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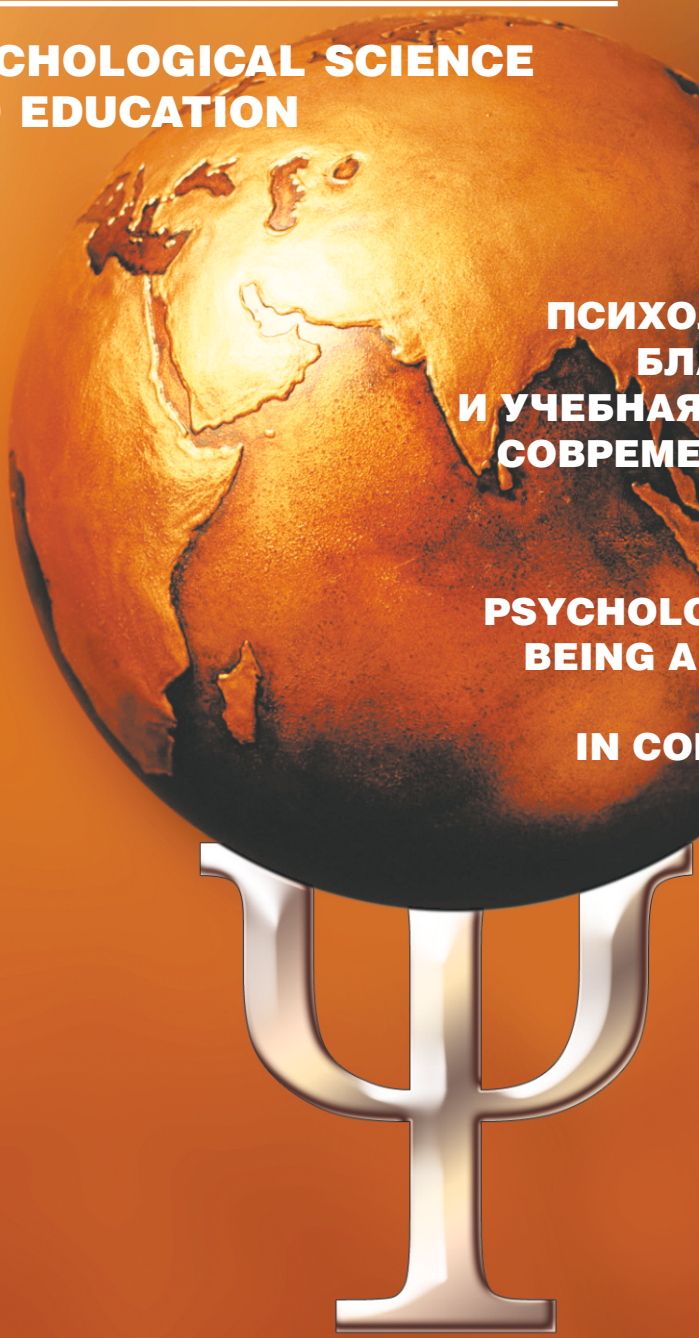

ПСИХОЛОГИЧЕСКОЕ БЛАГОПОЛУЧИЕ И УЧЕБНАЯ МОТИВАЦИЯ СОВРЕМЕННЫХ ДЕТЕЙ

PSYCHOLOGICAL WELL-BEING AND LEARNING MOTIVATION IN CONTEMPORARY CHILDREN

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Московский государственный психолого-педагогический университет
Moscow State University of Psychology & Education

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Esteemed colleagues and readers!

The editorial board of "Psychological Science and Education" presents to your the second issue of 2025, featuring current research in the fields of developmental psychology and education. This issue continues the tradition of publishing scientific works dedicated to addressing contemporary problems in psychological and pedagogical science and practice.

The "Developmental Psychology" section offers readers insights into research on cognitive and social development throughout different stages of age. Specifically, the section includes research examining how the length of screen time affects the development of speech skills in preschoolers, highlighting the connection between digital device usage and the emergence of coherent speech. A special focus is given to a study dedicated to analyzing the features of visual information processing in children with hearing impairments, using modern eye-tracking technology. Additionally, the section includes studies on the impact of digital educational apps on enhancing mathematical abilities in older preschoolers, along with research on how the family social environment influences the development of social skills in teenagers.

The "Educational Psychology" section includes scientific articles addressing current issues related to the organization of the educational process. A comparative analysis of the features of students' learning motivation in various educational environments is presented, revealing the specifics of the motivational and need-based sphere of modern high school students. A particular interest is given to a study of the phenomenon of emotional burnout among highly motivated students in the context of preparing for the state final examination. Readers are also presented with a study dedicated to examining teachers' psychological well-being based on the PERMA model, as well as an investigation into the effectiveness of motivational interviewing as a method for developing psychological resilience in adolescents.

It is our hope that the studies published will attract the attention of the scientific community and stimulate professional interest.

With respect,
The Editorial Board of the journal
"Psychological Science and Education"

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ПСИХОЛОГИЯ РАЗВИТИЯ (ВОЗРАСТНАЯ ПСИХОЛОГИЯ)
DEVELOPMENTAL PSYCHOLOGY (AGE PSYCHOLOGY)

Научная статья | Original paper

Media multitasking as a way of personal adaptation to digital everyday life: the view of parents and teachers

