitude toward use, and intention to use). The items were defined as positive and negative statements and mostly adapted from Cabero Almenara, Barroso Osuna and

Llorente Cejudo (2016). Table 2 shows Cronbach's alpha values for TAM constructs and means and standard deviations of items.

Table 2
Cronbach's alpha values for TAM constructs and means and standard deviations of items

| TAM constructs | Items | M | SD | Cronbach's alpha |
|-----------------------|--|------|------|------------------|
| Technical quality | 3D objects in MAR apps provide a sense of reality. | 4.09 | 0.86 | .83 |
| | Objects and scenes seen in AR mode are aesthetically pleasing. | 4.06 | 0.76 | |
| | AR content in used mobile apps is attractive. | 3.85 | 0.90 | |
| Perceived usefulness | MAR apps helped me master the learning material. | 3.95 | 0.94 | .83 |
| | The 3D view in MAR apps helped me better understand the structure of a biological system (e.g., the human digestive system). | 4.26 | 0.87 | |
| | Thanks to the use of MAR apps, I learned more compared to traditional classes. | 3.71 | 1.10 | |
| | My attention in biology classes is better when there is additional AR content. | 3.66 | 1.10 | |
| | Using MAR apps could improve biology learning in the classroom (or online). | 4.04 | 0.91 | |
| Perceived ease of use | I think that MAR apps are easy to use. | 4.24 | 0.71 | .67 |
| | It was not a problem for me to learn how to use a MAR app. | 4.43 | 0.66 | |
| Attitude toward use | Using MAR apps in biology classes makes learning fun. | 4.20 | 0.87 | .80 |
| | AR content makes biology learning more interesting. | 4.28 | 0.77 | |
| | *Learning biology with MAR apps is boring. | 3.91 | 1.12 | |
| | I believe that using MAR apps in the classroom (or in online activities) is a good idea. | 4.10 | 0.99 | |
| Intention to use | If I have the opportunity in the future, I would like to use MAR apps for biology learning. | 4.05 | 0.95 | .75 |
| | I would like to use MAR apps in other school subjects as well. | 4.16 | 0.92 | |
| | *It is not necessary for me to use MAR apps in future biology classes. | 3.34 | 1.17 | |
| | *I'm not interested in using MAR apps for learning. | 3.76 | 1.18 | |

Note. The item "I had a hard time mastering the use of MAR apps." was excluded from the perceived ease of use construct due to low item-total correlation. For the negative items (marked with an asterisk [*]), a reverse scoring method was used.

Data Analysis

Statistical analyses were performed using IBM SPSS Statistics software (version 24). Besides descriptive statistics (arithmetic means, standard deviations, frequencies, and proportions), path analysis (based on multiple regression analysis) was used for testing the research model (hypotheses 1-7). Additionally, four MANOVA (multivariate analysis of variance) tests were run to examine the relationship between independent variables (gender, biology grade at the end of the first semester, type of school, and prior experience with AR) and dependent variables (the TAM constructs).

Results

Analyzing the results from the TAM-based scale (Table 3), it can be concluded that students included in this research accepted the use of MAR apps as a supplement in biology teaching/learning. According to students, MAR apps had sufficient technical quality ($M = 4.00$, $SD = 0.73$), they were easy to use ($M = 4.34$, $SD = 0.60$), and mostly useful for biology learning ($M = 3.93$, $SD = 0.76$). Also, the students

had a positive attitude toward the use of MAR apps in biology teaching ($M = 4.12$, $SD = 0.75$) and to a certain degree, expressed their intention to use ($M = 3.83$, $SD = 0.80$) this educational technology in the future (if given the opportunity).

Table 3
Means and standard deviations of TAM constructs

| TAM constructs | M | SD |
|-----------------------|------|------|
| Technical quality | 4.00 | 0.73 |
| Perceived usefulness | 3.93 | 0.76 |
| Perceived ease of use | 4.34 | 0.60 |
| Attitude toward use | 4.12 | 0.75 |
| Intention to use | 3.83 | 0.80 |

To test hypotheses, the path analysis based on multiple regression analysis was used. Therefore, path coefficients are standardized beta values. The results of the path analysis (Table 4) have revealed statistical significance of all paths in the tested research model.

Table 4
Results of the research model testing

| Hypotheses | Paths | Standardized coefficient (β) | t | p |
|------------|--|--------------------------------------|-------|--------|
| H1 | Technical quality \rightarrow Perceived usefulness | 0.62 | 10.73 | < .001 |
| H2 | Technical quality \rightarrow Perceived ease of use | 0.46 | 7.03 | < .001 |
| H3 | Perceived ease of use \rightarrow Perceived usefulness | 0.16 | 2.76 | .006 |
| H4 | Perceived ease of use \rightarrow Attitude toward use | 0.12 | 2.04 | .043 |
| H5 | Perceived usefulness \rightarrow Attitude toward use | 0.62 | 10.41 | < .001 |
| H6 | Perceived usefulness \rightarrow Intention to use | 0.18 | 2.76 | .006 |
| H7 | Attitude toward use \rightarrow Intention to use | 0.62 | 9.54 | < .001 |

The path between perceived ease of use and attitude toward use was found significant at a .05 level, whereas the paths between perceived ease of use and perceived usefulness and perceived usefulness and intention to use were found significant at a .01 level. The rest of the paths were found significant at a .001 level. Consequently, all hypotheses are supported. Figure 2 shows the final model.

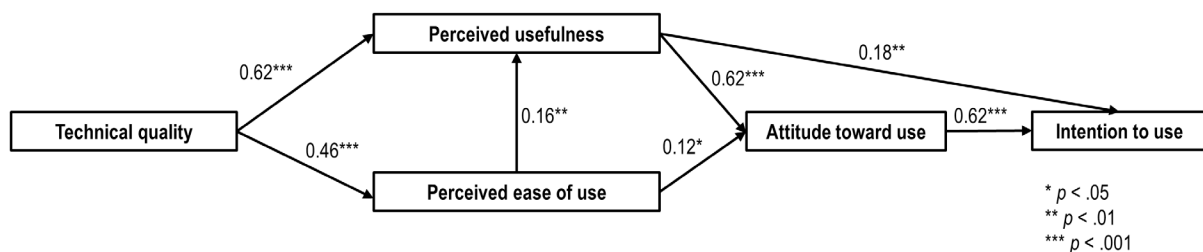


Figure 2. Results of the path analysis (Final model).

To answer formulated research questions, four MANOVA tests were performed. Preliminary tests were conducted to check violations for normality, linearity, univariate and multivariate outliers, homogeneity, and multicollinearity assumptions (see Pallant, 2020).

The first research question investigates potential differences in students' acceptance of MAR apps regarding gender (independent variable). The TAM constructs (technical quality, perceived usefulness, perceived ease of use, attitude toward use, and intention to use) were used as dependent variables. During preliminary testing, three cases were removed due to multivariate outliers. The results of the MANOVA test showed no significant difference between female and male students on the combined dependent variables, $F(5, 179) = 2.05$, $p = .073$, Pillai's Trace = .05, partial $\eta^2 = .05$.

The second research question explores potential differences in students' acceptance of MAR apps regarding biology grades at the end of the first semester (independent variable). The TAM constructs were used as dependent variables. During preliminary testing, three cases were removed due to multivariate outliers. Also, the "insufficient" group was excluded because there was only one case in it. Due to the limited number of cases, groups "sufficient" and "good" were merged into one group. The results of the MANOVA test showed a statistically significant difference between students with different biology grades ("sufficient/good", "very good", and "excellent") on the combined dependent variables, $F(10, 356) = 2.14$, $p = .021$, Pillai's Trace = .11, partial $\eta^2 = .06$. However, when the results for the dependent variables were considered separately (using the sequential Holm-Bonferroni method for alpha level correction), none of the differences reached statistical significance.

The third research question examines potential differences in students' acceptance of MAR apps regarding school type (independent variable). Five dependent variables were used (the TAM constructs). During preliminary testing, three cases were removed due to multivariate outliers. The results of the MANOVA test showed no significant difference between primary and secondary school students on the combined dependent variables, $F(5, 179) = 1.99$, $p = .083$, Pillai's Trace = .05, partial $\eta^2 = .05$.

The fourth research question explores potential differences in students' acceptance of MAR apps regarding prior experience with AR (independent variable). Again, the TAM constructs were used as dependent variables. During preliminary testing, three cases were removed due to multivariate outliers. The results of the MANOVA test showed a statistically significant difference between students with and without prior experience with AR on the combined dependent variables, $F(5, 179) = 2.51$, $p = .032$, Pillai's Trace = .07, partial $\eta^2 = .07$. When the results for the dependent variables were considered separately (using the sequential Holm-Bonferroni method for alpha level correction), the only difference to reach statistical significance was perceived usefulness, $F(1, 183) = 8.53$, $p = .004$, partial $\eta^2 = .04$. An inspection of the mean scores indicated that students with prior experience with AR perceived higher usefulness of MAR apps ($M = 4.09$, $SD = 0.67$) than students without prior experience with AR ($M = 3.78$, $SD = 0.76$).

Discussion

Using smartphone-supported apps is a way to provide everyone a chance to use AR experiences in the learning process (Dreimane and Daniela, 2021). Therefore, this research deals with primary and secondary school students' acceptance of MAR apps (that can be used as a supplement in biology teaching/learning).

Based on the results, it can be concluded that the majority of students accepted MAR apps which is in line with previous studies related to biology (including ecology) content teaching (Fuchsova and Korenova, 2019; Hung, Chen and Huang, 2017; Hwang et al., 2016; Safadel and White, 2019).

The seven hypotheses were tested using the path analysis. The results showed that technical quality was a very strong predictor of students' perceived usefulness and perceived ease of use. Perceived ease of use had a significant positive effect on students' perceived usefulness of MAR apps. Perceived usefulness was the most important predictor ($\beta = 0.62$) of students' attitude toward use regarding MAR apps. Also, perceived ease of use had a significant positive impact ($\beta = 0.12$) on students' attitude toward use, which was theorized in the research model but not always the case in prior studies regarding MAR apps (e.g., Koutromanos and Mikropoulos, 2021; Yavuz et al., 2021). Furthermore, attitude toward use was the most influential predictor ($\beta = 0.62$) of students' intention to use MAR apps. Similar results were reported in studies (regarding immersive technologies) by Cabero-Almenara, Fernández-Batanero and Barroso-Osuna (2019), Koutromanos and Mikropoulos (2021), and Wojciechowski and Cellary (2013). In addition, perceived usefulness had a significant positive impact ($\beta = 0.18$) on students' intention to use MAR apps. Although Huang and Liaw (2018) pointed out that in many studies perceived usefulness has been seen as the most significant predictor of students' intention to use various digital technologies

(e-learning systems, virtual worlds, and VR), we should be mindful that the authors of those studies used different TAM constructs (often without attitude as a construct). Additionally, [Wojciechowski and Cellary \(2013\)](#) did not find a significant effect of perceived usefulness on intention to use in their research.

In addressing research questions 1 and 3, the results of MANOVA tests showed no statistically significant differences regarding gender and school type on students' acceptance of MAR apps. [Cabero-Almenara, Fernández-Batanero and Barroso-Osuna \(2019\)](#) also reported that no significant differences were found regarding the influence of students' gender on the degree of acceptance of AR. However, [Pombo and Marques \(2020\)](#) reported that primary school students perceived higher educational value of the EduPARK MAR game than secondary school students.

In relation to research questions 2 and 4, the MANOVA test results showed statistically significant differences regarding biology grades (at the end of the first semester) and prior experience with AR on the combined dependent variables (the TAM constructs). However, for biology grades, none of the differences reached statistical significance when the dependent variables were considered separately. The results are encouraging since students found AR content useful for learning regardless of their prior achievement in biology. According to [Salmi, Thuneberg and Vainikainen \(2017\)](#), AR is one of the few pedagogical solutions that especially benefits those students who are below average in school achievement. For prior experience with AR, the only difference to reach statistical significance was perceived usefulness indicating that students with prior experience with AR perceived higher usefulness of MAR apps. These results are similar to the findings of [Stojić et al. \(2020\)](#) and suggest that the positive students' responses were not just products of a novelty effect (see [Akçayır and Akçayır, 2017](#)).

Conclusions

The results of this research showed that both primary and secondary students accepted MAR apps and perceived their usefulness, as well as they had a positive attitude toward the use of AR in biology teaching and expressed their intention to use this educational technology more frequently if given the opportunity. Still, we need to take into consideration that the BYOD (bring your own device) model remains the only way for many schools and teachers in the Republic of Serbia to introduce certain digital innovations in teaching practice ([Atanasković et al., 2022](#)). Furthermore, we should bear in mind that "each AR application is unique, influencing students in specific ways according to its design" ([Radu, 2014, p. 1534](#)). Therefore, to ensure a meaningful, effective, and successful integration, app evaluation is a necessary step, as well as using appropriate integration models (such as one proposed by [Stojić et al., 2019a](#)). Also, the importance of prior evaluation of apps was highlighted in the results of this research since technical quality (of used MAR apps) had a very strong positive impact on perceived usefulness and perceived ease of use.

Like in the study done by [Dreimane and Daniela \(2021\)](#), we also finished the evaluation process with a limited number of usable MAR apps. Teachers' access to suitable AR/VR content is a bottleneck when it comes to the broader adoption of immersive technologies in education ([Garcia Estrada and Prasolova-Førland, 2022](#)). We should emphasize that the Expeditions app was discontinued in June 2021. Additionally, one of the biology-themed MAR apps used in the study by [Fuchsova and Korenova \(2019\)](#) is no longer available as well. Therefore, usable AR content (in currently available free mobile apps that can be used for biology teaching) is limited and learners cannot always use it independently (due to low information architecture and/or educational value, see [Dreimane and Daniela, 2021](#)), but it can be integrated (as a supplement) into activities and teacher-created materials to engage students with the teaching content in classrooms or online. However, the question regarding the reliability of using free MAR apps (as the main option for integrating AR in educational settings) is still open. Utilizing AR authoring tools is not more reliable either. For example, [Dengel et al. \(2022\)](#) also raised questions about reliability since over half of AR authoring tools reported in the scientific articles (43 papers were included in the meta-analysis) were not accessible or discontinued. The same authors pointed out that "having to change to a different Authoring Toolkit after a year or two is tedious and could keep educators putting in the effort of learning how to use such toolkits" ([Dengel et al., 2022, p. 9](#)). In addition, in their SWOT analysis, [Stojić et al. \(2019a\)](#) indicated the rapid obsolescence of mobile devices and the cancellation of authoring tools and apps as threats that could jeopardize the wider adoption of immersive technologies in learning environments.

This research has some limitations. The first limitation relates to the selection process since we only included free Android mobile apps (with AR content about biology). Moreover, selection and evaluation processes can involve aspects of subjectivity, which cannot be fully eliminated using evaluation

questionnaires and frameworks (Dreimane and Daniela, 2021). The second limitation is that we didn't have the means to monitor the actual use of MAR apps in online groups of students. The third limitation is the voluntary response bias (possible differences between students who filled in the questionnaire and those who did not).

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Conflict of interests

The authors declare no conflict of interest.

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Cognitive and Personality Traits of Social Media Users With Eating Disorders

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Abstract: This work aims to study the personality and cognitive characteristics of social media users with eating disorders. The work involved 209 people (84 women with anorexia nervosa, 82 women with bulimia nervosa, a control group of 43 healthy women). The Eating Behavior Rating Scale (EBRS), Cognitive-behavioral Patterns in Eating Disorders Questionnaire, 16-factor Personality Questionnaire, and the Dysfunctional Relations Scale (DRS) were used to assess cognitive and personal characteristics of people with eating disorders. It was found in the work that emotional instability, anxiety, and suspicion are characteristic personality traits for persons with eating disorders. It has been found that individuals with anorexia nervosa and bulimia nervosa have different cognitive characteristics. The cognitive characteristics of individuals with eating disorders are correlated with their personality traits.

Keywords: anorexia, bulimia, cognitive and personality traits.

Introduction

The problem of disorders in eating behavior is becoming increasingly important today. In recent years, there has been a significant increase in the number of patients with eating disorders, both in Russia and abroad, which is a severe problem (Kessler et al., 2013). Eating disorders are mental disorders that manifest themselves as impaired eating (Schag et al., 2013; Mehler and Rylander, 2015; Iqbal and Rehman, 2020). Current research examines the factors that influence the occurrence of eating disorders. The emergence of eating disorders such as anorexia nervosa and bulimia nervosa is associated with genetic predisposition, social influences, the role of psychophysiological factors, as well as personality traits (Bulik, Sullivan and Kendler, 2003; Urwin and Nunn, 2004; Javaras et al., 2008; Rask-Andersen et al., 2010; Muller et al., 2012; Trace et al., 2013; Yilmaz, Hardaway and Bulik, 2015; Grzelak et al., 2017; Motalova and Vorobyeva, 2018; Zam, Saijari and Sijari, 2018; Himmerich et al., 2019; Vorobyeva et al., 2021).

In the era of the COVID-19 pandemic, on the one hand, there were certain restrictions for conducting face-to-face psychological research, and on the other hand, with the increasing stressfulness of the surrounding situation, the need for consultation with a clinical psychologist based on psychological diagnostics in persons with eating disorders has increased significantly as the number of people with eating disorders has increased.

Eating disorders include anorexia nervosa, bulimia nervosa, binge eating disorder, and other specific eating disorders. Their clinical manifestations are described in two main classifiers of mental and behavioral disorders: the International Classification of Diseases (ICD-10 and ICD-11) and the American Psychiatric Association's Diagnostic and Taxonomy of Mental Disorders Handbook (DSM-IV and DSM-V). Anorexia nervosa is a neurotic register syndrome that manifests itself in abstaining from food to lose for weight due to the belief in the presence of apparent or overestimated obesity. Bulimia nervosa manifests itself as an intermittent inability to refrain from eating large amounts of food. Bulimia nervosa characterized desire to prevent the effect of food on body weight, by inducing vomiting, taking laxatives and diuretic drugs, and fasting. Bulimia nervosa is associated with guilt and fear of obesity (Kaye et al., 2011; Voon, 2015; Harasim-Piszczatowska and Krajewska-Kulak, 2017; Burton and Abbott, 2019).