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Abstract

Context and relevance. In the context of digital transformation of everyday life, the idea of multitasking as a necessary condition for successful activity is increasingly popular. However, there is no unambiguous position on the benefits or harms for the development of children and adolescents of multitasking and its type — media multitasking (MMT), as well as their effectiveness. **Objective.** The research aims to identify the attitudes of parents and teachers with varying levels of digital competence and user activity towards the phenomenon of MMT and its effectiveness. **Hypothesis.** Teachers and parents are characterized by more positive attitudes towards the MMT and its effectiveness in general in everyday life than in the educational context. **Methods and materials.** Parents and teachers (N = 283) filled out a questionnaire to assess various aspects of attitudes towards MMT, user activity, and the Digital Competence Index. **Results.** T While the majority of teachers and parents have a positive attitude towards MMT in everyday life, they see it as a factor that reduces the effectiveness of educational activity. Parents and teachers with higher success indicators of digital socialization are more positive about MMT. Adults who subjectively assess themselves as multitaskers are more skeptical of this format of activity, and multitasking parents do not seek to develop such activity in their children, which may be explained by its perception as a forced and resource-expensive strategy. The contradictory attitudes of adults about MMT testify to the lack of appropriate strategies for dealing with this practice in the family and at school. **Conclusions.** For the effectiveness of this tool, special efforts to form MMT are required. The inevitability of adolescents independently mastering MMT and their subjectively high evaluation of its effectiveness require attention from socialization institutions to provide tools for managing MMT in an adequate format without compromising children's development.

Keywords: media multitasking, teachers, parents, representations, attitudes, digital everyday life

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Медиамногозадачность как способ адаптации личности к цифровой повседневности: взгляд родителей и педагогов

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Резюме

Контекст и актуальность. В условиях цифровой трансформации повседневности все большую популярность приобретает представление о многозадачности как необходимом условии успешной деятельности. При этом не существует однозначной позиции о пользе или вреде для развития детей и подростков многозадачности и ее вида — медиамногозадачности (ММЗ), а также их эффективности. **Цель**. Работа направлена на выявление особенностей отношения родителей и педагогов с разным уровнем цифровой компетентности и пользовательской активности к ММЗ и ее эффективности. **Гипотеза**. Для педагогов и родителей характерно более позитивное отношение к формату ММЗ и ее эффективности в целом в повседневной жизни, чем в условиях учебного процесса. **Методы и материалы**. Родители и учителя (N = 283) заполняли опросник для оценки различных аспектов отношения к ММЗ, пользовательской активности, а также методику «Индекс цифровой компетентности». **Результаты.** При позитивном отношении к ММЗ в повседневной жизни большинство педагогов и родителей видят в ней фактор снижения эффективности учебной деятельности. Родители и учителя с более высокими показателями успешности цифровой социализации позитивнее относятся к ММЗ. Взрослые, субъективно оценивающие себя как многозадачников, более критично относятся к такому формату деятельности, а многозадачные родители не стремятся развивать такую активность у своих детей, что может объясняться ее восприятием как вынужденной и ресурсозатратной стратегии. Противоречивость представлений о ММЗ у взрослых свидетельствует об отсутствии выработанных стратегий взаимодействия с такой практикой в семье и школе. **Выводы**. ММЗ может рассматриваться как инструмент оптимизации деятельности тех-

нологически расширенной личности в условиях насыщенной смешанной офлайн/онлайн-реальности. Для эффективности этого инструмента необходимы специальные усилия по формированию ММЗ. Неизбежность самостоятельного освоения ММЗ подростками и их субъективная высокая оценка ее эффективности требуют внимания со стороны институтов социализации для обеспечения инструментами управления ММЗ в адекватном формате без ущерба для развития детей.

Ключевые слова: медиамногозадачность, учителя, родители, представления, цифровая повседневность

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Introduction

The modern world is characterized by rapid digitalization across various spheres of life and the growing significance of online spaces in everyday activities, giving rise to a new anthropological type — a human augmented by digital devices, various applications and programs, along with their usage patterns — what scholars term the “technologically extended self” (Soldatova & Voiskounsky, 2021). The concept of using cultural tools and merging with them traces back to L.S. Vygotsky’s works. Variants of externalist methodology, which examines humans through the lens of their external augmentations and extensions, have been reflected in various theoretical frameworks (Soldatova & Voiskounsky, 2021). This highlights the importance of understanding psychological processes within the context of our rapidly changing world where digital technologies play a pivotal role.

Modern individuals who actively employ technologies to expand their capabilities are mastering new activity formats that may facilitate the development of constructive adaptation strategies in digitally saturated environments requiring simultaneous engagement in both physical and virtual spaces.

One response to these new challenges for technologically extended individuals has been the growing popularity of multitasking — simultaneously combining or switching between multiple tasks (Soldatova et al., 2020; Ophir, Nass, & Wagner, 2009) — as a potential strategy for success in contemporary conditions. The ability to multitask is increasingly listed as a job requirement across various professions and is being recognized as a crucial meta-competency (Varlamova & Sudakov, 2021) that determines success regardless of specialization and requires cultivation within educational systems (Zeer et al., 2019). In the context

of education digitalization, multitasking has become not only a competency to be developed in students but also a requirement for effective educators (Petrash & Sidorova, 2021).

However, the scientific community remains divided regarding the benefits or harms of multitasking and its specific form — media multitasking (MMT) — for child and adolescent development, as well as its actual effectiveness (Soldatova et al., 2020; May & Elder, 2018; Pop awska, Szumowska, & Kuś, 2021). Within Russian pedagogical circles, doubts have been raised about the value of developing MMT skills in both students and teachers amid education digitalization (Polikarpova, 2020; Sidorova, 2021). The contradictory discourse surrounding MMT in modern educational environments raises questions about how significant adults involved in child and adolescent socialization perceive this phenomenon. The attitudes toward MMT conveyed by adults may either promote or restrict this practice among younger generations.

The aim of our study is to examine how parents and teachers with varying levels of digital competence and user activity perceive media multitasking and its effectiveness among school students. As shown in other research, digital competence can be viewed as a criterion for successful management of technological augmentations by extended selves, while user activity serves as a quantitative indicator of engagement with these augmentations (Soldatova, Chigarkova, & Ilyukhina, 2024).

The study tests the following hypotheses:

1. Teachers and parents generally hold more positive attitudes toward MMT and its effectiveness in daily life compared to educational settings.

2. Higher levels of digital competence and user activity among parents and teachers correlate with more positive evaluations of MMT in daily life and its perceived importance for future success.

3. Parents and teachers who rate their own MMT abilities highly will demonstrate more favorable attitudes toward its use in daily life and will be more inclined to develop this ability in children.

Materials and Methods

In accordance with the research objectives and hypotheses, a diverse methodological toolkit was employed. To assess attitudes toward MMT in general, teachers and parents were asked to select no more than two response options out of six, such as: “A unique ability available to few” or “An obstacle to serious matters.” Three responses corresponded to positive attitudes, three to negative attitudes (see Fig. 1). Comparative analysis examined two groups based on predominantly selected responses — a group with positive attitudes toward MMT and a group with negative attitudes toward MMT.

To evaluate perceptions of MMT effectiveness in the educational process, teachers and parents selected no more than three responses out of eight, for example: “Substantially decreases in all cases” or “Mostly remains unchanged because students always try to do multiple things simultaneously, and it’s not related to educational digitalization” (all response options — see Fig. 2). For comparing opinions of parents and teachers,

they were divided into four groups: positive assessment of effectiveness (improves), neutral (effectiveness remains unchanged), negative (decreases), and contradictory (equal number of responses about decreasing and increasing effectiveness).

To assess perceptions of the importance and demand for MMT skills for future success, respondents were asked to choose one of six response options: “Yes, it will be one of the key skills,” “Yes, but far from the most important,” “Yes, in some professions,” “No, one can easily do without it,” “No, multitasking is only needed when people fail to plan their time properly,” or “No, because the world will quickly realize that doing multiple things simultaneously leads to poor performance in all tasks.” When comparing groups, the first three responses were classified as positive assessments of MMT importance, while the last three were considered negative.

Teachers and parents were asked to rate their own MMT on a 5-point scale (from 1 — “rather single-tasking” to 5 — “rather multitasking”) and their desire to enhance this ability (from 1 — “don’t want to change anything” to 5 — “want to become much more multitasking”). Parents were also asked to evaluate their children using these same parameters.

Digital competence level was assessed using the “Digital Competence Index (Soldatova, Rasskazova, 2018). User activity assessment included questions about time spent online on weekdays and weekends, with 12 response options ranging from “little or almost none,” “about half an hour” to “about 12 hours or more” in 1-hour increments.

The study sample consisted of 283 respondents: 131 teachers (46,3%) and 152 parents (53,7%), of whom 87,3% were female. 226 participants (79,9%) were from Moscow and the Moscow region, while 57 (20,1%) came from other regions. The average age was 41,8 (SD = 8,7) years. The average teaching experience among educators was 19,6 (SD = 10,6) years.

Data collection took place from autumn 2020 to winter 2021. Statistical analysis was performed using IBM SPSS Statistics v. 23.0. The analysis employed Pearson’s χ^2 test, Kruskal-Wallis test, ANOVA, and Spearman’s rank correlation test. When no differences were found between teacher and parent groups, analysis was conducted on the entire sample. The database is available in the repository (Soldatova, Chigarkova, Koshevaya, 2024).

Results

The statistical analysis yielded data showing the distribution of parents’ and teachers’ assessments regarding their own media multitasking (MMT), children’s MMT, attitudes toward MMT, and its perceived effectiveness for children in the learning process. The analysis also revealed differences in these assessments among parents and teachers with varying levels of user activity, digital competence, and perceptions of their own MMT. Let us examine these findings in detail.

Perceptions of Personal and Children’s MMT

More than half of teachers and parents (58%) rated themselves as multi-

taskers (4–5 points on the assessment scale), 29,7% reported incorporating some elements of MMT in their activities (3 points), while only 12,4% considered themselves predominantly single-tasking (1–2 points). Nearly half of parents (46,7%) viewed their child as primarily single-tasking, with only one in five parents (22,4%) perceiving their child as a multitasker. Two-thirds of respondents (69,3%) expressed a desire to enhance their MMT capability (scores 3–5 on the assessment scale), and a majority of parents (77,6%) wished the same for their children.

Attitudes Toward MMT

Parents and teachers demonstrated consensus in their positive attitudes toward MMT. Approximately half of respondents believed MMT to be either: (1) a necessary skill that modern individuals should cultivate, or (2) a valuable ability useful in specific situations (Fig. 1). One-fifth of parents and teachers considered it a unique capability possessed by few. Among negative assessments, the most prevalent view characterized MMT as an impediment to serious work, held by one in five teachers and one in seven parents. Perceptions of MMT as detrimental to cognitive development or indicative of poor discipline were uncommon. When respondents were categorized into three groups based on response patterns, 78,8% exhibited positive attitudes toward MMT, 12,4% held negative views, and 8,6% expressed ambivalent opinions (selecting both positive and negative items).

Attitudes toward the effectiveness of children's MMT in learning

The majority of parents and teachers believe that learning effectiveness tends to decrease in MMT mode, most often because the other activity is un-