This paper presents the results of an online study of the cognitive and personality traits of individuals

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with eating disorders. The purpose of this work is to study the cognitive and personal characteristics of users of social networks with eating disorders. The subject of research: persons with eating disorders from the thematic group in the social network "VKontakte" with a confirmed diagnosis. Research hypotheses: 1. The personal characteristics of persons with eating disorders may have statistically significant differences from the control group in terms of the emotional attributes of the personality: anxiety, emotional instability, suspicion, and tension; 2. Individuals with anorexia nervosa and bulimia nervosa may have different cognitive factor; 3. The cognitive aspect of individuals with eating disorders may be inter-related with their personality traits.

Materials and Methods

The study was conducted in a specialized social media group. The number of participants left 209 people. Of these, 84 women with anorexia nervosa (mean age 22 ± 0.3 years and 82 women with bulimia nervosa at age 23 ± 0.5 years. Control group - 43 healthy girls aged 22 ± 0.4 , used Google Forms.

The Eating Behavior Rating Scale (EBRS) (Wilson et al., 1989) was used to assess the severity of eating disorders. We used the Russian version of EBRS (validation by Ilchik et al., 2011). Cognitive-behavioral Patterns in Eating Disorders Questionnaire (Sagalakova and Kiseleva, 2014) was used to revealing cognitive and behavioral features at persons with eating behavior disturbances. 16-factor Personality Questionnaire (Cattell, 1949) was used to assess the personal characteristics. The Dysfunctional Relations Scale (DRS) (Weissman and Beck, 1978) was used to measure the intensity of dysfunctional attitudes. We used the Russian version of DRS (validation by Zakharova, 2013). Statistical data processing was carried out using Statistica 10. The Shapiro-Wilk test was used to assess the normality of the distribution, the Mann-Whitney nonparametric test was used to evaluate the reliability of differences between the compared groups, and the Spearman correlation coefficient was used to determine the presence of relationships.

Experiment and obtain the some or equivalent results. Provide sufficient detail to allow the work to be reproduced. A reference should imply published methods; only appropriate changes should be described.

Results

Individuals with eating disorders showed a pronounced expression of such behavioral stereotypes as: inefficiency (8.4 ± 0.9), perfectionism (6.9 ± 1.7), distrust in interpersonal relationships (7.7 ± 1.8), in-teroceptive incompetence (8 ± 1.2). Indicators on the scale "Episodes of overeating and cleansing behavior" ($U=1769.5$; $p<0.05$) in the group of people with bulimia nervosa are statistically significantly higher than in the group of people with anorexia nervosa.

According to the methodology "16-factor personality questionnaire R.B. Cattell", significant differences were found between the group of people with anorexia nervosa and the group of people with bulimia nervosa on the scales: "Emotional instability - Emotional stability" ($U=2753$; $p=0.05$), "Restraint - Expressiveness" ($U=2662$; $p=0.05$). Significantly significant differences were found between individuals with eating disorders and individuals from the control group in terms of individual psychological personality traits such as: self-esteem ($U=531$; $p<0.05$), emotional stability ($U=466$; $p<0.05$), gullibility ($U=658$; $p<0.05$), calmness ($U=664.5$; $p<0.05$), relaxation ($U=400$; $p<0.05$).

The assessment of the severity of cognitive features in eating disorders was carried out. The results obtained for individuals with anorexia nervosa are shown in Figure 1.

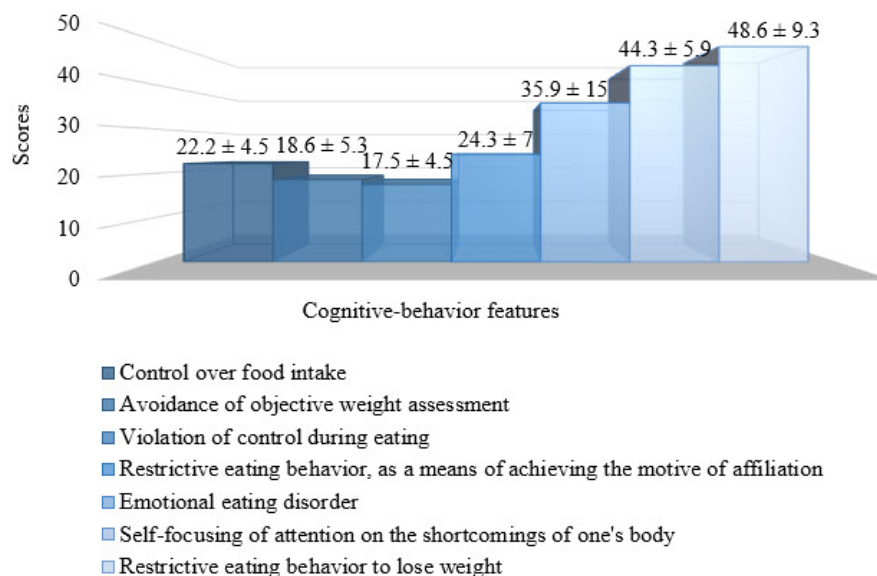


Figure 1. Mean values of the severity of cognitive features in individuals with anorexia nervosa.

Based on the results depicted in Figure 1, we can say that individuals with anorexia nervosa demonstrate a high severity of such cognitive features as: control over food intake, self-focusing on their body imperfections, and restrictive eating behavior to lose weight. For the parameter “Control over food intake”, the average value in individuals with anorexia nervosa was 22.2 ± 4.5 , which is a high indicator. According to the parameter “Self-focusing of attention on the shortcomings of one’s body”, the average value was 44.3 ± 5.9 , which is a high indicator and indicates the presence of close attention to the imaginary “shortcomings” of their own body. In addition, there is a desire to hide “flaws” with the help of certain clothes. For the parameter “Restrictive eating behavior to lose weight,” the average value was 48.6 ± 9.3 , which is a high indicator and indicates the presence of respondents’ dissatisfaction with their weight and the application of the strategy of restricting food intake. In addition, people with anorexia nervosa resort to vigorous physical exercise, laxatives, and diuretics. The revealed cognitive features of persons with anorexia nervosa are of moderate severity with a tendency to high: “Avoidance of objective weight assessment”, “Violation of control during eating”, “Restrictive eating behavior, as a means of achieving the motive of affiliation”.

According to the parameter “Avoidance of objective weight assessment”, the average value was 18.6 ± 5.3 , which is an average indicator and speaks of a not vivid expression of the desire not to attract the attention of others to one’s figure and body. This pattern consists in avoiding cases of evaluating the figure by choosing loose clothing, eating restrictions, and can manifest itself in avoiding social contacts due to dissatisfaction with one’s appearance. According to the parameter “Violation of control during food intake,” the average value was 17.5 ± 4.5 , an average indicator indicating rare cases of loss of control during eating and accompanied by cleansing behavior. Such results are less pronounced in individuals with anorexia nervosa and are more common in individuals with bulimia nervosa. According to the parameter “Restrictive eating behavior, as a means of achieving the motive of affiliation” the average value was 24.3 ± 7 , which is an average indicator and suggests that weight loss is perceived as a factor necessary for realizing the need for communication, friendship, and love with other people. For the parameter “Emotional eating disorder” the average value was 35.9 ± 15 . There is a tendency to high severity. These results suggest that not all individuals with anorexia nervosa exhibit this pattern. The indicators suggest that food intake serves to change the emotional state. The above cognitive-behavioral patterns have moderate and high severity among individuals with anorexia nervosa.

An assessment of the severity of cognitive features in persons with bulimia nervosa was obtained. The results are displayed in Figure 2.

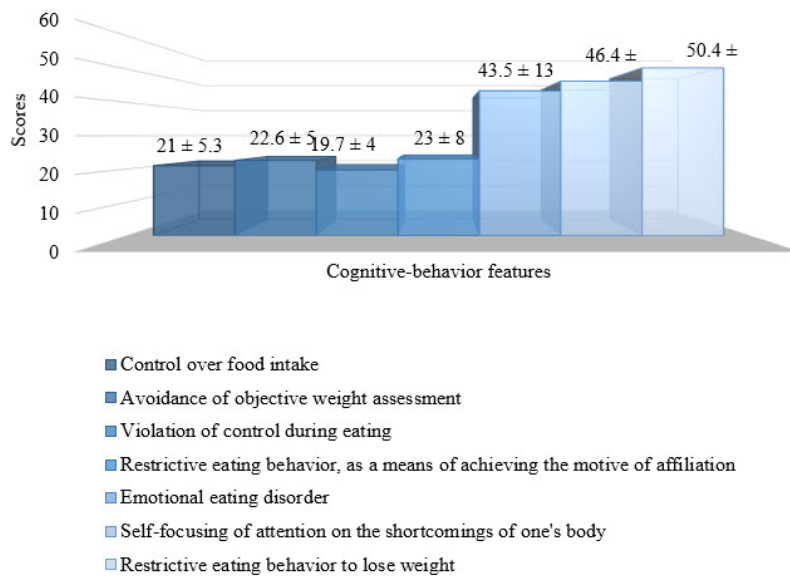


Figure 2. Mean values of the severity of cognitive features in persons with bulimia nervosa.

Based on the results presented in Figure 2, we can say that people with bulimia nervosa demonstrate a high severity of such cognitive features as: control over food intake, avoidance of objective weight assessment, impaired control during eating, emotional eating disorder, self-focusing on the deficiencies of their body, restrictive eating behavior to lose weight. According to the parameter "Control over food intake", the average value in persons with bulimia nervosa was 21 ± 5.3 , which is a high indicator and indicates the severity of the pattern, which manifests itself in increased self-control in the field of eating behavior, as well as in the establishment of rules and requirements for oneself, to your figure and body, the way you eat. According to the parameter "Avoidance of objective weight assessment", the average value was 22.6 ± 5 , which is a high indicator and indicates the presence of a desire not to draw the attention of others to their figure and body. This pattern can be expressed in avoiding cases of figure evaluation, by choosing loose clothing and eating restrictions, and avoiding social contacts due to dissatisfaction with their appearance. According to the parameter "Violation of control during food intake," the average value was 21 ± 5.3 , a high indicator indicating frequent loss of control during eating and accompanied by cleansing behavior. According to the parameter "Emotional eating disorder", the average value was 43.5 ± 13 , which is a high indicator and suggests that food intake is a way to change one's emotional state. According to the parameter "Self-focusing of attention on the shortcomings of one's body," the average value was 46.4 ± 6.7 , which is a high indicator and testifies to the expressed attention of respondents to their body and its "shortcomings". For the parameter "Restrictive eating behavior to lose weight," the average value was 50.4 ± 10.5 , which is a high indicator. For the parameter "Restrictive eating behavior as a means of achieving the motive of affiliation" the average value was 23 ± 8 , which is the average. To achieve acceptance by other people, respondents apply food restrictions by choosing low-calorie foods. For the parameter "Restrictive eating behavior for the purpose of losing weight" the average value was 50.4 ± 10.5 , which is a high indicator. For the parameter "Restrictive eating behavior as a means of achieving the motive of affiliation" the average value was 23 ± 8 , which is the average. Respondents apply food restrictions by choosing low-calorie foods to achieve acceptance by other people. For the parameter "Restrictive eating behavior lose weight," the average value was 50.4 ± 10.5 , which is a high indicator. For the parameter "Restrictive eating behavior as a means of achieving the motive of affiliation" the average value was 23 ± 8 , which is the average. Respondents apply food restrictions by choosing low-calorie foods to achieve acceptance by other people.

The data of a comparative analysis of the personal characteristics of individuals with eating disorders and individuals from the control group are given in Table 1.

Table 1

Comparative analysis of personality traits of individuals with eating disorders and individuals from the control group (Mann-Whitney U test)

| Personality traits | Sum of ranks in the eating disorder group | The sum of the ranks in the control group | U | Z | p-level |
|------------------------------------|---|---|-------|-------|---------|
| Low self-esteem - High self-esteem | 1477 | 2264 | 531 | -3.39 | 0.00 |
| Emotional instability | 1412 | 2328.5 | 466.5 | -3.95 | 0.00 |
| Emotional stability | 2137 | 1604 | 658 | 2.29 | 0.01 |
| Gullibility - Suspicion | 2130.5 | 1610.5 | 664.5 | 2.24 | 0.01 |
| Relaxation - Tension | 2395 | 1346 | 400 | 4.52 | 0.00 |

Analysis of the data presented in Table 1 allows us to speak of the presence of significantly significant differences between individuals with eating disorders and individuals from the control group in terms of individual psychological personality traits such as: self-esteem ($U=531$; $p<0.05$), emotional stability ($U=466$; $p<0.05$), gullibility ($U=658$; $p<0.05$), calmness ($U=664.5$; $p<0.05$), relaxation ($U= 400$; $p<0.05$).

Based on our results, we can say that people without eating disorders have significantly higher confidence, self-satisfaction, and emotional stability. Individuals with eating disorders are characterized by excitability, irritability, tension, and frustration. Thus, the most pronounced personality traits that distinguish people with eating disorders from healthy people are: anxiety, low self-esteem, emotional instability, caution and vigilance towards people, self-doubt, anxiety, irritability, frustration, and tendency to experience feelings of guilt.

Spearman's correlation analysis made it possible to determine the existence of a relationship between the clinical manifestations of eating disorders and cognitive characteristics in individuals with eating disorders. Correlation analysis revealed a moderate relationship between the indicators "Excessive concern about weight" and "Control over food intake" ($r=0.34$, at $p\leq 0.05$), "Episodes of overeating and cleansing behavior" and "Self-focusing on the shortcomings of one's body" ($r = 0.35$, at $p\leq 0.05$), "Excessive anxiety about weight" and "Impaired control during eating" ($r=0.36$, at $p\leq 0.05$), "Binge eating episodes and cleansing behavior" and "Violation of control during food intake" ($r=0.49$, at $p\leq 0.05$), "Excessive anxiety about weight" and "Restrictive eating behavior as a means of achieving an affiliation motive" ($r=0.35$, "Episodes of overeating and cleansing behavior" and "Avoidance of objective weight estimation" ($r=0.55$, at $p\leq 0.05$), "Dissatisfaction with the body" and "Violation of control during food intake" ($r=0.44$, at $p\leq 0.05$), "Episodes of overeating and cleansing behavior" and "Emotional eating disorder" ($r=0.65$, at $p\leq 0.05$), "Dissatisfaction with the body" and "Self-focusing on the shortcomings of one's body" ($r=0.47$, at $p\leq 0.05$).

Discussions

The study revealed significant differences in the severity of clinical signs of eating disorders between the group of individuals with anorexia nervosa and the group of individuals with bulimia nervosa in terms of the frequency of episodes of overeating and purging behavior. These results indicate that individuals with bulimia nervosa have a higher incidence of binge eating and cleansing behaviors. This result reflects the features of the clinical picture of the disorder, which includes alternating episodes of overeating and maladaptive compensatory behavior that occurs in response to a "breakdown" in eating. Our results do not contradict the previously obtained data described in works involving the study of bulimia nervosa (Benton and Karazsia, 2015; Moore et al., 2017; Herpertz et al., 2019).

During our study, it was found that for people with bulimia nervosa, compared with people with anorexia nervosa, a higher severity of the desire not to attract the attention of other people to their figure, a violation of control during meals in combination with episodes of overeating, a tendency to change your emotional state with the help of meals and increased attention to the imperfections of your body. The results obtained can be explained by the fact that the understanding of the loss of control over their eating behavior and the prognosis of the consequences (weight gain) in persons with bulimia nervosa are accompanied by the fear of negative assessment of their appearance by other people, as well as the fear of social interactions. In this case, emotional overeating attempts to cope with frightening social

assessment and “relaxation” from negative experiences. Thus, people with this disorder are characterized by an avoidant type of behavior, the desire to avoid condemnation due to existing social fear, and a high susceptibility to emotional overeating since this is a simple and safe way to get rid of tension and cope with stress.

Our work found that people with eating disorders are characterized by high seriousness of dysfunctional attitudes. Comparison with the control group showed a significant predominance of indicators in the group with different forms of eating disorders in comparison with healthy subjects. Thus, it can be concluded that individuals suffering from eating disorders are characterized by a high degree of cognitive biases, regardless of the form of the disease. Our results confirm the data available in the literature on inadequate perception of oneself and the surrounding reality in individuals with eating disorders (Sansone and Sansone, 2011; Hasan and Hasan, 2011; Dufresne et al., 2019).

In the study of personality traits, we found that individuals with bulimia nervosa had a statistically significantly higher severity of emotional instability and expressiveness than those with anorexia nervosa. The results can be explained by the fact that in bulimia nervosa, difficulties in the self-control of emotions and impulsive drives can contribute to the emergence of new bulimic episodes, while individuals with anorexia nervosa are characterized by pronounced sustained control over the amount of food consumed. Our results on a sample are consistent with the data that adolescent girls with bulimia nervosa are indicated by the presence of impulsivity and affective instability (Šobot and Markovic, 2010).

Comparative analysis of personal characteristics of individuals with eating disorders and individuals from the control group showed differences in emotional aspect. The personality traits of individuals with eating disorders include emotional instability (C-), suspicion (L +), anxiety (O +), tension (Q4 +), low self-esteem (MD-). The combination of personality factors O +, Q4 +, L + indicates a neurotic anxiety syndrome, focus on resolving internal conflicts. In the control group, personality traits included emotional stability (C +), gullibility (L-), calmness (O-), and adequate self-esteem (MD). Based on the results obtained, it can be concluded that the control group is characterized by a more “harmonious personality organization” than for persons with eating disorders.

Correlation analysis provided data on the correlations between the clinical manifestations of eating disorders and the cognitive characteristics of individuals with eating disorders. The data obtained indicate that the clinical signs of these disorders are reflected in specific cognitive and behavioral patterns. In individuals with anorexia nervosa, a positive correlation was found between excessive anxiety about weight and some cognitive features: control over food intake; restrictive eating behavior to lose weight. In addition, in individuals with this disorder, positive correlations were found between dissatisfaction with their bodies and such patterns as: avoidance of objective weight estimation, self-focusing of attention on the shortcomings of your body and disturbances in control during food intake. The study of correlations among people with bulimia nervosa revealed a positive relationship between excessive anxiety about weight and such cognitive features as: impaired control during meals; restrictive eating behavior. Similar results were found in individuals with anorexia nervosa, which ensures that the clinical picture of these eating disorders is similar. In addition, in individuals with bulimia nervosa, correlations were found between binge eating, purging, and weight avoidance, and emotional eating disorders. The obtained result suggests that episodes of overeating occur in response to emotional pain, reflecting the eating behavior’s reliance on the emotional state. Above results are consistent with data from other studies on the manifestations of eating disorders and their distinguishing features (Burton and Abbott, 2017).