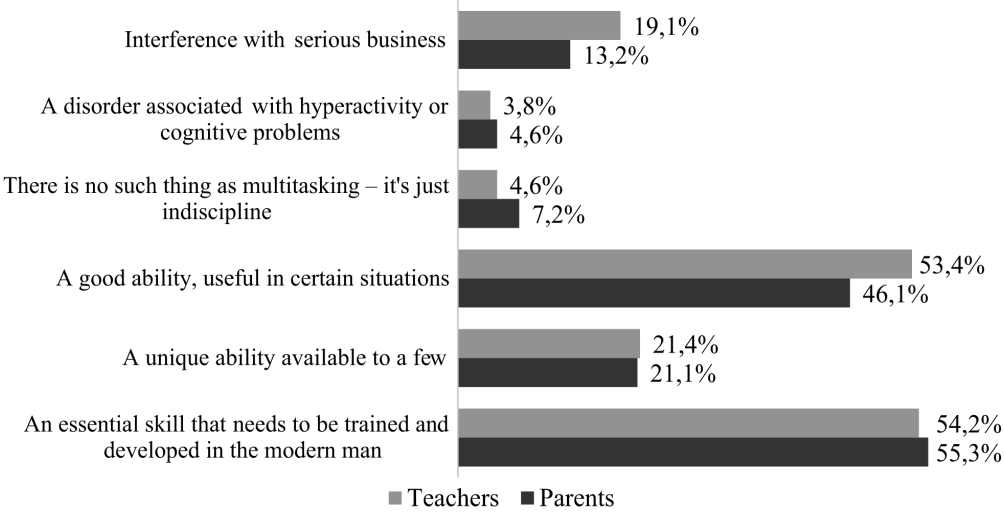

Fig. 1. Comparison of parents' and teachers' assessments of attitudes towards MMT in everyday life, %

related to studies or due to children's inability to keep multiple tasks in mind simultaneously (Fig. 2). Differences between parents' and teachers' opinions were analyzed by dividing them into four groups according to multiple response options: positive assessment of effectiveness (improves), neutral (effectiveness remains unchanged), negative (decreases), and contradictory (equal number of responses about decreasing and increasing effectiveness). The results showed that 10.2% of teachers and 12.5% of parents believe that a child's effectiveness improves when using MMT mode in learning; 85% of teachers and 74,3% of parents believe it decreases; 3,1% of teachers and 11.8% of parents believe the child's effectiveness remains unchanged; 1,6% of teachers and 1,3% of parents have contradictory opinions ($\chi 2$ = 7,971, df = 3; p = 0,047). Parents are slightly more optimistic in their assessment of MMT, believing it does not affect effectiveness in the learning process, while teachers more often think that MMT interferes with it (Fig. 2).

Thus, most educators and parents demonstrate a positive attitude toward MMT in daily life while maintaining a negative assessment of its effectiveness for school students in the learning process, which confirms the first hypothesis.

Digital Competence and Attitudes Toward MMT

A one-way ANOVA revealed marginally significant differences in digital competence (DC) levels depending on attitudes toward MMT (F = 2,721, df = 1, p = 0,069). Respondents with more favorable attitudes toward MMT demonstrated higher DC levels.

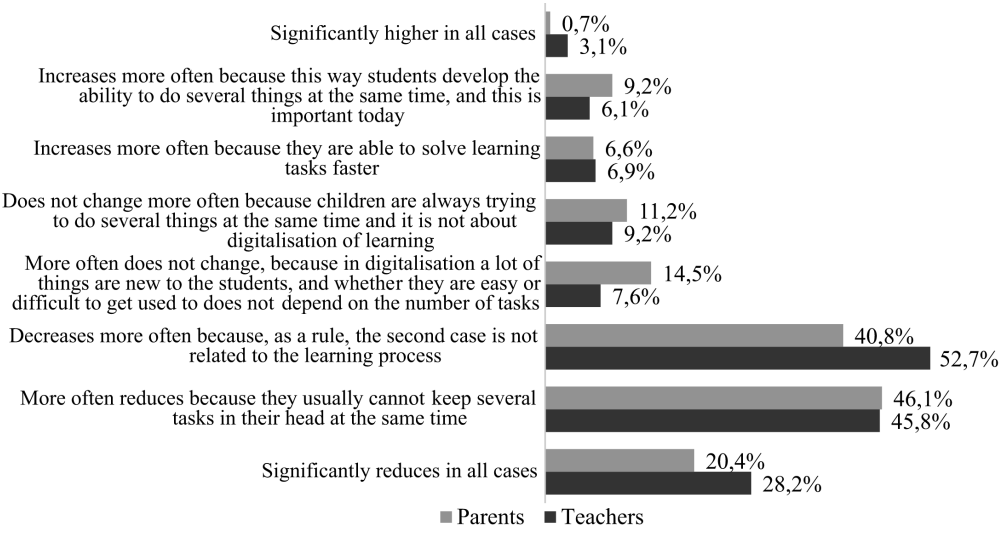

Fig. 2. Comparison of parents' and teachers' assessments of attitudes towards children's effectiveness when working in media multitasking in the learning process, %

The sample was divided into three groups based on DC levels (maximum score = 100 points): one-fifth (21.6%) showed low DC (20,9±5,86); two-thirds (64%) demonstrated moderate DC (46,7, SD = 9,27); one-seventh (14,5%) exhibited high DC (67,62, SD = 6,59). Marginally significant differences emerged between DC groups in self-assessed MMT ($F = 2,956$, $df = 2$, $p = 0,054$). Post hoc Scheffé tests indicated that high-DC respondents rated their MMT higher than low-DC respondents ($p < 0.09$).

Significant between-group differences were found in desire to enhance MMT skills ($F = 5,675$, $df = 2$, $p = 0,004$). Post hoc Scheffé tests revealed that high-DC respondents expressed stronger desire to improve MMT abilities than both low-DC ($p < 0,01$) and moderate-DC ($p = 0,01$) groups.

Respondents who believed MMT skills should be developed had higher DC indices, while those opposing skill development showed lower DC ($F = 8,504$, $df = 1$, $p = 0,04$).

User Activity and Attitudes Toward MMT

To compare MMT attitudes among adults with different user activity (UA) levels, four groups were established based on weekday and weekend internet usage time (Table).

Pearson's chi-square analysis revealed no significant differences in attitudes toward MMT among teachers based on their UA levels. However, significant differences in MMT attitudes were found among parents depending on UA levels ($\chi^2 = 13,116$, $df = 5$, $p < 0,05$). Parents with high UA demonstrated the most positive attitudes toward MMT, while those with low UA showed the least favorable views.