In addition, positive correlations were found between interoceptive incompetence and insufficient control during meals in individuals with bulimia nervosa. Such results can be explained by the fact that during episodes of overeating, there is no feeling of satiety, the absorption of food continues until the onset of pain in the abdomen and shortness of breath. During episodes of binge eating, it is difficult for a person to identify a feeling of fullness. Our results are consistent with the previously obtained data of other authors (Laviano, Lazzaro and Koverech, 2018; Burton and Abbott, 2019).

Our correlation analysis of personality traits and dysfunctional attitudes in individuals with eating disorders showed that individuals with anorexia nervosa showed a positive correlation between timidity and such dysfunctional attitudes as: dichotomous thinking, overgeneralization, dependence of the state on other people. In addition, in persons with this disorder, positive correlations were found between anxiety and dichotomous thinking, overgeneralization. In the group of people with bulimia nervosa, a positive relationship was found between stress and catastrophizing, the condition’s dependent of the situation on other people. In summary, we can say that people with eating disorders tend to interpret their feelings in terms of defeat, failure, or loss of something important to their happiness or peace of mind. Our results do not contradict the previously obtained data from other authors (Hoseini, Dusti and Bagheri, 2016).

In our work, it was found that the cognitive characteristics characteristic of persons with conduct

disorders correlate with suspicion and anxiety. Similar results were also obtained in other works concerning the personality traits of people with eating disorders (Sanchez-Guarnido, Pino-Osuna and Herruzo-Cabrera, 2015; Izydorczyk and Sitnik-Warchulska, 2018).

In the group of people with bulimia nervosa, we found a positive relationship between emotional instability and interoceptive incompetence. It can be assumed that a person is under the influence of feelings, changeable, and easily upset due to pronounced emotional instability, which can contribute to episodes of overeating to get rid of emotional discomfort. During a bulimic episode, eating large amounts of food in a short period of time is accompanied by a loss of satiety.

Individuals with eating disorders have a high degree of cognitive biases, regardless of the form of the disease. Correlation research has shown that clinical signs of eating disorders are reflected in cognitive characteristics. It was found that individuals with eating disorders tend to interpret their feelings in terms of defeat, insufficiency, loss of something important for their happiness or peace of mind, with a tendency to overgeneralize the meaning of the loss.

Characteristic features of individuals with eating disorders are social maladjustment, avoidance of social experience, and rejection of interpersonal interactions (from casual, everyday interactions to friendship and intimate relationships). Thus, during our study, it was determined that such personal characteristics characterize individuals with eating disorders as anxiety, emotional instability, suspicion, and difficulties in social adaptation.

Conclusions

1. Personal characteristics of people with eating disorders who are users of social networks (members of the specialized group "In contact") have statistically significant differences from the control group. The characteristic personality traits for persons with eating disorders are emotional instability, anxiety, and suspicion, and for the control group, emotional stability, calmness, and gullibility.

2. Individuals with anorexia nervosa and bulimia nervosa have different cognitive characteristics. Individuals with bulimia nervosa, compared with individuals with anorexia nervosa, are characterized by a higher severity of avoidance of objective weight assessment, impaired control during meals, emotional eating disorders, and self-focusing of attention on the shortcomings of their body.

3. The cognitive characteristics of individuals with eating disorders are interrelated with their personality traits. In individuals with anorexia nervosa, a positive correlation was found between suspicion and impaired control during eating and a negative relationship between non-conformism and emotional eating disorder. In persons with bulimia nervosa, a positive correlation was found between suspicion and such cognitive features as: self-focusing of attention on the shortcomings of one's body; restrictive eating behavior to lose weight.

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Conflict of interests

The authors declare no conflict of interest.

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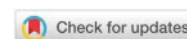
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Teaching ESP Online: A Guide to Innovation in the Aftermath of the Covid-19 Crisis

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Abstract: The paper studies the student experiences related to online teaching of English for Specific Purposes (ESP) in order to determine which computer-mediated learning practices were perceived as purposeful and should be incorporated in traditional in-person teaching. The sample comprised of 60 students from two faculties of the University of Belgrade, Serbia. Descriptive statistics were obtained. The gathered data were subjected to qualitative and quantitative data analysis. The results indicate that the positive experiences are related primarily to synchronous conferencing in the form of real-time written communication as an integral part of the classes offered via videoconferencing. The use of video content and availability of various learning materials uploaded to the learning platforms proved to be helpful. Loss of concentration, technical difficulties and a lack of in-person communication were perceived as obstacles to effective learning. The most salient conclusion of the study refers to the necessity of incorporating real-time comment writing in the traditional classroom. The results also urge the need for addressing the issues of large classes and inadequate auditoriums in the traditional mode of teaching. The conclusions provide the guidelines for the improvement of in-person teaching of ESP based on specific computer-mediated learning practices that were found facilitative of the development of the students' language competencies.

Keywords: online teaching, English for Specific Purposes, computer-mediated learning, synchronous conferencing, synchronous online teaching, teaching methods.

Introduction

The onset of the COVID-19 pandemic and the consequent declaration of a state of emergency in the Republic of Serbia in March 2020 shifted academic activities online. By the beginning of April 2022, the modes of both asynchronous and synchronous online teaching were introduced.

From the very beginning of the pandemic in March 2020 to the end of the spring term in June 2020, the University of Belgrade offered asynchronous online teaching using platforms such as Moodle, Zoom, and Google classroom. Online teaching has long since been introduced to higher education (Harasim et al., 1995; Hiltz 1986), yet the Covid-19 pandemic imposed an abrupt shift. The transition was to be prepared at very short notice, so it "is an important consideration when evaluating how the various challenges were met" (Forrester, 2020).

The students were provided with an online access to the selected learning materials, PPT presentations, additional literature, homework and tests. The main channel of student-teacher communication was e-mail. Homework was regularly assigned and submitted via Google classroom. Upon the assessment, the students were given a timely feedback. In the newly imposed circumstances, homework was a substitute for the mid-term tests, while the final exam was conducted exclusively as a written exam.

In difference to the spring term of 2020/21 being completely online, at the beginning of academic 2021/2022, there was a transition to synchronous online teaching. Depending on the epidemiological reports, online, combined, hybrid and traditional (face-to-face) modes of teaching alternated. The lectures were held in real time via online platforms, while the seminar classes were held in small groups at the faculty. During this period, it was possible to conduct the written mid-term assessments as well as the final oral exams in the format used prior to the pandemic.

During the Covid-19 pandemic, teaching English as a Foreign Language (EFL) and English for

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Specific Purposes (ESP) was to pursue yet another goal –adapting the entire teaching process to online mode as a stopgap solution. Compared to their counterparts, language teachers faced a considerable challenge as one of the primary goals of foreign language teaching is the achievement of communicative language competence. According to the Common European Framework of Reference for Language Learning, Teaching and Evaluation, communicative language competence includes linguistic, sociolinguistic and pragmatic competence. According to Byram (1997), language teaching has yet another goal - the acquisition of intercultural competence that facilitates understanding and communication in culturally diverse environments. The specificity of teaching ESP is that it “involves teaching the literacy skills which are appropriate to the purposes and understandings of particular communities” (Hyland, 2002). Its goals are partly socio-historical, legal and intercultural, and partly linguistic, i.e. lexical, grammatical, and logical-discursive (Dion 2007, pp. 183- 184, as cited in Vujović 2010, p. 208). Effective work on the attainment of these goals is additionally challenged in online teaching, prompting innovation and creative approaches.

Apart from the disciplinary specificity, teaching ESP does not neglect developing the productive skills – speaking and writing, as well as the receptive skills – reading and listening. In a digital learning environment, the development of speaking is facilitated merely via online speaking activities including participation in online class discussions. On the other hand, activities for the development of receptive skills, e.g. listening, might considerably diversify taking the advantage of the easily accessible Internet video segments from interviews, lectures, films, and educational video clips. In case of writing, computer-mediated learning provide the students with another form of written interaction with the teacher and classmates in real time through the comment section on the platform screen. Namely, the students are encouraged to send their written comments, which requires fast adjustment to tracking and comprehending multiple simultaneous threads. Also, there is the possibility of submitting homework assignments in writing via the platform. Synchronous online teaching also allows for student presentations to be held, individually and in groups. On the other hand, the digital environment is unfavourable for conducting activities such as work in pairs or work in small groups in real time.

Materials and Methods

The research was conducted in May 2022 and included 60 respondents, first-year students of the Faculty of Philosophy, and Faculty of Technology and Metallurgy of the University of Belgrade. The research was descriptive. The obtained data were subjected to qualitative and quantitative data analysis. A questionnaire was constructed as a measuring instrument consisting of 36 items, 24 closed-ended and 12 open-ended.

The research questions were grouped into three parts. The first part referred to the technical aspects of online teaching. The second part dealt with the psychological and pedagogical aspects, i.e. motivation, concentration, the ability to deal with the learning material, improvement of productive and receptive skills, and interaction with the teacher and classmates. The third part was related to determining the specific advantages and disadvantages of online ESP teaching from the students' perspective.

Results and Discussions

Firstly, the respondents' experiences of the technical aspects of online teaching were examined. The results indicate that as many as 76.3% of the respondents faced technical problems during synchronous online classes. In most cases the respondents mentioned the instability and quality of the Internet connection. On the other hand, the accessibility of virtual classrooms from any location was regarded as an advantage by 83.1% of the respondents. The respondents also expressed the need for lectures to be held in the morning, as they had been experiencing decreased concentration in the afternoon.

Another set of questions referred to the respondents' perception of online ESP courses. When it comes to student motivation, the results show that 54.2% of the respondents were motivated to attend online classes (Figure 1). However, the reasons given by the poorly motivated respondents were related to the lack of concentration and interaction. These respondents mentioned other potentially disruptive factors such as the presence and activities of their household members or the challenge of performing other activities during class time. The results also indicate that 59.3% of the respondents found it difficult to maintain concentration during synchronous online classes. The decline in concentration was most often affected by the people and things from the surroundings, as well as the possibility of browsing the Internet during class time. According to the results, the majority of the respondents (55.9%) resorted to this activity during online classes.

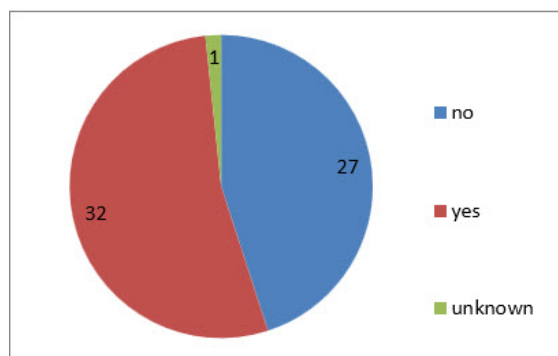


Figure 1. Number of the respondents motivated for attending online classes

When it comes to the types of devices used during online classes, the majority of the respondents (60%) opted for a laptop, while only 6 respondents (10%) used a desktop computer. Such results might be significant for the optimization of display formats of the learning materials (Figure 2).

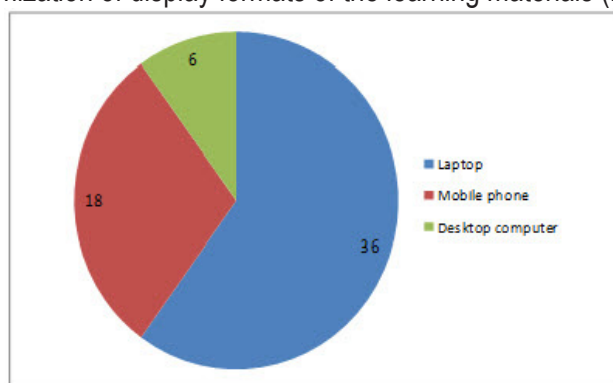


Figure 2. Device types used during online classes

On the other hand, the majority of the respondents (61%) stated that online teaching stimulates their motivation for active class participation. However, the reasons of the students (22) who were demotivated to participate in classes should be seriously taken into consideration. The principal objections were as follows:

"I'm less motivated to participate in online classes as there's no face-to-face contact";

"I can participate in completing exercises online, but I don't have enough confidence to join real-time discussions and express my opinion. It's very unusual to engage in class conversations without being able to see other participants";

"expressing my opinion in an online class makes me more uncomfortable than expressing it in person";

"the screen often freezes and the sound is not clear; overall, it's exhausting".

Regardless of the results that indicate that the respondents were not mainly discouraged to participate in various online class activities, the above mentioned comments clearly suggest that participation in synchronous online classes still poses a significant challenge for the students.

These answers correspond to the answers given to the question whether online teaching increased student interest in the ESP course. The majority of the respondents (52.5%) claimed that online teaching negatively affected interest in the course. The results indicate that the vast majority of the respondents still tried to attend online lectures, although a smaller percentage (15.3%) of the students stated that they joined online classes pro forma without actually following their content.

A large percentage (79.7%) of the respondents also claimed that online teaching had a positive effect on dealing with the learning materials. The difficulties that students experienced were mainly related to the lack of concentration and loss of focus.

The analysis indicates that peer communication and interaction during synchronous online classes was not satisfactory. Namely, 54.2% of the students stated that online teaching did not positively affect classroom interaction. On the other hand, the majority of the respondents (61%) claimed that peer collaboration in preparation of debates and presentations was facilitated online. Disagreeing comments emphasize the benefits of communication in person. The most common comment was:

“Communication in person is always better and more effective”.

Some comments such as *“I believe communication would be much better if it were in person, because facial expressions and gesticulation often have great persuasive power”* warn that the socio-pragmatic aspect of language teaching might be neglected in online classes.

When asked whether they had better collaboration with the teacher online, 52.5% of the respondents answered negatively, stating that there was no difference in student-teacher collaboration compared to the traditional mode of teaching. Typical comments highlighting the positive aspects of online collaboration with the teacher were as follows:

“I feel more comfortable to ask questions online”;

“The teacher can read or hear each student’s comment and everyone is given opportunity to participate, unlike in the massively attended in-person classes”;

“I can hear the teacher better online than in spacious classrooms”.

These comments clearly suggest that in-person teaching should seriously address the issue of teaching ESP to large classes and in inadequate classrooms. This problem constantly accompanies foreign language teaching, as the solution is left to teachers themselves and it remains so (Carbone, 1998; Cooper and Robinson, 2000).

One of the questions referred to the homework assignments which accounted for independent student work and were part of the overall grade. The students were obliged to submit their homework on schedule. This type of activity was positively assessed by a very high percentage of the respondents (91.5%). The students’ comments mostly emphasize the usefulness of such an assignment, but one comment drew attention to its misuse:

“the copies of homework are easily distributed among students; sometimes, a couple of students do their homework and share it”.

This comment suggests that homework assignments should be tailor-made for each student, which poses a great challenge for teachers teaching ESP to large classes.

The results indicate that the highest percentage of the respondents (95%) positively assessed the upload of the accompanying learning materials to the platform. This practice was not a novel one as it had been introduced long before the Covid-19 pandemic. Open-source learning platforms, such as Moodle have been used for posting PPT presentations, additional literature, and homework assignments. Uploading various learning materials has grown in importance, intensity and scope, particularly in asynchronous learning. Moreover, the use of instructor-generated video content in asynchronous online courses is found to favourably influence creating social and teaching presence, as well as student satisfaction (Lapadat, 2002).

The results of this study are in line with the above findings, indicating the importance of video content in synchronous online classes, as well. The majority of respondents (81.1%) were of the opinion that the use of various video materials such as excerpts from lectures, interviews and films, as well as educational video clips was purposeful.

The analysis of the results determines that the possibility of synchronous conferencing (Figure 3) in the form of writing comments in real time during class was of special importance for the development of writing skills. 71.2% of the respondents confirmed this. Synchronous conferencing was an adjunct to synchronous online classes, so a way should be found to enable this kind of the participants’ interaction in face-to-face classes. Apart from learning benefits, it might considerably increase the number of students participating in class activities. It also implies greater involvement on behalf of teachers and their ability to handle both oral and written student feedback.

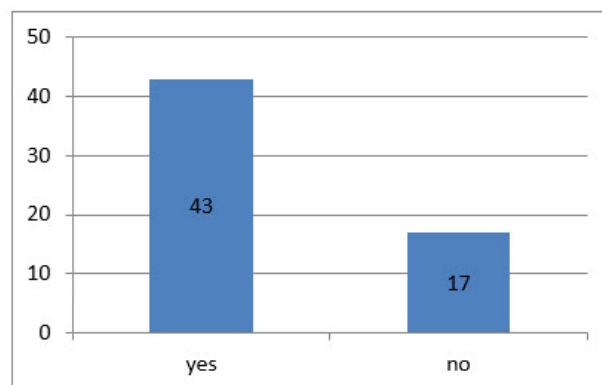


Figure 3. Number of the respondents who consider real time comment writing beneficial

Finally, the respondents were asked to list the specific advantages and disadvantages of online ESP, as well as newly introduced practices that should become an integral part of the future learning. As for the advantages, typical comments emphasized accessibility, saving time and the availability of learning materials on the platform. When it comes to the disadvantages, the respondents mentioned a lack of in-person communication, a lack of concentration and technical difficulties. According to the respondents, the practices that should be maintained include posting learning materials on platforms and homework assignments.

The research also examined the respondents' perception of the effectiveness of online ESP from the perspective of the development of their language skills (speaking, listening, reading and writing). The results (Figure 4) show that there was almost an equal percentage of the students who registered the improvement (50.8%) and of those who did not (49.2%). Such results imply that online ESP teaching was not perceived as purposeless, but it definitely failed to affect the respondents' perception of the enhancement of their language skills.

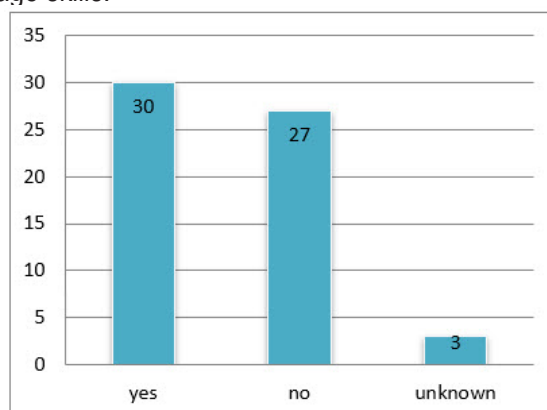


Figure 4. Perception of the effectiveness of online ESP

Conclusions

The paper has analysed the student experiences of computer-mediated learning of ESP, covering its technical, psychological and pedagogical aspects.

The most salient conclusion of the study refers to the necessity of incorporating real-time comment writing in the traditional classroom. As documented by the research, interactive online writing was perceived as beneficial. Lapadat (2002) further argues that it "provides the benefits of writing oneself into understanding, as well as a social milieu that elicits thoughtful contributions, and provides timely, contextually-appropriate feedback". Educators are faced with the challenge of incorporating this activity into the traditional mode of teaching relying on the latest technological developments.

Positive experiences from online ESP classes are also related to the availability of various learning materials uploaded to the learning platforms, and the use of video content. Posting course materials and the use of video clips in class had been practiced before the transition to online teaching due to the Covid-19 pandemic, but the results of this research strongly imply that such practices reached its full potential in virtual classroom. The conclusion is that the use of platforms and appropriate video materials are perceived as purposeful teaching aids for the optimization of students' learning and should be insisted upon.

The findings of this study indicate that the achievement of the goals of teaching ESP online is negatively affected by certain psychological factors such as loss of concentration. Technical difficulties and a lack of in-person communication may also pose serious obstacles.

The conclusions also highlight a need for addressing the issues of large classes and inadequate classrooms in the traditional mode of teaching. Regardless of the unfavourable technical aspects of online teaching, the respondents recognized the advantages of teaching small classes and good acoustics.

Computer-mediated ESP teaching, as documented by the study, is beneficial and student-friendly in terms of accessibility and convenience. However, it adversely affects in-person communication, which consequently results in neglecting the development of social, pragmatic and intercultural language competence. The conclusions we have reached can be the guidelines for reshaping teaching strategies and implementing new activities and approaches in ESP in the aftermath of the Covid-19 crisis.

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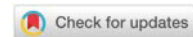
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Conflict of interests

The author declares no conflict of interest.

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Internet Addiction Disorder (IAD) as a Consequence of the Expansion of Information Technologies

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Abstract: Internet addiction disorder (IAD) is a global topic that increasingly attracts the attention of the wider public. The purpose of this paper is to research the current situation in the prevalence of both Internet addiction and problematic Internet use, which is the most common precursor to developing psychological disorders related to the relationship to the Internet and its elements. The initial hypotheses of this paper are that the Internet addiction disorder is more widespread and harmful than can be deduced from the attitude of society and health authorities towards it and that it calls for renewed theoretical and empirical research, which is the attitude shared by the scientific community. The results that we stated in the paper clearly show numerous mental and physical deficiencies and problems that are experimentally proven and presented in the paper. As a recommendation, we would point to increasing awareness of the dangers of excessive and problematic use of the Internet, offering healthy alternatives, promoting the culture of safe use of the Internet, as well as educating individuals on other self-control mechanisms. Attention should be constantly paid to dangers that realistically exist, and it should be permanently worked on this aspect of mental health of individuals, nations, and the global society.

Keywords: Internet addiction disorder, digital violence, the Internet, information technologies, digital expansion.

Introduction

In recent decades, the Internet has become an integral part of the lives of most of the world's inhabitants. Today, every active person has the hardware that allows a permanent connection to the world wide web where they can communicate or work, educate or entertain themselves, or simply search for the necessary information. The Internet is inseparable from contemporary man in the contemporary world. "The Internet is of great benefit to humanity as an inexhaustible source of information, an affordable way to acquire skills and knowledge, as an indispensable assistant in work and business, as a means of spending and planning free time, as a meeting place and a way to be and stay in touch with whoever they want. The Internet makes it easier to choose and buy the necessary goods and services and allows one to save on their purchases" (Kont, 2017). The emergence and widespread use of the Internet has opened up a whole range of new degrees of freedom that did not exist before: now, having overcome space and time, it turns into an important participant in various processes, from observing events taking place thousands of kilometers from its location, to expressing indignation to unfamiliar participants in the interaction (Bovina and Dvoryanchikov, 2020a).

In other words, the fourth industrial revolution promoted the Internet and ICT and their necessary use in the way of life of the inhabitants of the planet. Media literacy and media competence represent important features in the process of self-realization of an individual in the modern media society. However, when defining the dimensions of the media competencies of the teaching staff, it is necessary to take into account the accelerated scientific and technological development, as well as the specific individual and social needs associated with it (Maksimović, Osmanović and Mamutović, 2020). The application of ICT itself is gaining momentum in the educational process. The development and application of new technologies are growing as a measure of whether teachers are trained for their advantages and

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disadvantages. The application of ICT in education has become an integral part of the teaching and learning process. Full implementation of information technology requires fundamental changes in the informatical sphere of teacher education, and teachers' acquisition of digital competencies becomes the precondition for successful execution of educational tasks (Maksimović and Dimić, 2016). Their multifunctional manifestations reveal a whole hierarchy of codes that function in a singular and public consciousness as one. However, relevant questions remain: "Do teachers have the ability to use educational technology and are the school sufficiently equipped with all modern technical means?" (Stošić and Stošić, 2015; Stošić, 2015). The results of one research show that teachers are trained to use innovations in teaching but are not sufficiently trained to implement the Internet in the classroom (Stošić, 2015).

However, just as "yin" has "yang", just as good has evil, so does the light, at times the bright side of the Internet has its dark opposite, sometimes difficult and destructive state of addiction with numerous harmful manifestations and implications. Internet addiction has been declared a serious disease in some places and put in line with the already known destructive types of addiction, addiction to the use of tobacco, alcohol, opiates, and gambling. New times and accelerated scientific and technological development, especially in digital engineering, have led the scientific community to question the impact of addiction to virtual products such as film, television and video games on the mental and physical health of not only users but of society as a whole. The fundamental difference in relation to the classic forms of addiction (drugs, alcoholism, tobacco) is reflected in the fact that in the case of addiction to virtual contents, we do not take any ingredients into the body, by using technical means we achieve a certain degree of satisfaction and excitement that triggers biochemical mechanisms in the brain like those when chemicals are introduced into the body. This type of addiction does not create a physiological dependence, as with the use of drugs, tobacco, or alcohol, but only a psychological one, although we should pay attention to scientific views that prove that every psycho-stimulation ends in chemical reactions in the brain.

From the second half of the 1990s until today, researchers have been examining the influence of the Internet on social relations, life habits, and the personality of users. New communication technologies open up the widest possibilities for the individual to construct and manage an identity, to present it as they wish (Дворянчиков и Бовина, 2022, 54). The Internet is presented as important for strengthening existing stable social ties, strengthening social activities, identity formation, personality development, and the like. On the other hand, the Internet is blamed for developing superficial, weak relationships with acquaintances (instead of the previously nurtured stable, strong ties with relatives, and friends), social isolation, loneliness, depression, criminal behavior, and more (Kovačević-Lepojević, 2011). Many studies have analyzed demographic, socioeconomic, and other habits as reasons for early Internet addiction, emphasizing the importance of a multidisciplinary approach in the treatment of Internet addiction, and some studies study the predisposing factors for the emergence of Internet addiction (Dimitrijević, 2007). The goal of this paper is to investigate the current situation in terms of the prevalence of both Internet addiction and problematic use of the Internet, which is the most common precursor to the creation of psychological disorders related to the Internet and its elements. The data that we will present in this paper is the result of the empirical research of the author, about which we will write in more detail later. The initial hypotheses of this paper are that the disorder of Internet addiction is more widespread and harmful than can be deduced from the attitude of society and health authorities towards it, and that it deserves repeated theoretical and empirical research, which is the position shared by the scientific community, as evidenced by numerous studies, the oldest of which we will present in this paper from 2000, and that the approach to this problem must be multidisciplinary because the manifestations of this problem are multiple and diverse - from problematic Internet use in general, through problematic the use of social media, online video games, all the way to the manifestation of various paraphilias and other forms of deviant and destructive behavior that have just found a new, unlimited polygon on the Internet with numerous benefits for antisocial and antisocial behavior.

Correlation of expansion of information technologies and the IAD

The term "internet addiction" was first used by American psychiatrist Ivan Goldberg in 1995 (Basu and Dalal, 2016). The term very quickly became generally accepted and introduced into psychiatric practice, although there were objections that Goldberg introduced it into science as a kind of assumption or even a joke. Gradually, more scientists became involved in researching the phenomenon of problematic Internet use and its implications, despite never reaching a scientific consensus whether it can be classified as an addiction disorder. If so, then why is Internet addiction a problem for man and society? Psychologists have been warning about the dangers for years and comparing the phenomenon of Internet addiction with the hitherto dominant forms of addiction to gambling, alcohol, and drugs. Ongoing research on Internet addiction shows that "long and uncontrolled stays in the network cause changes in

the state of consciousness and functioning of the brain. Gradually, this leads to a loss of learning ability and deep thinking” (Kont, 2017). Nicolas Carr, an American scientist and publicist, an expert in the field of management and transmission of information, came, together with a group of psychologists, to the indicative conclusion (Carr, 2010), that regular multi-hour stay on the Internet leads to the human brain eventually losing the ability to think deeply, turning regular network users into people who may have a problem with concentration and the ability to do deep intellectual work (Carr, 2010).

The scientific community believes that disruption of thought processes and memory impairment is not the only negative effect of the Internet on humans. By staying in the virtual world for a long time, a person gradually loses the skills necessary for normal, real communication with people, which often leads to a certain alienation and asocial disorder. Instead of social life, people start texting, liking attitudes on social media statuses, chatting on Skype, and sending e-mails, instead of buying goods in regular stores, buying by ordering them through specialized services without leaving home.

The problem of Internet dependence threatens to turn all the benefits offered by the Internet, which are rightly classified as fundamental values of civilization, into a problem with their long-term and non-selective abuse. Thus, difficulties in communicating with new people begin to appear, and entering an unknown society for an Internet addict becomes a stressful situation. A person shuts himself in, which affects work or study, and has problems sleeping and eating. Some unhealthy attachments to information technology even led to suicide (Kont, 2017).

If steps are not taken to bring Internet addiction under some control, the progress of addiction can cause disruption of family relationships with broader socio-psychological implications. Internet addiction could become a problem in modern society.

Although the warnings of scientists and the professional public seem too dystopian, this may not be the case. The Center for Technological Management of the Faculty of Organizational Sciences in Belgrade, referring to the World Economic Forum, reported that by 2025 it is expected that (Ukropina, 2019):

- With a probability of 91.2%, ten (10) percent of the world’s population will wear clothes with an internet connection;
- With a probability of 91%, ninety (90) percent of the world’s population will have unlimited and free internet access;
- With a probability of 84.1%, the first car will be produced using a 3D printer;
- With a probability of 81.7%, the first smartphone that can be implanted in the human body will be available for purchase;
- With a probability of 84.4%, 80% of the world’s population will have a digital presence on social media.

At the center and essence of the problem is the Manichean nature of man and all things and phenomena on Earth, which, as we have already stated, makes the Internet get its negative sides, and that, in addition to immeasurable benefits can cause enormous damage (Bjelajac and Filipović, 2020). Potential negative things in the case of the Internet are exacerbated by the fact that it is still a young technology, although generations have already arrived for whom the Internet has been an integral part of their entire lives. In previous technological inventions that changed the way society functioned, new inventions reached users who were not prepared or ready for them relatively slowly. But in this case, with the combined rapid development of nanotechnology and consequently various other branches of the information and communication hardware and software industry, the possibility of unlimited Internet use has reached the hands of people who did not originally intend to use the Internet when buying, say, a mobile phone. The novelty and innovation of the Internet have led to the spread of cybercrime, which has found very fertile ground on the Internet, full of users who approach the Internet, and everything on it, in a confusingly naive way. Cybercrime is a big problem for countries and businesses, so in 2001 the European Commission adopted the European Convention on Cybercrime, which recognizes four basic forms of crime that are categorized as cybercrime: actions against the confidentiality, integrity, and availability of computer data and systems; hardware-related activities - where counterfeiting and theft are most common; content-related activities - mostly child pornography; and actions related to copyright and intellectual property infringement (Bjelajac and Filipović, 2019). A question that may be of interest to researchers of both the human psyche and security culture is why people have a far greater degree of trust in content and people they know and meet online than in the same real-world situations. More broadly, it is precisely in this specific relationship with digital online content that the elements that are factors in the genesis of digital addiction are found.

IT development as a risk factor for the development of the IAD

Although there are opinions (Wallace, 2015) that the Internet itself is an aggressively addictive environment, the prevailing opinion in science is that the Internet itself is a neutral environment that a priori does not provoke addiction (Young, 1998). However, the Internet has specific properties that, in the case of users, provoke inappropriate behavior on the Internet. In this regard, Kimberly Young draws attention to the characteristics of cyberspace such as anonymity, usability (convenience), and escapism (Young, 1998). "Among the specific characteristics of cyberspace that make the Internet desirable for use, researchers state easy availability, security, ease of use, the ability to maintain control over their own actions and the consequences of decisions, the ability to experience strong emotions from the results of their own actions. Continuity of the Internet (24 hours a day, non-stop mode), stimulating role contained in a huge amount of information and their intensity, the possibility of disinhibition and increase of intimacy are important for creating Internet addiction" (Greenfield and Sutker, 1999).

When we talk about risk factors that can determine a person's propensity to become more or less addicted in cases of equal exposure to the agent, we are talking about two types of risks: biological risks and risks to family and family relationships (Мальгин et al., 2011).

General biological risk factors include prenatal, perinatal, and postnatal hazards that contribute to the development of organic inferiority of brain structures (Мальгин et al., 2011). "Hereditary factors are also important for the development of addiction as a basis for the formation of temperament and characterological personality traits. The fact is that the organic inferiority of the central nervous system can be the basis of infantilism, emotional-volitional instability, and personal aggression, it contributes to the formation of the risk of addictive behavior" (Мальгин et al., 2011). The burden of hereditary factors, especially in the field of mental disorders, also carries additional risk factors. In numerous studies on behavioral addictions, special importance is given to various cerebral diseases, brain injuries and other damage to the central nervous system as factors that contribute to the weakening of inhibitory processes with the development of hyperexcitability and rigidity of mental processes. A neuropsychological study of adolescents addicted to the Internet revealed diffuse disorders of regulatory functions, which reflects the functional weakness of the frontal lobes, which is manifested by difficulties in mastering motor programs; the inertia of mental processes, disorders in the dynamics of the flow of intellectual activity (Мальгин et al., 2011).

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common disorders of the central nervous system. One study (Yoo et al., 2004), in which 535 students participated (mean age 11.1 years), found that "students diagnosed with Internet addiction had significantly higher rates of inattention, hyperactivity, and impulsive behavior (as reported by parents and teachers) compared to the group in which no signs of Internet addiction were identified. Lack of self-control can cause adolescents to have difficulty controlling Internet use. As a result, it was concluded that they are at a higher risk of developing dependence on computers, which increases with the interaction of their weaknesses with the peculiarities of working on the Internet".

Due to the influence of family factors on the formation of Internet addiction, a relatively small number of papers have been dedicated. It was found that the low level of family functioning positively corrects with Internet addiction in adolescence (Петракова, 1995), as well as surfactant addiction (Hops et al., 1990). It has been found that in families with a high number of conflicts there is a reduced level of child-parent interaction, leading to child alienation and reduced parental control, which is often a predisposing factor for adolescent Internet addiction (Arv et al., 1999; see also Петракова, 1995).

Problematic Internet use or pathological Internet use is generally defined as problematic, compulsive Internet use, which leads to significant impairment of an individual's function in various life domains over a long period of time. Young people are particularly at risk of developing Internet addiction disorders (Tomczyk and Solecki, 2019; Tomczyk et al., 2021; Tomczyk, Szyszka and Stošić, 2020), with case studies highlighting students whose academic success declines as they spend more and more time online. Some also suffer health consequences due to sleep loss (Tereshchenko et al., 2021), because they stay awake later and later to chat online, check status updates on social networks or reach the next levels of the game (Wallace, 2014). Similar problems arise with the use of smartphones and the consequences on cognitive abilities (Mascia et al., 2022). There are also significant negative moderating effects of smartphone addiction on the relationship between self-regulation and well-being (Mascia, Agus and Penna, 2020). Abuse of Internet technologies results in a number of changes in the subject of interaction itself, including a lack of effort that leads to a lack of arbitrary regulation. As a result, there are violations associated with difficulties in initiating and planning activities, with the implementation of the control function, with infantilization (Bovina and Dvoryanchikov, 2020b). There is certainly a need for preventive measures against cyberbullying and just informing students about the socio-cognitive

components that are increased with aggressive behavior (Mascia et al., 2021).

Leading American Internet addiction researcher Kimberly Young identifies the following types of Internet addiction (Young, 2004):

1. Computer addiction - attachment to any type of computer activity that occurs against the will of an individual. First of all, it is related to the attachment to online games, with which addicts try to fill the empty space that has formed in their lives or simply to get rid of boredom. In addition, in virtual games, it is easier to achieve superiority over others without spending the effort required in real life.

2. Addiction to internet navigation - a relentless desire to search for information on sites. In another way, it is called obsessive surfing the Internet, which means indiscriminate search for information, deprived of any purpose and meaning. One wanders around websites, social networks, reads articles, notes, comments on them one by one, and endlessly follows links (Young and De Abreu, 2010). As a result, it leads to a loss of productivity and information overload.

3. Pathological attachment to online auctions, gambling or e-shopping. According to the problem of gambling addiction on the Internet of the American Psychological Association, this addiction depends on people much more than casinos or ordinary slot machines.

4. Cyber-communication addiction - dependence on communication in social networks, chats and online games for multiple players, which leads to the replacement of real relationships with virtual ones.