The Kruskal-Wallis test identified significant differences between UA groups in self-assessed MMT based on weekend usage ($\chi^2 = 10,936$, $df = 3$, $p = 0,012$). Higher UA levels among both teachers and parents correlated with higher self-ratings of MMT capability.

Significant differences in perceived importance of MMT for future success

Table

Teacher and parent user activity groups on weekdays and weekends

Days	Groups	User activity			
		Low (up to 1 hour)	Medium (2–4 hours)	High (5–7 hours)	Hyperconnectivity (more than 8 hours)
Weekdays	Teachers	4,6%	7,6%	24,4%	63,4%
	Parents	19,1%	19,1%	37,5%	24,3%
Weekends	Teachers	15,3%	18,3%	35,9%	30,5%
	Parents	40,8%	22,4%	28,9%	7,9%

were found among weekday UA groups (Kruskal-Wallis χ^2 = 13,687, df = 6, p = 0,033). Respondents with moderate (94,9%), high (87,6%), and hyperconnected (80,8%) UA considered MMT skill development most important, while those with low UA (68,6%) valued it least.

These findings regarding MMT attitudes and their perceived importance for future success among respondents with varying UA and DC levels confirm the second hypothesis.

Assessment of subjective MMT and related attitudes

Parents and teachers who rated themselves as more multitask-oriented showed more negative attitudes toward MMT (r = –0,238, p < 0,001). Parents with higher self-ratings of MMT desired to enhance this ability in their children (r = 0,363, p < 0,01). Thus, the third hypothesis was partially confirmed: while parents and teachers with high self-assessed MMT were more negative about its everyday use, parents who considered themselves more multitask-capable wanted to develop this skill in their children.

Results discussion

The findings reveal several key characteristics in the “average” profile of parents and educators as active online users with moderate digital competence who frequently engage in multitasking to varying degrees. Overall, both parents and teachers tend to view MMT (media multitasking) positively — as either a necessary skill for modern life, a useful ability under certain conditions, or a unique talent possessed by few. While most parents express a desire to develop this ability in themselves, an even greater proportion wish to enhance it in their children. Interestingly, although many parents consider themselves media multitaskers, only one in five perceives this capability in their children. This contrasts with research showing high prevalence of MMT among children and adolescents, particularly when using digital technologies (Soldatova et al., 2020; Soldatova et al., 2022; Baumgartner et al., 2017; Ettinger & Cohen, 2020).

While adults generally evaluate MMT positively when considered abstractly, most parents and teachers agree that MMT tends to reduce student effectiveness in educational contexts. This aligns with findings from MMT research in education (Zhou & Deng, 2022) and confirms our first hypothesis, while simultaneously highlighting the contradictory perceptions of MMT. On one hand, MMT is seen as a clear advantage for success in our complex, nonlinear world; on the other, the school as a socialization institution preparing students for professional life is viewed by key socialization agents as having no place for developing this ability. Consequently, children who frequently prefer task-switching or parallel task execution — including during learning activities (Soldatova et al., 2020; 2022; Soldatova & Koshevaya, 2023) — receive limited conscious, instrumental support from adults in mastering and appropriately applying this approach.

Parents and teachers with greater digital socialization success — those spending more time online and dem-

onstrating higher digital competence — hold more positive attitudes toward MMT. Unlike their less digitally engaged counterparts, they consider MMT an important future advantage, confirming our second hypothesis. This suggests that adults with extensive virtual environment experience and effective online navigation skills view MMT as a valuable capability-enhancing strategy, consistent with research on technologically extended selves (Soldatova, Chigarkova, & Ilyukhina, 2024). Notably, multitasking parents also want to develop this ability in their children. However, adults who subjectively rate themselves as multitaskers show greater skepticism about MMT in daily life, partially refuting our third hypothesis. This initially paradoxical result becomes understandable when considering that adults, like children, typically develop MMT strategies independently while coping with increasing information flows and new challenges, often without formal training or adequate consideration of their cognitive limits (Kahneman, 1973). For them, MMT may represent a demanding, resource-intensive coping strategy rather than a consciously developed skill.

Skepticism about MMT's educational effectiveness and the reservations of self-identified multitaskers appear justified given the frequent unconscious engagement in MMT — what researchers often term "digital distraction" (Aagaard, 2019). Nevertheless, the growing prevalence of MMT among younger generations and employer demand for this skill represent responses to digital world challenges, including unprecedented information volume and velocity. As an adaptation strategy for digitally extended individuals in our complex world, MMT emerges as a sophisticated tool requiring deliberate cultivation. Developing metacognitive abilities — those governing understanding and conscious management of one's own cognitive processes (Popławska, Szumowska, & Kuś, 2021) — may represent the optimal approach for mastering MMT as a task-appropriate strategy aligned with cognitive resources.

Conclusions

The findings of this study demonstrate that teachers and parents generally perceive MMT as a positive phenomenon important for effective functioning in modern society. Successful digital socialization manifested through greater immersion in online spaces and possession of knowledge, skills, and responsibility for ensuring safe and effective online activities, correlates with more pronounced positive attitudes toward MMT among parents and teachers. Presumably, adults who actively engage with digital environments personally recognize the necessity of this ability in the digital world through first-hand experience. Reflection on this experience could serve as a foundation for developing more targeted practices to cultivate conscious MMT skills in younger generations — an area currently lacking sufficient support.

At the same time, adults who frequently engage in multitasking exhibit more negative attitudes toward MMT, likely due to its perceived labor-intensity and the often obligatory nature of adopt-

ing it as an efficiency strategy. Both parents and teachers also reject the applicability of MMT in educational settings. This contradiction in adult perceptions ("a crucial skill to develop, yet detrimental to learning") highlights the absence of established strategies for managing MMT within families and schools. Given that adolescents inevitably develop MMT habits independently — often with high subjective assessments of its effectiveness — socialization institutions must provide guidance to help them manage MMT appropriately without compromising their development.