5. Cybersex addiction - the urge to visit pornographic sites or talk about sexual issues in closed groups or chat rooms. According to experts, many couples divorce or are on the verge of divorce due to the tendency of one of the spouses to satisfy their sexual needs via the Internet (Young, 2008). The English *The Daily Mail* published a study stating that online pornography created a younger generation that could not engage during normal sexual contact. The result of the study was the conclusion that impotence is getting younger and that it is no longer a problem only for middle-aged and older men (Ministry of Truth, 2013).

Digital violence - between the virtual and the real

Digital violence has its ontological roots and origins in violence in general, so digital violence in its being does not differ at all from general violence as a characteristic of the human race (Bjelajac and Filipović, 2021). The mere question or dilemma of whether digital violence is virtual or real in practice does not make much sense. This is so, starting from one definition (Russell, 1982) of evil, which says that evil is considered to be the intentional infliction of pain on a conscious being who is able to feel pain. And since digital violence is always directed at a conscious being, and that is without a doubt only man on Earth, it does not matter whether violence is applied directly, tête-à-tête, or information and communication technologies (ICT) are used for violence. In other words, like classic violence, digital violence is always real. The victims, without exception, feel it unmistakably. In addition to being real and painful, digital violence has some other characteristics that make it more dangerous and painful than conventional violence.

In the conventional form of violence, it has a physical reality where evil occurs, the abuser is often known so the victim can seek help, can identify the perpetrator, and report them to the authorities. In virtual violence, the attack cannot happen physically because it is in virtual and not real physical space, but physical manifestations of evil appear regularly. Young people are particularly exposed to digital violence because they tend to be constantly connected to the Internet, where the number of possible abusers is much higher. The abuser can hide behind anonymity indefinitely, so he does not need physical superiority over the victim, and the victim is generally unable to seek help, nor can he hide from the perpetrator, when he cannot regularly identify what creates a *circulum vitiosum* in which the victim is nowhere to be found safe from virtual violence (Križić, 2017).

Although the intention of digital abusers is to inflict pain on the victim, some research shows that there are differences in the type of pain that is most often inflicted on the victim depending on the sex of the victim. If violence is used against men, it is most often a threat, and for women it is insults, mockery, calling ugly names or spreading gossip about the victim. Boys are more likely to be victims of virtual abuse, while girls are more likely to be exposed to virtual violence. In research on gender differences in exposure to and susceptibility to virtual violence, men are more often involved in virtual violence than women (Križić, 2017).

According to a report by the European Women's Lobby (HerNetRights, 2017), digital violence is often portrayed as gender-neutral in the media and awareness-raising campaigns. Apart from multiple factors that influence the occurrence of violence, the picture is gained that digital violence is neutral in the sense that it affects Internet users in the same way, regardless of their gender. While it is true that both women and men report exposure to violence, the data indicate that women and girls, unlike men, are

the most common victims of online violence. They suffer the most drastic forms of violence and are most affected by the consequences of this type of violence.

Worldwide, women are 27 times more likely to be victims of online violence. In addition to the disproportionate risk for women and men between the ages of 18 and 24 to be exposed to online violence, women are in the majority when it comes to victims of the most drastic forms of violence, such as persecution and sexual harassment. Also, the data indicate that women and girls are the main victims of the so-called "revenge" pornography that was created without the consent of all parties involved.

In addition to women and girls in general, women who express their views on the Internet (representatives of academia, politicians, women in high positions), as well as activists of organizations advocating for gender equality and women's rights are particularly exposed to digital violence.

The report indicates that online violence can be divided into two groups: verbal violence, which includes sexism and hate speech, blackmail, death threats, rape, torture; and graphic violence, which includes photographing and posting photographs without consent, threats of graphic means, and retaliation by publishing pornographic content.

The need for more thorough research on the occurrence of violence against women and girls is indicated by the data that 9 million girls in Europe had some form of digital violence by the age of 15. One in five teenagers in Europe falls victim to cyberbullying, with girls at higher risk and in 2014 87% of reported child sexual abuse photos were pictures of girls (Ileš, M., n.d.).

Results and Discussion

Although global health authorities have not included Internet Addiction Disorder (IAD) on the list of psychological disorders due to a lack of scientific consensus on whether IAD is a separate psychological disorder or a manifestation of other psychological disorders that are exacerbated or manifested on the Internet, this problem has been the subject of scientific interest for more than 20 years. The foundations of the scientific study of this phenomenon were laid by the already mentioned Kimberly Young, and on the basis of her theoretical postulates a methodology was built that is almost as a rule used in empirical research related to IAD. The oldest empirical research cited in this paper was conducted by Morahan-Martin and Schumacher in 2000 in the United States. Their research included 277 students. The diagnostic instrument, meaning the method, was a diagnostic scale of 13 questions, which included questions that were not directly related to the use of the Internet but corresponded to the psychological picture and condition of the respondents (personal problems, life function, problem response mechanisms). Finally, by interpreting the results obtained, Morahan-Martin and Schumacher came to the conclusion that 8.1% of all respondents can identify as Internet addicts (Morahan-Martin and Schumacher, 2000). A few years later, during 2004, four interesting studies of this phenomenon were published in different parts of the world. Leung conducted his research in Hong Kong, on a sample of 629 respondents aged 16 to 24, using a telephone interview method where the criteria were owning a home computer and accessing the Internet. Leung used the Kimberly Young list of eight criteria, where every respondent who was found to have at least five criteria was considered an Internet addict. Using this methodology, Leung concluded that 37.9% of all respondents could be categorized as Internet addicts (Leung, 2004). In the same year, in South Korea, a group of researchers led by H. J. Yoo conducted a study on a sample of 535 students with an average age of 11 years. Using Kimberly Young criteria, the researchers compiled a scoring scale, and depending on the answers, they assigned a certain number of points to the subjects that were collected. The thresholds set by these researchers were 80 points for the IAD, and respondents with a score between 50-79 were categorized as problematic Internet users. The results obtained show that IAD was detected in 0.9% of all respondents, while 14% of all respondents were classified as problematic Internet users (Yoo et al., 2004). The following year, 2005, another study was conducted in South Korea. A group of researchers led by K. Kim included a sample of 1,573 students aged 15 to 16, and using a variation of the Kimberly Young test with a score scale on which a score greater than 70 points indicated Internet addiction, it concluded that 1,6% of respondents were diagnosed as addicts, while 37.9% showed a predisposition to IAD (Kim et al., 2006). When we compare these two studies and take into account the time flow of one year between them, we can conclude that even with a small flow of time which practically means higher internet prevalence, and a slightly older group of respondents, we come to almost twice the prevalence of this disorder and almost three times higher propensity for IAD and what is particularly worrying, the respondents in both studies were primary and secondary school students, meaning children and adolescents. In 2004, two interesting research were published in geographically close areas that are both anthropologically and culturally close. In Norway, Johansson and Gotestam conducted a randomized

sample of 3,237 minors aged 12 to 18, using the Kimberley Young diagnostic criteria, where the presence of five of the eight criteria indicated the presence of Internet addiction. The result obtained by Johansson and Gotestam was that 1.98% of respondents could be classified as Internet addicts, of which 2.42% were male and 1.51% female (Johansson and Gotestam, 2004). In the same year in Finland, Kaltiala-Heino, Lintonen and Rimpelä, (2004) conducted a survey that was part of a national project, on a sample of 7229 minors. The diagnostic instrument was the adapted criteria for pathological gambling listed in the DSM-IV, where addiction was diagnosed in the presence of four of the seven criteria. The results showed that 1.7% of boys and 1.4% of girls can be categorized as Internet addicts.

As we can see by comparing the results of these studies, the prevalence is very similar and differs in decimal parts, while both studies indicate that males are more prone to developing Internet addiction disorders, which is an interesting topic for future research. A study published in the United States in 2006 is interesting because it approached the problem from the aspect of lack of impulse control. In that sense, the questions from the questionnaire for this telephone survey, which included 2513 adult respondents, were extrapolated from the already established diagnostic criteria for impulse control disorders, obsessive-compulsive disorder and substance abuse, to arrive at four diagnostic sets. The results indicated a 0.7% prevalence of problem Internet use, with the proviso that this study does not answer the question of whether problem Internet use is a separate disorder or a symptom of other psychopathologies (Aboujaoude et al., 2006). At the end of this review of global research, we list a study conducted in 2008 in Iran. In this study, 1968 high-school students were selected randomly through clustering, who responded to the Persian version of four measures: the Internet Addiction Test (IAT), UCLA Loneliness Scale, Rosenberg Self-Esteem Scale, and Matson Evaluation of Social Skills. Of the sample, 977 students were Internet users, who were classified into 37 Internet addicts, 304 possible Internet addicts, and 636 moderate users (Ghassemzadeh, Shahraray and Moradi, 2008). This research is particularly interesting because it also included respondents who do not use the Internet, because less than half of the total number of respondents used the Internet. When we translate these results into percentages, we come to the data that 3.78% of respondents who use the Internet are classified as Internet addicts, and that 31.1% of them are potential addicts. When we include respondents who do not use the Internet, then the prevalence is lower and amounts to 1.88% of people diagnosed with IAD in the total population of the Islamic Republic of Iran.

All this research provides an interesting historical context. Carried out in the period from 2000 to 2008, they firstly show that the problem of potential Internet addiction was scientifically approached at a time when the Internet was in the early stages of its development when it was immeasurably less accessible and widespread. On the other hand, similar results obtained in this research show that the development of a certain country and its technological capacities do not have a dominant influence on the prevalence and potential for developing Internet addiction disorders, or, to a lesser extent, problematic Internet use. However, the current phase of Internet development and proliferation, especially since mobile phones or other portable electronic devices such as tablets have become the primary means of accessing the Internet and its contents, should significantly increase the amount of time spent online in more ways than one. In the first place, ease of access and permanent connection to the Internet, and then the diversification of services and content that can be found on the Internet have brought a huge change compared to the time when the Internet was accessed from a fixed position in the household, usually desktop or laptop computers.

The research that will be presented below was performed by the authors of this paper for the second edition of the monograph "Bezbednosna kultura – umeće življenja" ("Security Culture – Art of Living") by Željko Bjelajac, which is being prepared and not yet published, and which is expected to be published in 2023. The research was conducted in the period from September 10th, 2021 to December 25th, 2021, in Belgrade, Novi Sad, Subotica, Niš, and Kragujevac. The research was conducted by the authors and associates. The type and size of the sample was a random, representative sample of 1,020 respondents of different ages and occupations, which is the frame of the sample. Sampling was performed by random sampling. The selection of respondents was done by random sampling on the day of the survey. The research technique was face-to-face, while the research instrument was a questionnaire representing the Internet addiction test by Kimberly Young. The questionnaire consisted of 20 questions, to which the respondents answered on a scale from 0 to 5, where 0 meant that the question was not applicable, 1 - rarely, 2 - occasionally, 3 - often, 4 - most often, and 5 - always. In accordance with the obtained answers, a cumulative scale was formed for each respondent, with a possible sum of points from 0-100. The score thresholds used to determine Internet addiction were 50-79 for problematic Internet use with a predisposition to addiction, while respondents who scored 80 or more were classified as Internet addicts. Respondents can be divided into four groups according to age or occupation: primary school students

(12-15 years), 221 or 21.7%, high school students (16-19 years), 284 or 27.8%, students (20-25 years), 199 or 19.5%, and employed persons (26-40 years), 316 or 31% of the total number of respondents. There were 492 or 48.2% male, and 528 or 51.8% female respondents.

By age groups, the gender structure was as follows: primary school children - 108 boys (48.9%) and 113 girls (51.1%), high school students - 136 boys (47.9%) and 148 girls (52.1%), students - 97 boys (48.7%) and 102 girls (51.3%), and employees - 151 men (47.8%) and 165 women (52.2%). The percentage representation by age categories is similar to the representation in the total sample. The obtained summary results were divided into four groups according to the total test result. A score of less than 20 was interpreted as the absence of an indicator of Internet dependence, results between 21 and 49 represent a low level of dependence, scores of 50-79 represent moderate to high levels of addiction, while scores higher than 80 represent the presence of strong Internet addiction, i.e., people who can be said to suffer from Internet addiction disorder (IAD). Of the total number of respondents, the score between 0-20 on the IAT scale had 241 respondents or 23.6%; a score between 21 and 49 had 406 respondents or 39.8%; 348 respondents, i.e., 34.1%, had a score between 50 and 79, while 25 respondents, i.e., 2.5%, had a score of over 80 points on the IAT scale. As for the thresholds we set, it should be noted that there are other studies that use the same methodology and which set the threshold for strong Internet addiction at 70 points, but we have taken the position that raising the threshold to 80 eliminates borderline cases and tightens the criteria by which we classify respondents as addicts in the interest of determining the prevalence of Internet addiction disorders and eliminating borderline cases in the final results.

Number of points on the IAT test

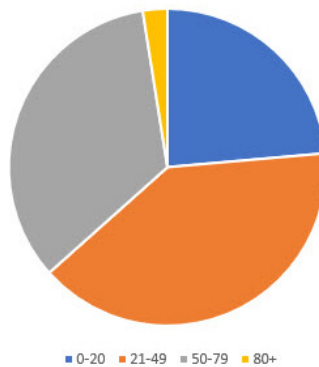


Figure 1. Survey results by the total number of points on the IAT test

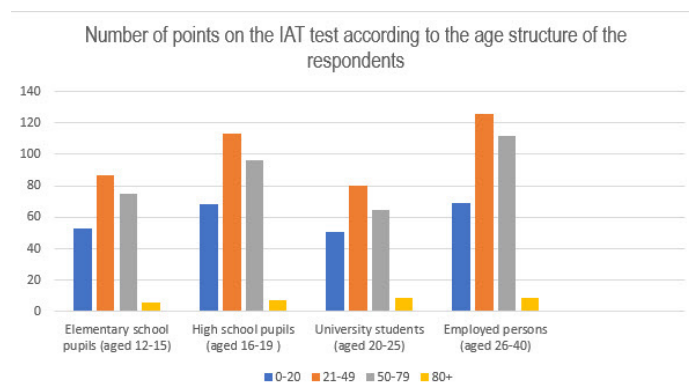


Figure 2. The results of the research presented according to the age structure of the respondents

Figure 1 shows the percentage share of four determined categories of results for the total sample of 1020 respondents, while Figure 2 shows the distribution of four determined categories of results differentiated by age group in total numbers.

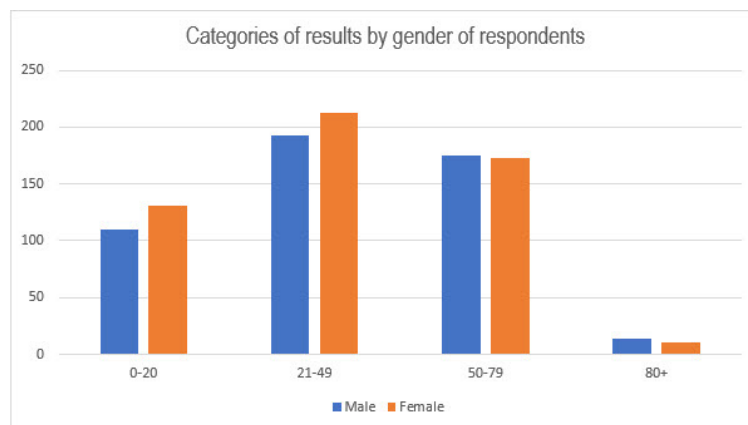


Figure 3. Distribution of result categories by gender of respondents

Figure 3 shows the distribution of categories of results in total numbers according to the gender of the respondents. In total, in the category of results from 0-20 points on the IAT scale, we have 110 male and 131 female respondents, in the category of 21-49 points we have 193 male and 213 female respondents, and in the category of 50-79 points, we have 175 male respondents and 173 females, while in the category of 80 and more points on the IAT scale we have 14 male and 11 female respondents. What is interesting is that as the total number of points among individual respondents grows, we notice a turnover in the gender structure, so from the ratio of 48.2% -51.8% in the total sample in the category of 50-79 points we have slightly more male respondents, while in the category over 80 points we have a distribution of 56% -44% in favor of male respondents. Similar trends have been observed in research by other researchers. The question that remains unanswered is why males are more prone to developing internet addiction. However, we can state that males are generally more prone to developing addictive relationships in classic addiction diseases, such as alcoholism, drug addiction, or gambling, and the results of various studies of these disorders show this. What is certainly a cause for concern is that the prevalence of Internet addiction disorders is 2.5% according to the results of our research, which would mean that there are more than 150,000 people suffering from this disorder in a country the size of Serbia, if we apply that percentage to the total residents of the Republic of Serbia. What is even more worrying is the fact that over 34% of respondents fall into the category of moderate to high Internet addiction (50-79 points on the IAT test). Similar data were obtained from a survey conducted in Croatia in 2019 (Černja, Vejmelka and Rajter, 2019), with a slightly different methodology and scoring thresholds. The comparability of these data with data from our research, as well as data from research conducted in other countries, indicates a general trend in which one-third of the population has at least moderate Internet dependence, which is an alarming fact and a potentially great challenge for public health, with a possible domino effect on other segments of life in society.

Conclusions

We have already stated that there is no consensus in the scientific community as to whether Internet addiction disorder is a separate psychological disorder or a symptom of some other comorbidity, nor whether it should be categorized as an impulse disorder or addiction disease. What is interesting is that science recognizes the disorder of online video game play, but the Internet addiction disorder, which should be the umbrella disorder for everything that contains the word "online", is still waiting to be included in medical theory and practice. However, regardless of different points of view and classifications, the problem of excessive or problematic use of the Internet exists, and its prevalence is not negligible. The research we presented in this paper, compared to the results of other research we included in the text, indicates a problem that has been present for more than 20 years, and with technological development and immeasurably greater availability and prevalence of the Internet, the problem can only get bigger. We should not ignore the fact that the new generation of the Internet has opened the space for the manifestation of other disorders that existed before, but gained momentum and new ways of expression on the Internet, such as various paraphilias and other psychosexual disorders, so that Internet addiction disorder should definitely be considered an umbrella disorder under which there are other disorders related either directly to the Internet, or which use the Internet to gain new ways of manifesting and satisfying

the impulses that arise from them. Physical and psychosomatic problems and disorders resulting from excessive internet use should not be neglected, especially when it comes to children and people with development. What must first be recommended are broad social activities to raise awareness of the dangers of excessive and problematic Internet use, offering healthy alternatives, promoting a culture of safe Internet use, and other self-control measures to educate individuals. The Internet will develop and expand even more, and although life without it is unthinkable today, the situation will be even more intense with further technological development and the influence of the Internet in additional pores of social and individual life, and this should be accepted in the best spirit as progress. But what must not be neglected, excluding any kind of moral panic that is not useful, is that we must constantly point out the dangers that really exist, and work permanently on this aspect of mental health of individuals, nations, and global society.