MMT emerges as an adaptation strategy for digitally extended individuals navigating a dense sociotechnological environment, and successful adaptation depends on mastering self-regulation tools through metacognitive development. Schools, as key socialization institutions — including digital socialization — can contribute to fostering effective MMT strategies aligned with developmental stages, learning objectives, and digital environment demands.

Limitations. Study limitations include sample size and gender composition (predominance of mothers and female teachers) as well as respondents' geographical concentration (Moscow and Moscow region). Additionally, the methodological design relied on fixed-response options, which may have constrained response variability.

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Anastasia G. Koshevaya — application of statistical methods for data analysis, description and visualisation of research results, manuscript formating.

All authors approved the final text of the manuscript.

Вклад авторов

Солдатова Г.У. — идеи исследования, планирование исследования, контроль за проведением исследования, обсуждение результатов, написание текста и аннотации.

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Кошевая А.Г. — применение статистических методов для анализа данных, описание и визуализация результатов исследования, оформление рукописи.

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Conflict of Interest

The authors declare no conflict of interest.

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The Relationship between screen time and expressive language (active vocabulary and narrative production skills) in preschoolers

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Abstract

Context and relevance. The study of the impact of electronic devices, particularly screen time (ST), on children's cognitive, emotional, and language development has become increasingly relevant in recent years, especially after the transition to fully or partially electronic forms of education. The influence of ST on language development is only beginning to be explored and shows contradictory results. **Objective.** To identify the relationship between a child's ST and the characteristics of their language development. **Hypothesis.** The negative impact of ST on language development would only be observed when ST exceeds the duration recommended by the WHO. **Methods and Materials.** The study involved 652 preschoolers (M = 70,4 months, SD = 4,53; 51% boys). Participants attended kindergartens in Moscow (74%), Kazan (13.5%), and Sochi (12,5%). Children were asked to "play with words" (i.e., complete a verbal and semantic fluency test) and then view a series of pictures and tell a story based on them. Parents completed a questionnaire indicating their child's ST duration on weekdays and weekends. **Results.** It was shown that ST duration is not significantly associated with the size of children's vocabulary but is associated with their ability to construct coherent narratives. **Conclusions.** The negative impact of ST is indeed observed only when it is excessive and, according to our study, affects more complex forms of speech (narratives). In the future, we consider it necessary to determine at what age these differences begin to manifest, as it can be assumed that by 70 months, lexical and grammatical skills are generally formed, and the negative impact primarily affects parameters that are actively developing at this age, namely, the construction of coherent narratives, their coherence, integrity, and structure.

Keywords: preschool age, language development, active vocabulary, coherent speech, macro- and microstructure, screen time, gadgets

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Связь экранного времени дошкольников и их экспрессивной речи (на материале активного словарного запаса и навыков составления рассказа)

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Резюме

Контекст и актуальность. Изучение влияния электронных устройств, гаджетов, в частности, продолжительности экранного времени (ЭВ) ребенка на особенности его когнитивного, эмоционального и речевого развития становится в последние годы все более актуальным, особенно после перехода детей полностью или частично на электронные формы обучения. Влияние ЭВ на речевое развитие только начинает изучаться и показывает противоречивые результаты. **Цель**. Выявить взаимосвязь ЭВ ребенка и особенностей его речевого развития. **Гипотеза**. Негативное влияние ЭВ на речевое развитие будет отмечаться только при чрезмерной длительности (более ЭВ, рекомендованного ВОЗ). **Методы и материалы**. В исследовании приняли участие 652 дошкольника (M = 70,4 месяца, SD = 4,53; 51% мальчиков). Участники являлись воспитанниками детских садов городов Москвы (74%), Казани (13,5%) и Сочи (12,5%). Детям предлагалось «поиграть в слова» (то есть пройти тест на вербальную и семантическую беглость), а затем посмотреть серию картинок и рассказать историю по этим картинкам. Родители детей заполняли анкету, где указывали продолжительность ЭВ ребенка в будни и выходные дни. **Результаты.** Было показано, что длительность ЭВ значимо не связана с объемом словарного запаса детей, однако связана с навыками построения связной речи. **Выводы**. Негативное влияние ЭВ действительно проявляется только при чрезмерной длительности и, судя по нашему исследованию, при оценке более сложных форм речи (нарративов). В даль-

нейшем мы считаем необходимым узнать, с какого возраста начинают проявляться эти различия, поскольку можно допустить, что в 70 месяцев лексико-грамматические навыки уже в целом сформированы и негативное влияние оказывается прежде всего на те параметры, которые особенно активно развиваются в этом возрасте, а именно — на построение связного рассказа, на его связность, цельность и структурированность.

Ключевые слова: дошкольный возраст, речевое развитие, активный словарный запас, связная речь, макро- и микроструктура, экранное время, гаджеты

Дополнительные данные. Наборы данных, собранных в рамках государственного задания ФНЦ ПМИ, находятся по адресу: г. Москва, ул. Моховая, д. 9, стр. 4, Лаборатория психологии детства и цифровой социализации ФНЦ ПМИ.

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Introduction

The study of language development has a long history; however, modern technologies have introduced new research trends and challenges. One of the increasingly relevant issues is the impact of children's screen time (ST) on their language and speech development (Bukhalenkova et al., 2021; Zinchenko, 2022; Duch et al., 2013; Karani, Sher, Mophosho, 2022). Currently, there is a lack of data on this issue in the context of the Russian language, despite its growing significance. Addressing this challenge requires the development of new psychological approaches and methods to mitigate the negative effects of digital technologies on both oral and written speech, particularly in older preschool and early school-age children (Kortava, 2024).

The main stages of language development in children under five years old have been extensively studied, including in the Russian language (Veraksa et al., 2024). However, the 5–7 age range in typically developing children remains insufficiently explored, particularly concerning the formation of discourse and narratives and the influence of ST on its development.