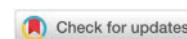
Conflict of interests

The authors declare no conflict of interest.

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Transgressive Core of Multi-Modal Education

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Abstract: The development of Man as a social being is often underscored by his interaction with his boundary/boundaries, and the opportunities for reaching, overcoming, or shifting them. The challenges facing modern education, as well as the ever-increasing requirements for the training of pedagogical specialists, define the need for the construction of transgressive models for growth design and development of various competences of pre-service teachers. In this context, the concept of transgression receives additional connotations that orient it in the direction of the design of a multimodal environment as early as the stage of preschool education in order to achieve the idea of the "transgressive person", constantly pushing the boundaries of their knowledge to facilitate personal development. The present article outlines the methodological parameters of the environment for multimodal preschool education as well as its potential and transgressive nature.

Keywords: transgressive education, multimodal educational environment, preschool age.

Introduction

The idea of transgressive education reaches out to an increasing number of people, insofar as it puts to the test the possibility for each participant in the educational process to reach a point where he must either choose the routine or the risk to venture into the unknown in their thinking and behavior.

The term transgressive is used in different contexts of understanding and functions in the structures of different scientific fields. It is included in a scientific mode in geology, biology, climatology and other scientific fields, and for the humanities it was adapted by the Polish psychologist J. Koziellecki, creator of the new tendency in psychology: psychotransregionalism (Koziellecki, 1987).

For J. Koziellecki, man is an expansive individual who deliberately transcends their boundaries in order to become what they can and, often, must be. According to him, the main generator and catalyst of human development (social, cultural, civilizational) is crossing material, social and symbolic boundaries (Koziellecki, 2002). A. Maslow's understanding of overcoming one's own limitations as a form of satisfying the need for self-realization is associated with the idea of the transgressive personality (Maslow, 1986).

Analyzing the "transgressive concept of man" (Koziellecki, 1987; Koziellecki, 2001; Koziellecki, 2002), developed by J. Koziellecki (Koziellecki, 1987, Koziellecki, 2001, Koziellecki, 2002), as an object of consideration, T. Szczerska (2014) brings to the fore the understanding of the person as a free and creative being who is able to take actions that allow him to transcend material and immaterial boundaries. According to the author, "creators of transgressive activities show personality predispositions in the following areas: originality, sensitivity, independence and flexibility of thinking. This type of human activity, also known as action from "without", is activated by the "can", "want" motivation and is in opposition to defensive (conservative) actions" (Szczerska, 2014).

According to T. Szczerska (2014), focusing on "virtual transgression" (suggested to accompany human existence at its earliest stages), as possibly located on the border of four worlds, the following types of transgression are deduced: "towards oneself", "towards others", "towards things", "towards symbols" (Koziellecki, 2001). The process of overstepping boundaries or expanding the edges of human environment does not necessarily imply that one belongs to any of these worlds. According to the author, "the human need to create a virtual world has deep roots in the psyche", and "Man - Homo transgressivus" creates a real and a virtual world, changing the environment of his material and immaterial existence,

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and this revolutionary and dynamic development of “virtual transgression” in time is a consequence and continuation of historically realized activities.

T. Szczerska (2014) presents a comprehensive view of the evolution of transgressive behavior from prehistoric human existence to the creation of artificial intelligence and virtual spaces. At the heart of her ideas lies perspective that “virtual transgression occurs as a result of the creation of artificial worlds, which is possible thanks to knowledge of the real world, in the course of which the creator consciously initiates the process of interaction between the two worlds, balancing between the real and the artificially created reality by relating these processes to the specific human motivation to take action ‘beyond’ (the human need to create a virtual world has deep roots in the psyche) its realistic possibilities, which is actually a manifestation of man’s tendency to confirm his importance”. For the author, “like risky activities, transgressive activities are also the most complex operations of the human mind and are largely related to the subjectively expected benefit - a strategy also known as the strategy of expectation” (Szczerska, 2014), giving rise to motivational stimuli that actually trace the path of transgressive behavior.

The characteristics of transgressive education are recognizable and we can point to some of them as dominant:

- The ethics of transgressive education is based on a “philosophy of care” that balances the desire for expansion with empathy;
- Transgressive education is a form of manifestation of transformative education;
- Transgressive education deals with forms of resilience characterized by a specific fuzziness;
- Transgressive education as a methodology is normative and related to an “ecology of knowledge”;
- Transgressive methods in education are reflexive and performative in nature (Macintyre and Chaves, 2017).

In a broad educational context, there are several possibilities for the application of the transgressive approach where at least two opposite or even similar phenomena, processes or factors are available, but which nevertheless imply the presence of a choice. In this case, we can talk about educational transgression in the presence of: (1) transgression of goal-setting and goal-setting in formal, non-formal and informal education; (2) transgression of cognitive, social, and cultural knowledge; (3) transgression of global and local knowledge; (4) transgression of instructional content; (5) transgression of theoretical and applied knowledge; (6) vertical and horizontal transgression of communication in learning communities; (7) transgression of the educational environment.

The understanding that “the limits of our language do not define the limits of our knowledge” (Eisner, 2003:1) is in accord with the futuristic goals of any educational institution, as well as with the philosophy of a transgressive educational space, guaranteeing a continuous shift of cognitive boundaries.

It is the insight, the awareness of these relations that conceptualizes the idea of a multimodal educational environment in the kindergarten. Its organization obeys the urgent need for pedagogical interaction not to remain in the inertia (routine, stereotype) of their traditional functionality, since it is unthinkable to achieve a perspective for children without realizing transformative education.

Preschool education for multimodal literacy

Pre-school age is a period marked by the child’s continuous strife for individualization and, at the same time, is accompanied by continuous comparison with others in the process of joint activity and relationships with them. The child organizes their relations through the act of social transaction (agreement and mutual concessions), which determines the need for the educational environment in the kindergarten to assist in strengthening one’s own resources and developing the child’s inherent potential, including the cognitive capacity.

In this regard, the child’s development is not the result of the action of individual factors, but is a consequence of their interaction, that is, the determination of changes in ontogenesis, the driving force of which is the interaction between the subject and the living environment, is determined by the dialectical relationship of the intrapsychic (organic) and external (set by the social and educational environment) factors.

Evolved concepts and approaches to modern education and the technology-enriched environment determine the need to search for opportunities for continuous activation of subjects. In preschool education, this search is aimed at overcoming fragmentation, lack of imagination through environment design, guaranteeing multidimensionality, dynamics, multilevel and effective transformation in the course of multimodal education fulfilled in experience.

In the context of preschool education, the manipulation of signs, their multiplication, is the basis of children’s endless presentations and representations.

Their transformation into game, verbal, pictorial, musical, constructive activities is traditionally

analyzed as personal indicators of the level of functional development of the child at preschool age.

Concerning these activities, however, it is important to emphasize that they actually have the character of semiotic resources, since they mediate the clarification of meanings and the achievement of understanding in the process of interactions with peers and adults. At the same time, we cannot ignore the fact that these semiotic resources, as well as their transfer in various contexts of meaning (family, social, educational), reflect the sociocultural dimensions of individual development. Precisely because of their cultural belonging, as well as because of their inherent individuality, the potential of these semiotic resources should be considered a process of continuous construction and reconstruction of personal identity at preschool age in which the transfer of knowledge and skills takes place.

The application of a multimodal approach in pedagogical interaction in kindergarten takes into account the diversity of sociocultural models and the corresponding ways of communication by identifying “the components that are prioritized in the idea of the new educational paradigm with their dichotomous conditioning: reproducibility – proactivity, personalization – dialogue, individualization – differentiation” (Dyankova, 2018: 3).

Recognizing the special importance of the sociocultural context in which the child grows and develops (the child’s personal microclimate), the teacher supports the “welded experience” of expression and develops, enriches, builds on it by using multiple semiotic resources to clarify meanings and their continuous representation, transformation and presentation.

Multimodality and multimodal environment – contexts of understanding

Theoretical studies of multimodality as analytical discourse are a relatively new direction in scientific research. In terms of content, multimodality refers to the influence of the aggregate application of different modes in the expression of meaning in the process of communication. The functioning of different semiotic resources or modes in oral, written, visual or auditory communicative events, as well as the immensity of variations in their combination, reveals the essence of multimodality as a phenomenon of communication. In fact, multimodality is that specific entity of communication which significantly facilitates and aids understanding. As a structure-determining component, multimodality has been manifested since the very beginning of communication, but its role for sociocultural interactions is becoming increasingly visible and more and more tangible with the unprecedented increase in information exchange in the conditions of the postmodern world.

Thus, regardless the “multimodality” goes back to the beginning of the evolutionary development of civilization, it is the explosion of discoveries (in the 60s-70s of the previous century) in the field of information and communication techniques and technologies that unlocks the increased interest in it. It is the changing immensity of the communicative composition in the real and virtual media environment that is the center where more and more disciplinary areas intersect, investigating the manifestations of multimodality in the constructions of social realities.

Clarifying questions about the multimodal composition of the message, too often in their studies, researchers use the terms “carrier” of information and “mode” of information rather indiscriminately. Along with the accepted and widely established synonymous use of these terms, given their similar content, contemporary research on multimodality is also characterized by a tendency towards a decentralized understanding of the concepts of “carrier” and “mode” of information. Tracing the cultural history of human civilization underscores the dynamics accompanying human progress both in terms of the content of information and in terms of the improvement of its carriers. Introduced in the second half of the last century, high information technologies have a decisive impact on culture, evidence of which is the fact that the society during this cultural-historical period openly began to call itself an “information society” or legitimized itself as a “society - carrier of information culture”. In principle, information removes or reduces the unknown, the indeterminacy. Of and in itself, the information content is a function of the state of the recipient, that is, it is a variable, because it is quite possible for the same message to different recipients to contain much, less or no information.

The cited finding reveals the importance of modes as an organizing principle of communication. Günther Kress defines the term mode in two directions: (1) first, as “a socially and culturally shaped resource of meaning: image, writing, layout, speech, moving images are examples of different modes” (Kress, 2010: 79); (2) second, “semiotic modes are similarly shaped both by the inherent characteristics and potentials of the environment and by the demands, histories and values of societies and their cultures” (Kress and Leeuwen, 1996: 35).

In the context of social semiotics, it becomes clear that each mode possesses multiple modal resources. Decomposing, for example, writing as monomodal allows one to distinguish individual modal resources (syntactic, lexical, graphic), each of which is charged with different potentials and limitations

for signifying meaning in communicative practice, whose meaning components are also “instrumental in associating the inner world of the mind and ideas with the outer world of the body and its interactions and reactions to outside stimuli” (Levunlieva 2012: 175).

Noting that “the mode points to the material resources shaped in the often long histories of social endeavours”, Gunther Kress emphasizes its importance and highlights its predication on history and culture (Kress, 2010: 114). At the same time, the author points out the mutual dependence between the modes that shape the systems and the influence of the systems themselves on the formation of the modes. This interdependence is manifested with particular force with the advancement of information and communication techniques and technologies, where it becomes possible to combine resources in multimodal entities.

Focusing on the now-established concept of “visual rhetoric” refers to the various scholarly practices exploring the generation and comprehension of meaning in multimodal entities. Their theoretical basis is Halliday’s formulation, according to which the meaning presented in a combination of written speech and images functions at three meta-levels: ideal, interpersonal and textual (Halliday, 1978).

The semiotic analysis created by Halliday is applied to the study of visual art (O’Toole, 1994), but later Kress and van Leeuwen highlight the resources of visual texts in the direction of: (1) presenting the discourse (creating an image of objects, phenomena, events, relationships); (2) setting the communicative positions (presentation of author/producer and addressee/audience); (3) creating sharedness (internalizing meanings according to their informational structure and degree of credibility/authenticity) (Kress and van Leeuwen, 1996).

The applied value of the semiotic analysis of visual art (visual rhetoric) is also reflected in the testing and documentation of its effectiveness on multimodal resources: (1) of speech, sound and music (van Leeuwen, 1999); (2) of gesture and movement (Martinec, 2000); (3) of color (Kress and van Leeuwen, 2002); (4) of the moving image – kineikonic (Burn, 2013; Burn and Parker, 2003); (5) of web content (Herring, 2009) and layout (Kress, 2010).

For the user of the semiotic approach, it is clear that they must make sense of the essential belonging of ideas and their “expressors” (the variety of communicative modes), accept or reject the order (the meaning they refer to) and the discourse they impose. New information technologies construct a new level in the organization of communication.

The diverse communicative modes and their potential resources together make up the “fragments” of reality, but design manages to select the adequate conceptual means to shape a complete message.

In itself, the design “says and shows”, but the meaning potential of what is shown has another explicit form and points to another dimension, different from what is said.

Design materializes discourse as a supralinguistic structure – the multimodal unfolding of meaning realizes the constitutive functionality of meaning.

Each research discourse requires a specific research approach and inventory. In summary, the content and form of multimodal texts/contents reflects their transformative role in the context of social interactions in the direction of: (1) multi-layered insertion (introduction) and transmission of meaning; (2) objectification of the potentials of the modes of communication in the implicitly contained contexts; (3) personification of ideas as a result of the dynamics in the cultural conditions, but also from the readings and interpretations of the semiotic discourse.

The distinction between functional, structural, and systemic communication analysis approaches is becoming more and more relative (Genova, 2019: 154). The starting points in their representative nature are based on the internal functional organization of the message.

The distribution of individual resources in the multimodal text and the mutual tensions between them turn visual communication into a unified mechanism: at certain points in the use of design (whether perceived or created) it is possible for one or the other communicative mode to temporarily dominate, but it is not possible to ignore the contextual information of the other mode(s).

While multimodal interaction analysis examines the convergence (density, integrity) of organically connected interactants through their self-determined contextual information and their aesthetically structured charge (O’Halloran, 2011; Norris 2004), in semiotic terms, critical multimodal discourse analysis is concerned not so much with the structure of one or another resource but with its social (pragmatic) functioning in the general system of codes and meanings.

Methodologically, research in the field of multimodality (O’Halloran and Smith, 2011; O’Halloran, 2011; Jewitt 2013) claims that: (1) all communication is multimodal; (2) multi-modal studies should not be focused solely on language; (3) each mode with its inherent modal resources has a specific added value that is subordinate to and satisfies specific communicative requirements; (4) the combination of modes is a purposeful phenomenon, organizing their reinforcing function in the act of communication and playing a

key role in the exchange of information.

Thus, the generalized methodological reflections on multimodality represent communication as a process of integration and hierarchical correlation of multiple modes, all of which are socially developed as resources of meaning and therefore, understanding. Research on the multimodal nature of language has mainly focused on the accompanying role of additional modes in the process of verbal and non-verbal communication, whose repertoire – consciously or unconsciously – creates a specific linguistic world.

While the initial studies of multimodality are concentrated solely on the use of language in its oral and written form, in the last two decades this limited focus has expanded and, by conquering new areas, has created new contexts in its unprecedented manifestation.

Studies that analyze multimodality in the relation social-communicative-cognitive enhance the delicacy of analysis, to include the perspective of digital technologies. As a result, a large-scale potential and a horizon for further development of multimodality in social, cultural and educational contexts emerge before the research quests.

Digital technologies boost the multimodal approach to scientific knowledge, which not only enhances the transfer among scientific traditions, but also converges theoretical and methodological platforms to interpret the processes of internalization of meanings, values and meanings in modern society. The age of digital technologies presents multimodality as “the normal state of human communication” (Kress, 2010: 18). This finding is also supported by John A. Bateman’s thesis that today “the text is only one strand in a complex presentational form that seamlessly incorporates a visual aspect ‘around’ and sometimes even instead of the text itself” (Bateman, 2008: 41). This is due to the common purpose served by the two aspects in the message - the verbal and the visual, as their functional role is aimed at the potential “to create and maintain social relations and ... both language and image are socially constructed means of conveying meaning” (Genova, 2019: 154).

Multimodal text modifies the meaning of words by using them in a new context—audio, visual, digital, or a combination of these. Bezemer and Kress (Bezemer and Kress, 2008) point out as an advantage the concrete character of information perception when the message is composed in multiple communicative modes, that is, the cases in which the sign format is supplemented by sound or image as a secondary mode of communication. Their perception is realized through dialectical interpenetration and complex interrelationships.

Presenting the features of human communication in a semiotic context, Halliday, M. (1978) was the first to consider the role of communication modes other than oral and written speech. Kress and van Leeuwen (2001) extend the research scope to an analysis of all resources to represent aspects of multimodality.

By discussing the meaning potentials of modal resources in transmitted messages, the authors clarify the relationship between the potential of communication modes and the social aspects of design in making sense of the text (Bateman and Schmidt 2011). What the sign can potentially convey in different representations or materials builds accessibility into the potential of communicative modes. Both the ways of expressing knowledge and the limited possibilities of the communicative mode relate to its potential – that is, to its accessibility. The shift of meaning from one communicative environment to another (recontextualization) helps specify, conceptualize and redefine the semiotic repertoire of the perceiver and creates new needs and value systems inspired by the multimodal text, which not only engages multiple channels of information perception, but activates different spheres of the individual’s inner world which are required for its processing and its adequate comprehension.

The combination of modes, their parallel “weaving” in the generation of meaning-enriched expressiveness is an indicator of the dynamic structure of multimodality. This gives grounds to define it as determinant of the socio-cultural levels in which societies, communities and individuals articulate relations, values and ideologies in a certain order. The assertion of multimodality as a “determinant of sociocultural levels” has its logic and acceleration, due to the growing contexts of understanding, and the analysis of its functionality highlights the capacity that multimodality has as a phenomenon of communication in the information society. In practice, in every cultural and historical era, the socially accepted methods of transferring, processing and storing information reflect the constitution and evolution of multi-modality in the course of human civilization.