In recent years, particularly due to the COVID-19 pandemic, the issue of ST's impact on child development has gained even more prominence (Gomes, Souza, 2023; Zinchenko, 2022; Qi, Yan, Yin, 2023). Screen time is generally defined as the duration a child spends using digital devices, such as smartphones, televisions, computers, and tablets (Ponti et al., 2017).

The Impact of Screen Time (ST) on Children's Cognitive Development

The study of screen time (ST) and its effects on child development has been gaining increasing attention in recent years (Veraksa et al., 2024). Researchers are not only accumulating data but also conducting reviews and meta-analyses to account for various variables and determine the extent to which ST has a definitive impact on child development.

It is important to note that many studies focus specifically on excessive ST. Excessive ST is generally defined as screen exposure exceeding two hours per day (Whiting et al., 2021). Research has identified negative effects of prolonged ST on children's physical and mental health, as

well as their emotional development (Kurgansky et al., 2023; Kerai et al., 2022). Specifically, excessive ST has been linked to behavioral and cognitive problems (McArthur, Tough, Madigan, 2022), obesity, anxiety, sleep disturbances (Muppalla, Vuppalapati, Reddy Pulliahgaru, 2023), memory impairments, learning difficulties, and even neurodegeneration (Neophytou, Manwell, Eikelboom, 2021).

However, a considerable number of publications report no negative impact of ST on various psychological phenomena in children. For instance, a study by Bukhalenkova and Almazova (2023) found no correlation between ST duration and different aspects of children's imagination. It is worth noting that in this study, prolonged ST was defined as more than 80 minutes per day—less than 1.5 hours—which, as previously discussed, does not qualify as excessive ST in most countries.

It is suggested that the varying data on the effects of screen time (ST) on children's psychological development may be linked to differences in the types of digital games children engage with (Plotnikova, Bukhalenkova, Chichinina, 2023) and the distinction between active and passive ST (Sweetser et al., 2012). Passive ST refers to screen exposure in which the child does not interact with the digital device, such as watching videos, whereas active ST involves interaction, including playing games and using educational programs (Sweetser et al., 2012).

Studies indicate that a predominance of passive ST negatively affects children's cognitive and social skills development (Hu et al., 2020). In contrast, no such association has been found with active ST (Hu et al., 2020), even when it exceeds pediatric recommendations. Moreover, the negative effects of ST can be mitigated by sufficient outdoor time, with a favorable screen time-to-green time ratio (Oswald et al., 2020).

A recent review (Panjeti-Madan, Ranganathan, 2023) concluded that ST may have adverse effects on motor development, physical activity, sleep, nutrition, socio-emotional skills, and self-regulation. However, based on their analysis, the authors suggest that acceptable ST limits should be as follows: no screen exposure for children under two years, less than 60 minutes per day for children aged 3–5 years, and 60 minutes per day for those aged 6–8 years.

Similar recommendations exist in various countries. For preschoolers, the WHO Guidelines on Physical Activity, Sedentary Behavior, and Sleep for Children under 5 Years of Age (2019) advise limiting ST to 60 minutes per day for children aged two and older. In the Russian Federation, the Methodological Recommendations on Daily Screen Time Duration for Children (MR 2.4.0330-23) were developed by Rospotrebnadzor and approved by the Chief State Sanitary Doctor of the Russian Federation, A.Yu. Popova, on August 29, 2023, for school-age children. According to these guidelines, daily ST should not exceed two hours for children from early school age onward.

The Relationship between Screen Time Duration and Children's Language Development

The study of the relationship between screen time (ST) and language development has been widely explored. A relatively recent meta-analysis (Madigan et al., 2020) identified 26,751 studies on this topic from 1960 to 2019 during the selection phase alone. It is important to note that most of these studies focus on language development in children under 36 months. Additionally, many studies assess language development solely based on passive vocabulary size.

For example, the study that found a negative effect of ST on language development (Beatty, Egan, 2018) reported that prolonged ST negatively impacts the vocabulary size of 5-year-old children. A longitudinal cross-sectional study of Latin American children

(Duch et al., 2013) also indicated that ST has adverse effects on both communicative and linguistic skills. However, in this study, the average ST for 2-year-old children was 2 hours per day, and the negative effect was observed in those who spent more than 2 hours per day watching television.

Some review papers (e.g., Watt, 2010) suggest a positive impact of digital devices on language development, particularly in increasing vocabulary size and promoting literacy. However, it is essential to note that these studies focus not on ST duration but rather on the mere fact of gadget use by children.

Another research direction in studying the effects of screen time (ST) on children's language development is considering additional family and social factors. A longitudinal study (Blankson et al., 2015) demonstrated that ST duration at ages 3–4 negatively affects vocabulary and self-regulation skills at age 5. However, this negative impact was mitigated when parents engaged actively with their children, providing support in language acquisition and self-regulation

Recent analytical reviews (Bhutani et al., 2023; Karani, Sher, & Mophosho, 2022) suggest that ST can have positive, negative, or neutral effects, depending on three key factors: 1) ST duration; 2) content type (educational vs. passive consumption); 3) parental involvement during screen interaction.

Our analysis of existing literature, including meta-analyses and critical reviews, indicates that excessive ST (over 2,5 hours/day) negatively affects language development—particularly in children under 4–5 years old engaged in passive ST (e.g., watching videos without interaction). However, results are less conclusive under other conditions.

Research Objectives and Hypothesis

The goal of our study was to investigate the relationship between children's ST and their language development. The research question was formulated as follows: How does ST duration on weekdays and weekends correlate with the development of children's narrative skills and the size of their active vocabulary?

In our empirical study, we tested the hypothesis that a negative effect of ST on language development would only be observed when ST exceeds the WHO-recommended limits.