Continuing the view that in the new civilization bits (a unit of information) replace atoms (a unit of matter) as the primary attribute of human interactions, it can be said that in the digital age multimodality is in control, but also leaves the door open for its violation, given the fuzzy boundaries within which people, groups, and communities function.

The preeminently interactive character in the comprehension of the multimodal content radically changes the differentiation of roles and positions in their classical setting “source of information - perceiver

of information". In fact, the optimal relevance between subjects in the information exchange, as well as the precise selection of the modes and their modal potentials, are the factors determining the limits of this role designation. The symmetrical synchronization in this interaction is also emphasized by D. Anderson who announces the emerging communicative role "prosumer" ("prosumers = producers & consumers") in the creation of multimodal texts, which denotes a simultaneous identification of producers/creators/authors ("producers") and users/consumers in the process of coding, transfer and recoding of multimodal designs (Anderson, 2003).

That is, in order to be adequate to the conditions in the multimodal environment, a heuristically oriented consciousness is expected and required from the modern person, which creates and processes information meaningfully, generates, induces meanings or rejects them.

The analytical interpretation of the phenomenon under investigation confirms the understanding that due to the gradual mastering of the known, but also due to the rapid encounters with the unknown - (with the continuous sophistication of information technologies), in the new age, multimodality is situated as an object of study in the field of multiple scientific studies, which adds relevance to its interdisciplinary significance.

Transgressive core of the multimodal educational environment in kindergarten

The conceptualization of the idea of a multimodal educational environment presupposes the necessary conditions for dialogue and personalization of the pedagogical interaction in the kindergarten. In operational terms, the multimodal educational environment is "oriented towards the technological integration of the following mental functions of 3-7-year-old children: identification, testing, expression" (Dermendzhieva, Tasevska and Dyankova, 2022: 56). In fact, it is a predictor of the full development of children's potential in the context of the transgressive perspective towards the active inclusion of competent application of multiple literacies in the knowledge society.

Considered as a complex of purposeful actions, the design of a multimodal educational environment in kindergarten synthesizes the statements in the sociocultural theory of development (Vygotsky and Cole, 1978; Rogoff, Matusova and White, 1998), in the socio-semiotic theory (Kress, 1997) and in the concept of multiliteracy pedagogy by operationalizing their potential in the context of transgressive education:

- the sociocultural theory asserts the idea that (1) social interactions play a major role in the formation of knowledge and understanding and that (2) learning is an active process of communication with others, that is, children construct their understanding of language in the context of family, community and institutional belonging;

- according to the tenets of social semiotics (1) children use diverse modes of expression and (2) those who employ similar forms of communicative modes interact effectively and strengthen their sense of community, that is, children know how to connect with each other, not only conveying messages through signs and symbols, but also generate (specify) meanings in the form of speech, rhythm, movement, image, music and visual arts;

- the pedagogy of multiliteracy suggests the idea that (1) the educational institution should expand its inclusive function towards the diverse ways of expression, according to their cultural, communicative, linguistic, artistic and technological aspect and that (2) pedagogical interaction should focus on the different modes of meaning creation and the ways in which meaning can be represented in communicative events, that is, the pedagogy of multiliteracy reflects the dynamics in the development of information and communication technologies and their impact on communication in the modern world.

Bearing in mind that each new concept is based on efficient-proven approaches, the operationalization of the transgressive potential of the multimodal educational environment in kindergarten relies on the synergy between:

a) established approaches in pedagogical theory and practice:

- the activity-and-communication approach, which is built around the understanding that the realization of a given activity is mediated by communication allowing meanings and implications in the pedagogical interaction to be clarified;

- the holistic approach that focuses on the development of the individual as a whole; based on playing games, creativity, imagination and exploiting the potential of the arts (dance, music, visual arts, theater, performance, etc.); primary importance is given to the experience of the child as a whole;

- the multi-cultural approach that takes into account cultural dynamics and aims at developing an understanding of and respect for cultural similarities and differences; the approach is oriented towards the symbolic image – cultural image link based on the experiences in intercultural dialogue and also towards the development of sensitivity to the specifics of a multicultural environment;

- the constructivist approach which is based on the concept that knowledge originates and is

constructed within social interactions in the educational environment (sharing, comparison, debating) and thus creates conditions for the subjects to build knowledge together by clarifying their own meanings and helping others to clarify theirs;

b) specific approaches for multi-modal design of the educational environment:

- the "100 languages" approach to children (known as the Reggio Emilia approach) is based on the assumption that children can express themselves in "100 languages" (speech, facial expressions, gesture, narrative/story, movement, dance, image, music etc.). When encouraged to use all these 'languages', they share with the community in the kindergarten what they have learned and why it is important to them; the approach emphasizes the development of imagination by providing a variety of opportunities for the child's creative self-expression; children's way of thinking is considered a value that requires special attention from the adult (parent/teacher);

- the Funds of knowledge approach prioritizes the importance of the social context in which the child grows and develops; the understanding that the cultural and family practices reflected in the child's everyday experience provide a valuable resource and a rich linguistic and cultural repertoire that the teacher should be aware of, use, develop and build on;

- the VARK-approach differentiates the subjects in the pedagogical interaction with respect to their leading style in learning and cognition (visual, auditory, reading/writing, and kinesthetic);

- the multi-sensory approach and its main advantages are related to engaging students (in both real and digital educational environments) by creating conditions for simultaneous processing, transformation and use of information based on the activation of different sensory systems in the process of cognition.

- The transgressive potential of the presented approaches impresses to a particularly high degree the concept of a multi-modal environment in the kindergarten and is of crucial importance for the development of transgressive behavior.

In order to meet the expectations of a digital society, "the modernization of education is imperative in the development of people's talent and potential and so is the acquisition of digital skills" ([European Commission, 2021](#)). In the context of the emphasized dynamics, the grounds for a new outlook on the pedagogical practice can be seen as well as those for reflexivity towards the challenges facing the organization of the educational environment in the kindergarten. The forecast for the future is becoming increasingly unpredictable and the life and career conditions in which today's children will realize their potential becomes increasingly difficult to define. Transformative education requires a multi-modal approach in the development of the ability for in-depth "understanding/interpretation", for conscious application of the "communication/internalization" dialogue in view of the transgressive perspective of the active individual who transforms the environment and himself. The individual is an active agent who the capacity to think and act transgressively, to focus on change and development.

A multi-modal learning environment: (1) is comprehensive in its use of visual, audio and kinesthetic modalities-both verbal and non-verbal, including videos, images, movement, real-life examples, and hands-on activities; (2) promotes two-way communication and puts the active participation of the child at the center of the pedagogical interaction, thus, operationalizing the subject principle; (3) provides quality experiences and balanced opportunities for the child to develop and learn by integrating all areas of development in the course of everyday communication and activities (play, study, work) within the context of a digital age to support the emerging needs of each child and to enhance their personal sense of well-being; (4) ensures the delivery of content from all educational streams through the synergistic inclusion of visual elements, sounds and other components (various modality resources) to enrich the child's perception and support the semiotic funds of knowledge which determine the creation of a universal design for preschool learning and a presentation of the educational content in a cognitively accessible manner for every child; (5) includes in its organization dynamic tasks that result in the child's qualitative experiences to create the basis of metacognitive development; such tasks are crucial for the development of the child's abilities to act strategically in future situations as well as to have the freedom to express his/her understanding about concepts, objects, phenomena from the social context in a unique way based on his/her own experience and creativity.

Conclusions

The multimodal educational environment in the kindergarten is based on the organization of inter-subject, multimodal processes of meaning, which create conditions for learning through quality experiences and relationships.

The development of multiple literacies relies on children's experiences in play, verbal performance,

visual, musical, constructive activities, whose dynamic, creative nature favors the specific educational context for multimodal interaction built on design and redesign techniques, skills for construction and deconstruction, for recontextualization in the compositional construction of multimodal messages (verbal, non-verbal, audio-visual, motor, etc.).

In the spontaneous expression and impulsive expressiveness inherent to preschool age, children not only assert themselves, but also continue to learn about the world, to make sense of the relationships that structure it, to experiment with their own resources for coping with everyday tasks, to discuss ideas, make choices, make decisions by applying the acquired knowledge in relevant communicative and cognitive modes.

Psychologically, the organization of pedagogical interaction in a multimodal educational environment stimulates not only the conscious, but also the subconscious layers of the child's psyche and presupposes motivation for a communication process managed by the multimodal ensemble used by the teacher.

In the information (network) society, multimodal communication functions as a meta-platform with limitless educational potential, especially now that: „[s]piritual spaces have been replaced by the rhythms of technology and telecommunication. A virtual reality has been created and technologies have revolutionized culture“ (Penev, 2021: 115). The harnessing of its pragmatic and applied ubiquity should be oriented in the following two directions:

First: Effective application in the learning process - organization of a multimodal educational environment as a requirement for the professional qualification and competence of pedagogical specialists.

Second: Adaptation of curricula and resources to transgressive 21-st century skills related to complex problem solving, creativity, critical thinking, collaboration and digital literacy, that is, to the development of multimodal literacy in adolescents.

The goal-orientation to these two areas is in line with the trend towards modifications of education systems, as skill requirements are changing at an accelerating pace – especially in the IT field. These productions provoke a revision (re-revision) of pedagogical interactions in the kindergarten as an environment that is to develop and build on not only the experience of “living with others” in the context of the personal perspective, but also the activity of constantly shifting the cognitive boundaries. Therefore, there is a real, significant and open to research field situated on the boundary between the processes of socialization and transgressive education and their crucial importance for child development and their preparation to live in the information society.

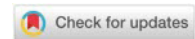
Conflict of interests

The authors declare no conflict of interest.

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Quasi-Experimental Research as An Epistemological-Methodological Approach in Education Research

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Abstract: Pedagogy as a social-humanistic science that deals with upbringing and education expresses its complexity through a plurality of ideas, understandings and opportunities for studying, learning and researching educational practice. The methodology dealt with by experimental and quasi-experimental pedagogy is exact and serves to establish reliable data, i.e., it searches for facts and evidence that can replace research hypotheses. A synonym for quasi-experimental pedagogy is “new pedagogy” because the evaluation of research quality in educational practice can be defined through the methodological basis of research, originality, novelty and significance. The question arises: how many quasi-experiments have been conducted so far that researchers are not even aware of, that is, they have not called this type of research by its real name? The main goal of theoretical research is to analyze the crucial differences between non-experimental, experimental and quasi-experimental research. From the presented goal of the research arises the research task which is reflected in seeking to affirm quasi-experimental research in pedagogy with the aim of bringing closer to the scientific public the characteristics and advantages of quasi-experiments in terms of streamlining implementation and practicality in the natural school environment. The paper uses the theoretical analysis method with the content analysis technique. The authors presented conclusions about the importance of quasi-experimental research as a special epistemological-methodological approach in determining the causality of educational phenomena.

Keywords: quasi-experimental pedagogy, causality, epistemological-methodological approaches, methodology of pedagogy, research plurality.

Introduction

Ontology, epistemology, and methodology are essential segments of every branch of science, including pedagogy. Because of them, it is possible to determine the criteria for the systematization of scientific knowledge and to review the state and scope of theory and pedagogy as a science. Linking research and philosophical traditions helps researchers to clarify the theoretical frameworks of their research. The research framework includes beliefs about the nature of reality (ontology), the theory of knowledge that characterizes the research (epistemology), and how that knowledge can be acquired (methodology). All these represent different directions that can be taken in research. The use of quantification for the presentation of research results must be in compliance with positivist epistemology, and for this reason, the epistemological-methodological peculiarities of education research must be understood first. Is this really the way it is in practice? The goal of this paper is to provide a brief overview of research paradigms in education research and place quasi-experimental pedagogy among applied pedagogical research used in the examination of educational practice.

The complexity of the educational process and the very nature of educational problems require the integration and combination of qualitative and quantitative methodology in research. The basic characteristics of these methodologies point to the need of conducting mixed methods research. Quantitative methodology relies on large samples in order to analyze certain parts of the population. On the other hand, qualitative methodology is based on small samples that are thoroughly described and analyzed. Combining them ensures the analysis of individual parts of the population, but also the understanding of their full complexity. Using the mixed method implies that the researcher is well acquainted the basics of both qualitative and quantitative methodologies. Finally, the concept of quasi-experimental pedagogy represents a set of logically related assumptions, concepts or propositions that

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guide research. Without determining the paradigm as the first step, there is no basis for further choices in terms of the methodology, methods, literature and research design itself. Certainly, there are problems in pedagogy related to the methodology based on the positivist paradigm, as well as those related to the so-called humanistic methodology. But what we can predict with great certainty is that pedagogy, or any other social-humanistic science, will not develop within the framework of only one methodological approach. In relation to that, the authors highlight that one can rely on the logical-methodological and, among other things, the epistemological setting as the basic philosophical starting point of research, but also that one can follow modern research trends and use a plurality of ideas when it comes to experimental and quasi-experimental pedagogy.

Epistemological-Methodological Approaches in Education Research in the Context of Quasi-Experimental Pedagogy

During the 1980s, many quantitatively and qualitatively oriented researchers claimed that their approach was superior. Some of these researchers were “purists,” as they argued that the two approaches cannot be used together due to differences in worldviews or philosophical orientations (Antwi and Hamza, 2015). Within the social and humanistic sciences, there is a need for a planned and systematized approach to basic and principled epistemological questions. Epistemology and methodology go together – they are intertwined concepts and are always in a dialectical unity, which leads to new knowledge in pedagogy. In terms of their philosophical foundations, epistemology is closer to logic and gnoseology, while methodology is focused on empiricism, i.e., “practical activity” (Sladoje Bošnjak, 2019; 2018a; 2018b).

Al-Ababneh (2020) gives the following definitions: 1. Epistemology is the theory of knowledge embedded in the theoretical perspective, and therefore in the methodology; 2. Theoretical perspective is the philosophical stance informing the methodology and thus giving a context for the process and grounding its logic and criteria; 3. Methodology is the strategy, action plan, process or design that lies behind the choice and use of certain methods and connects the choice and use of methods with the desired outcomes; 4. Methods are defined as the techniques or procedures used to gather and analyze data related to a research question or hypothesis.

Ontology refers to the nature of our beliefs about reality. Researchers have assumptions about it. The ontological question that prompts the researcher to think about is what kinds of reality exist: a single, verifiable reality or a multiple social reality. In its origin, ontology refers to a branch of philosophy that deals with articulating the nature and structure of the world. It specifies the form and nature of reality and what can be known about it. There are two broadly contrasting positions - objectivism and constructionism. Objectivism holds that there is an independent reality and constructionism assumes that reality is a product of social processes (Antwi and Hamza, 2015).

Epistemology refers to a branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and confirmed. It represents a concern about the nature and form of knowledge, how it can be acquired and how it can be communicated to others. Epistemological questions lead the researcher to think about possibilities, objectivity, subjectivity, validity and generalization in some researched studies. Adhering to an ontological belief system, we can certainly arrive at certain epistemological assumptions. If it is assumed that there is a single verifiable truth, we strive with our beliefs to discover it and to learn “exactly how things are” and “how things really work”. On the other hand, believing there is a socially constructed multiple reality leads the researcher to include other subjects and understand phenomena from a wide variety of contexts. Epistemology represents a distinctive “worldview” (Antwi and Hamza, 2015; Al-Ababneh, 2020).

Research methodology is a theoretically based approach to the study of data. Methodology can also be defined as a method used in conducting research and it reflects the question of how knowledge can be acquired. The methodological aspect of research must be in compliance with ontological and epistemological attitudes (Antwi and Hamza, 2015; Kamal, 2019). It refers to the study and critical analysis of data acquisition techniques. Methodology is the strategy, action plan, process or design that informs the choice of research methods. It guides the researcher in deciding which type of data and instruments to use in a specific study, and which tools are most suitable for researching a particular phenomenon. Finally, methods are specific means of collecting and analyzing data. Which methods will be used in a study depends on its design and the researcher’s “theoretical” way of thinking. It should be noted that the use of certain methods does not entail ontological and epistemological assumptions (Rehman and Alharthi, 2016).

Ontology, epistemology and methodology are essential segments of every branch of science,

including pedagogy. Because of them, it is possible to determine the criteria for the systematization of scientific knowledge and to review the state and scope of theory and pedagogy as a science. Linking research and philosophical traditions helps researchers to clarify the theoretical frameworks of their research. The research framework includes beliefs about the nature of reality (ontology), the theory of knowledge that characterizes the research (epistemology), and how that knowledge can be acquired (methodology).

All of these are different research directions that can be taken in experimental and quasi-experimental pedagogy research. This section provided a brief overview of research paradigms in education research. The focus of the study are three main paradigms: positivist, interpretivist, and critical theory with a brief review of the four components of each research paradigm – namely, ontology, epistemology, methodology, and methods.

Position of Quasi-Experimental Pedagogy – A Paradigmatic Debate

The choice of the philosophical basis and perspective when researching a certain phenomenon should be founded in the needs and requirements of the study, and it should not be insisted on only one philosophical point of view while excluding all others (Rehman and Alharthi, 2016). On the other hand, there are numerous paradigms that can guide us in the research process, thus relying on different paradigmatic schemes in order to conceptualize and classify research.

Pedagogy research is generally classified into two broad categories: qualitative and quantitative research. Each approach has its own methodology and terminology. Quantitative research uses measurement, whereby data is tested to examine pre-set hypotheses. It is a type of research which requires controlling variables. On the other hand, in qualitative research the focus is on research in the natural environment. No hypotheses are set here, but this type of research is distinctive because it can result in hypotheses and the creation of new theories. It is often thought that qualitative research is the precursor to quantitative research (Preglej, 2014). The terms quantitative and qualitative research generally mean more than different ways of gathering information and represent divergent assumptions about the nature and purpose of research in pedagogy (Bryman, 1988; Gojkov, Krulj and Kundačina, 1999; Guba and Lincoln, 1988; Halmi, 2005; Howe, 1988). Qualitative research describes events in their natural environment. Instead of designing experiments and controlling variables artificially, when conducting qualitative research, researchers use anthropological and ethnographic methods to study respondents (Lowhorn, 2007). Different research methods can be used in qualitative research. The qualitative method with qualitative analysis is one of the studied reality properties. We distinguish the following research methods within qualitative research: historical, comparative, genetic, functional method, structural method, system analysis, monographic method, case study method, dialectical method.

According to the quantitative approach, social phenomena should be treated in the same way natural phenomena are treated by scientists from the field of natural sciences. Quantitative research is a research methodology with a holistic approach that the researcher uses during the research process. The quantitative method deals with the quantification and analysis of variables in order to arrive at research results. It involves the use and analysis of numerical data to answer the following questions: who, how much, what, where, when and how? Quantitative research explains the problem by presenting data with numerical indicators, while the analysis and interpretation of research results is based on mathematical methods, especially statistics.



Figure 1. Non-experimental versus experimental research

Once the decision to conduct a quantitative study is made, it must be designed. There are two main types of quantitative research designs: experimental and non-experimental designs. Experimental pedagogical research deals with cause-and-effect relationships (also known as causal links and relationships) and strives to determine the effects of pedagogical procedures in a systematic way (Knežević-Florić and Ninković, 2012; Fajgelj, 2010). In experimental research, we manipulate variables in order to examine the influence of one variable on another, while in non-experimental research, variables are not manipulated.

Quasi-Experimental Research in the Context of Experimental Research

The main reason for the rise of experimental pedagogy should be sought in the development of social and natural sciences, as well as in the circumstances of the 19th and the 20th century. Experimental research first emerged in natural sciences, and then spread to the field of social-humanistic sciences. Under the influence of the positivist research paradigm, there was a tendency to separate from deductivism and join natural sciences. The focus shifted from the field of psychology to the issues dealt with in pedagogy. Experimental pedagogy is empirical. The methodology dealt with in experimental pedagogy is exact and it is used to determine definite data, i.e., it looks for facts and evidence that can replace research hypotheses. A synonym for experimental pedagogy is “new pedagogy,” although the term “scientific pedagogy” can also be found. In the first half of the 19th century, pedagogy spread its knowledge, developed the methodology of studying pedagogical problems and replaced theoretical and deductive studies of pedagogical phenomena with experimental, i.e., empirical research. Historically, in the period between 1880 and 1990, pedagogical laboratories that explored various pedagogical phenomena (teaching, teaching methodology, opinion and memory, curricula and programs, school systems, etc.) were opened (Nahod, 1999).

Experimental research is a systematic and scientific approach to research in which the researcher manipulates one or more variables, and controls and measures any changes in other variables. The goal of experimental research is predicting phenomena. In most cases, the experiment is designed in such a way so that some types of causal relations can be explained. Experimental research describes the process which the researcher undergoes to observe whether manipulating variables leads to certain results, i.e., whether the manipulation directly causes a certain outcome.

When research is carried out, there is no criterion that will immediately show that a certain design is better than the other, or that some experiment is more valuable than the other. Evaluating research quality is done through the methodological basis of the research, originality, novelty, and significance, and these are the so-called generic research evaluation criteria. Originality implies that the research is based on new data and on innovative approaches to researching complex pedagogical problems.

In the last few decades, a wider use of quasi-experimental research in social sciences has been observed. This trend, partially derived due to the “credibility revolution” in social sciences, is notable together with the increasing use of randomized controlled trials with the purpose of testing causal relations and conclusions (Gopalan, Rosinger and Ahn, 2020). Quasi-experimental research design should be brought as close as possible to the benefits of real experimental designs in a natural school environment.

The main difference between experimental and quasi-experimental research lies in the distribution of respondents into groups. In experimental research, distribution of respondents into groups is randomized to reduce bias. In quasi-experiments, such a random distribution is not possible. The control group serves as a comparison group. In order to retain the advantages of experimental research (environment control) as much as possible, it is crucial to ensure that the experimental and comparison (control) groups are as similar as possible. This is not easy to do because the number of variables that can affect outcomes is considerable. Therefore, the best thing to do is to think carefully about the factors that may affect the results. The control and experimental groups should be as similar as possible in the following sociodemographic characteristics: socioeconomic status, gender, ethnicity, ability, etc. The researcher must try to collect as much data as possible on as many variables as are believed to be relevant to the outcomes of the quasi-experimental research. Statistical control of the effects of these variables can then be attempted. It is obvious that from the point of view of establishing causality this is not an efficient method (Gopalan, Rosinger and Ahn, 2020; Mujs, 2004; Levy and Ellis, 2011).

Everything mentioned above makes it clear that it is necessary to find a group that matches the experimental group, and this is not an easy task at all; lack of randomization may lead to research bias. Quasi-experimental research designs have one obvious advantage over experimental designs, which is that they are conducted in a natural setting. If we discover the effects of a program, we can be sure that they occur in natural, not only laboratory, conditions. Such quasi-experimental research is suitable for evaluating some new initiatives and programs in the educational process (Mujs, 2004).

Quasi-experimental research designs test causal hypotheses. In both experimental and quasi-experimental research, a treatment, an intervention, or an experimental factor is used.

Groups of qualitative indicators of experimental and quasi-experimental research are as follows. Literature review is the key element for the conceptual design of the research; It is important that the review presents the existing information and grounded theory for the proposed research. Literature review should reflect recent and basic research studies in the field. If there is no literature to support a particular problem, the researcher should state this clearly. Regardless of whether the researcher is proposing

an innovative approach for which there is little existing empirical evidence or interventions, literature review should provide appropriate arguments for the importance of investigating a particular research problem; Highlighting the importance of re-investigating a certain issue; Presenting arguments supporting the intervention; Presenting sufficient arguments on why treatment is necessary for a certain group; Using adequate procedures to ensure that groups are comparable under all conditions; The intervention is clearly described; A faithfully described research procedure; A clearly described apparatus; Providing evidence for the validity and reliability of the obtained measures; Effects of intervention measures are recorded on time; The selected data analysis techniques correspond to the research questions and research hypotheses; The variability of the sample should be represented by adequate statistical parameters.

Real experiments and quasi-experiments have different goals. Real experiments are conducted in order to study a phenomenon, while quasi-experiments have a practical purpose. Quasi-experiments are aimed at discovering causal links and relationships based on correlations between the phenomena themselves. They are said to be “halfway between a passive observation and a true experiment” (Milas, 2005, p. 221).

To sum up, what guides researchers when choosing a research sample is debatable. If the experimental method is used, the researcher must randomly select the research sample. If they use the quasi-experimental method, they can use a deliberate and convenient sample. This can be done by researchers, students, teachers, reflective practitioners. From an epistemological and methodological point of view, it should be pointed out that if the researcher uses the experimental method with a pre-selected sample from the population, this is not a real experimental design, but a quasi-experimental study. For example, if a teacher introduces a new method in their class, this is not the experimental method, but the quasi-experimental method. In this sense, the aim is to establish the right terminology and perform quasi-experimental research from the shadows of experimental research.

The Mixed Method Reconciling Paradigms Through Quasi-Experimental Research

The relationship between the theoretical and the empirical approach to the study of the phenomenon or research problem is presented, together with the relationship between qualitative and quantitative methods in pedagogical research. As both types of research are beneficial (what can be learned by one method cannot be learned by the other due to different philosophical starting points to which they epistemologically belong), it cannot still be argued that one or the other perspective in research should be strictly followed. The solution is found in triangulation, that is, a mixed methodology that manages to reconcile these two paradigms through the methodological element of methods, techniques and research instruments that can be combined in empirical studies.

The mixed method actually refers to methods of data collection, data analysis and interpretation of evidence, that is, the analysis and interpretation of research results. The terms “mixing, mixed” are essential because this is a key step in a certain phase of the research process. “Purposeful data integration enables researchers to seek a more panoramic view of their research landscape, viewing phenomena from different viewpoints and through diverse research lenses” (Shorthen and Smith, 2017, p. 74–75). For example, in a randomized controlled trial, quantitative data can be collected to examine knowledge about a problem, while qualitative data is used to analyze certain experiences. This point of view is characteristic of both natural and social sciences. In experimental research, for example, the researcher may conduct an interview with respondents to examine the desired phenomenon, but they may also use a questionnaire or a rating scale to assess some characteristics of the investigated phenomenon. This is a typical example of combining a qualitative and a quantitative method because the interview is an instrument that belongs to qualitative research, while the assessment scale belongs the quantitative paradigmatic orientation.

The complexity of the educational process and the very nature of educational problems require the integration and combination of qualitative and quantitative methodology in research. The basic characteristics of these methodologies point to the need of using the mixed method. Quantitative methodology relies on large samples to analyze certain parts of the population, while qualitative methodology is based on small samples that are described and analyzed in a detailed manner. Combining them ensures the analysis of individual parts of the population, but also the understanding of their full complexity. Using the mixed method implies that the researcher is well acquainted with the basics of both qualitative and quantitative methodologies (Denzin and Lincoln, 2000).

It is necessary to point out that even in the context of experimental and quasi-experimental research, one should not stick to only one research tradition and that through the application of different research methods it is possible to reconcile the irreconcilable.

Concluding Remarks

In summary, each paradigm has its own advantages and disadvantages, that is, each paradigm has specific features and a unique role in the process of researching upbringing and education, especially in pedagogy. By using a multifaceted approach, not limiting ourselves to one paradigm, we can have a holistic framework and approach in investigating our research question. It is firmly believed that connecting paradigms in research ensures the quality, validity, reliability and relevance of the facts.

Furthermore, when the researcher is well acquainted with the philosophical, epistemological and methodological postulates, and paradigmatic frameworks, they can use this knowledge to change their views on the research methodology they are dealing with. For example, experimental research involves studying the effect of a systematic manipulation of one or more variables on another variable. To conduct a “true” experiment, researchers must select a randomized research sample. By random distribution, each respondent has an equal chance of entering the research process. Sometimes, researchers cannot randomly select respondents. Instead, the experimenter will often use already formed research groups, such as a class community, and conduct the research in the classroom. In this case, the research is described as quasi-experimental. In non-experimental quantitative research, the researcher identifies variables and may look for relationships between them but does not manipulate the variables. There is a tendency to assert the function and importance of research not only among researchers, but also among pedagogues, teachers, and students. It is important that researchers undertake the role of practitioner in the research process. Researchers should see the research problem as an action by which the practice is constantly changing and developing. As already mentioned, the realization of the research is described from the point of view of the subject’s nature, research goal, sample, methods, techniques and instruments, as well as data processing. Each study is conducted with the aim of understanding the research problem better (Bandjur and Potkonjak, 1999; Hebib and Matović, 2012). The relevant data can be collected in both qualitative and quantitative form or by constructively combining them.

It is important to point out to the scientific public that there are different types of quasi-experimental and experimental research designs. But in order for them to be further affirmed in special segments, it is necessary to define quasi-experimental research and understand the crucial difference between an experiment and a quasi-experiment. To achieve that goal, methodological, research and statistical literacy is necessary, especially for teachers who tend to improve themselves and the educational system. When the researcher is “qualified” in this domain, there is no doubt that they will conduct the research appropriately and write a proper report on its implementation, as well as distribute it to the scientific public. On the one hand, one of the goals of this paper was to gain a certain perspective of the research process, and on the other hand, it was to encourage greater argumentation of the practical findings of experimental research and affirmation of quasi-experimental research in pedagogy.

Conflict of interests

The authors declare no conflict of interest.

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- When quoting hearsay, cite the author's name and year of the original work, followed by a semicolon and then cited code, then last name, year and foreign labor from which he quoted original work. The first definition of intrinsic motivation gave Decy (1975; see Suzić 2005, p. 108) ...

- If we know the year of the first publication of the work, then it is to be connected age translation by first listed year of first publication, a slash and then year translation.

(James, 1890/1983)

- For an Internet source that does not have a bookmarked Web page, use a pair of ¶ and paragraph number on the page where it was published.

(Myers, 2000, ¶ 5)

- Personal communication or publicly spoken words in a lecture to quote only in plain text, but not in the list of references, but does mention the date of actual communication.

Decy (personal communication, April 18, 2001) ...

REFERENCES

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The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title of the paper [point], the name of the magazine - in italics [comma] the number or volume - in italics [comma] page starting work [line] Page completing work [point].

Dennis, TA, Cole, PM, Wiggins, CN, Cohen, LH & Zalewsky, M. (2009). The functional organization of preschool-age children's emotion expressions and actions in challenging situations. *Emotion*, 9, 520-530.

- Form quoting the works of authors of books is as follows:

The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title deeds - in italics [point], the city (and state) [two counts], the publisher [Point].

Hirsch, Jr., E. D. (1996). *The schools we need and why we do not have them*. New York: Doubleday.

- When you mention a paper published in a journal or as part of a book as a chapter, then applies the following form:

The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title of the paper [point], In Proceedings ... (note that the work was published in a journal or book ...) The name of the publisher [open small brackets] Issue. (Note that this is a publisher) [Close little brackets] [comma] title of the collection - in italics [open small brackets] page starting work [line] Page completing work [point], the city (and state) [two counts], publisher [point].

Barrett, KC, & Campos, JJ (1987). Perspectives on emotional development: II. A functionalist approaches to emotions. In Osofsky JD (Ed.), *Handbook of Infant Development* (2nd ed., Pp. 555-578). Oxford, England: Wiley.

- If seven or more authors, then we will list the names of the six authors, and the seventh and the rest fall into the category of " and associates " .

Adam, JJ, Paas, F. Teeken, JC van Loon, EM, Van Boxtel, MPJ, Houx, PJ, et al. (1998). Effects of age on performance and a finger-precuing task. *Journal of Experimental Psychology: Human Perception and Performance*, 24, pp. 870-883.

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Henry, W. A., III. (1990, April 9). Beyond the Melting Pot. *Time*, 135, 28-31.

- When we need to with the title of the article mention what kind of material it is then enclosed in square brackets after the title of the paper is printed by it is a brochure, video recording and the like.

Research and Training Center on Independent Living. (1993). Guidelines for reporting and writing about people with disabilities (4th ed.) [Brochure]. Lawrence, KS: Author.

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Schwarzer, R. (1989). Statistics software for meta-analysis [Computer software and manual]. Retrieved March 23, 2001, http://www.yorku.ca/faculty/academic/schwarze/meta_e.htm

- When the list reference is made to the work that is being prepared for the press, after the authors' names, in parentheses, listed in the press in English.

Zuckerman, M. Kieffer, SC (in press). Race differences in faceism: Does facial prominence imply dominance? *Journal of Personality and Social Psychology*.

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The new health-care lexicon. (1983, August / September). *Copy Editor*, 4, 1-2.

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Ganster, DC, Schaubroeck, J. Sime, WE, & Myers, BT (1991). The nomological validity of the Type A personality among employed adults [Monograph]. *Journal of Applied Psychology*, 76, 143-168.

- When an abstract or summary of the quote as the original source, after the title should be in parentheses to indicate that it is abstract.

Wolf, NJ, Young, SL, Famselow, MS, & Butcher, LL (1991). Map-2 expression in cholinceptive pyramidal cells of rodent cortex and hippocampus is altered by Pavlovian conditioning [Abstract]. *Society for Neuroscience Abstracts*, 17, 480 harvesters.

- Titles that are not in English, and we want them to be published in the journal in English, listed in their native language, and then in the square brackets give the title translation into English. In addition to the title, everything else remains the mother tongue.

Ising, M. (2000). Intensitätsabhängigkeit evozierter Potenzial their EEG: Sindh impulsive persons Augmenter stage Reducer? [Intensuty dependence and event related EEG potentials: Are impulsive individuals augmenters or reducers?]. *Zeitschrift für Differentiel und diagnostisch Psychology*, 21, 208-217.

- In the list of literature translated work following a text that we have a year of the original edition listed in parentheses at the end behind the publisher. When we quote in plain text, year of first publication and translation writing along with a slash between (eg. Laplace, 1814/1951).

Laplace, P. S. (1951). A philosophical essay on probabilities (FW Troscott & FL Emory, Trans.). New York: Dover. (Original work published 1814)

- When the list of references cites a paper published in the Proceedings of the translated, italics will print the name of the collection at the end to add when it published the original.

Freud, S. (1961). The ego and the id. In J. Strachey (Ed. & Trans.), The standard edition of the complete psychological works of Sigmund Freud (Vol. 19, pp. 3-66). London: Hogarth Press. (Original work published 1923).

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Broadhurst, RG, & Maller, RA (1991). Sex offending and recidivism (Tech. Rep. No. 3). Nedlands: University of Western Australia, Crime Research Center.

- When the list of sources cites a report of an organization or institution that has no author, it is best to nominate as the author of this organization, which is also the publisher.

Employee Benefit Research Institute. (1992, February). Sources of health insurance and characteristics of the uninsured (Issue Brief No. 123). Washington, DC: Author.

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Vandenbos, G. Knapp, S., & Doe, J. (2001). The role of reference elements in the selection of resources by psychology undergraduates [Electronic version]. *Journal of Bibliographic Research*, 5, 117-123.

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- When you download from the Internet a document which has no date or author, then the document name takes the place of the author or the first place.

8th GVU's WWW User Survey. (Od). Retrieved August 8, 2000, from http://www.cc.gatech.edu/gvu/user_surveys/survey-1997-10/

- Material from the symposium or a scientific paper which was only exposed, but not published, listed with the note on which the scientific or professional meeting is material exposed. If the author has presented on the site, it is desirable to name and web page.

Cuter, LD, Frölich, B., & Hanrahan, P. (1997, January 16). Twohanded direct manipulation on the responsive workbench. Paper presented at the 1997 Symposium on Interactive 3D Graphics. Abstract retrieved June 12, 2000, from <http://www.graphics.standard.edu/papers/twohanded/>

- Computer software listed noting computer software. Name of the software we write italics.

Miller, M. E. (1993). *The Interactive Tester (Version 4.0)* [Computer software]. Weastminster, CA: Psytek Service.

- Data downloaded from the website of the government or other official organization listed noting data file. The filename of the data listed in italics.

Department of Health and Human Services, National Center for Health Statistics. (1991). *National Health Provider Inventory: Home health agencies and hospices, 1991*. [Data file]. Available from the National Technical Information Service Web site, <http://www.ntis.gov>

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Thank you Reviewers!

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