Materials and methods

To verify the formulated hypothesis, we conducted a comprehensive assessment of children's language development levels. Language skills assessment included diagnostics of active vocabulary and narrative skills.

Active vocabulary assessment was performed using:

Verbal fluency test — children were asked to name as many different words as possible within one minute; Semantic fluency test — children named as many different actions as possible in one minute (Methods of Neuropsychological Examination..., 2016). Responses were evaluated based on productivity metrics.

Narrative skills assessment employed the "Storytelling based on a Series of pictures" method (Methods of Neuropsychological Examination..., 2016), using the "Nest" sequence from the Multilingual Assessment Instrument for Narratives (MAIN) (Gagarina et al., 2019).

Two experts evaluated the children's narratives based on two scales:

1) Macrostructure (10 points total) — assessed for semantic completeness, adequacy, coherence, and adherence to the narrative structure (goal — attempt — outcome). Scores ranged from 1 (no coherent story) to 10 (a complete, well-structured narrative with an introduction, all episodes, and a conclusion).

2) Microstructure (10 points total) — assessed for lexical (accurate word choice)

and grammatical (correct use of grammar, syntax, and agreement) accuracy (Oshchepkova, Shatskaya, 2023).

Screen Time Measurement

ST duration was assessed via a parent questionnaire. Parents provided information on:

— ST duration on weekdays and weekends,

— Child's age and gender, and

— City of residence, which was encoded in the study.

The study involved 870 preschoolers (Mean age = 70.4 months, SD = 4,53; 51% boys) and their parents from: Moscow (74%), Kazan (13,5%), Sochi (12,5%)

All assessments were conducted individually in quiet kindergarten rooms during morning hours to ensure optimal testing conditions. This methodological approach allowed for standardized evaluation while accounting for individual differences in children's language development patterns.

Results

Children's Screen Time Data. Preliminary Data Analysis

In the initial stage of data analysis, we calculated descriptive statistics for the key study variables. The Shapiro-Wilk test indicated that the data distribution was not normal. However, given that the total sample included over 650 children, we supplemented this analysis with the Skewness criterion, which also revealed a significant deviation from normality. As a result, we used non-parametric methods for further analysis of ST differences.

First, we examined the duration of ST on weekdays and weekends (Table 1). The analysis revealed that:

— Mean daily ST on weekends (M = 49,6 minutes; SD = 58,7) was almost twice as high as

— Mean daily ST on weekdays (M = 25,6 minutes; SD = 36,8).

A Wilcoxon signed-rank test confirmed that these differences were statistically significant (W = 1731; p < 0,001), with a biserial rank correlation coefficient of 0,946, indicating a strong effect size.

Additionally, Table 1 presents frequency distribution data, and we conducted a percentile-based classification of the sample. This allowed us to divide the children into groups based on ST duration, which facilitated further analysis.

Since the Shapiro-Wilk test (p < 0,001) and Skewness values (2,0 and 1,89) indicated a non-normal frequency distribution, we employed non-parametric statistical methods for further analysis.

Table 1

Descriptive statistics of screen time (ST), normality test, percentile groups (N = 652)

	ST (weekdays)	ST (weekends)
M (SD)	25,6 (36,8)	49,6 (58,7)
Min	0	0
Max	240	360
Skewness criteria	2.20	1.89
Shapiro-Wilk criteria W (p)	0,711 (<0,001)	0,784 (<0,001)
25%	0.00	0.00
50%	10,0	30,0
75%	30,0	60,0

Using percentile-based classification, we divided children into four groups based on their screen time (ST) duration:

— Weekdays: 1) no screen time (as reported by parents); 2) 10 minutes or less; 3) 11 to 30 minutes; 4) more than 30 minutes

— Weekends: 1) no screen time; 2) 30 minutes or less; 3) 31 to 60 minutes; 4) more than 60 minutes

A Kruskal-Wallis test comparing ST across different regions showed that weekday ST was significantly lower in Moscow than in Kazan (W = 3,49, p = 0,036) and Sochi (W = 4,06, p = 0,011). However, there were no significant differences between Kazan and Sochi. Weekend ST did not differ significantly across regions.

Additionally, gender differences in ST were analyzed. Results showed that boys spent significantly more time using gadgets than girls, both on weekdays (W = –3,02; p = 0,033) and weekends (W = –3,55; p = 0,012).

The Relationship Between Screen Time (ST) and Language Skills

Inter-Rater Reliability. Expert evaluations of narrative macrostructure (coherence, completeness) and microstructure (lexical-grammatical accuracy) showed high consistency (Spearman's r = 0,61, p < ,001), ensuring measurement validity.

ST Duration and Language Development. We compared the four ST exposure groups (see previous classification) across the parameters: verbal fluency, semantic fluency, narrative macrostructure, narrative microstructure (Table 2). The Kruskal-Wallis statistics showed significant differences between groups with different ST in weekdays only for narrative skills (macro— and microstructural aspects).

The results of the statistical analysis show the relationship between the duration of screen time (ST) in children and their language development.

Additional comparison of region groups with Kruskal-Wallis criteria showed no significant difference except for verbal fluency (Moscow children outperformed Sochi (W = –3,40, p = 0,043)) and lexical-grammatical skills (Moscow children outperformed Kazan (W = –6.92, p < 0,001)).

Supplementary pairwise comparisons using the Dwass-Steel-Critchlow-Fligner (DSCF) test revealed significant differences in narrative macrostructure between:

• Group 1 and Group 4 (W = –5,302, p = 0,001) (i.e., children with no weekday device use versus those using devices for more than 30 minutes)

• Group 3 and Group 4 (W = –4,403, p = 0,010) (i.e., children using devices for less than 30 minutes versus more than 30 minutes on weekdays)

For narrative microstructure, significant differences were found only between Group 1 and Group 4 (W = –4,298, p = 0,013).

No significant differences in any parameter (verbal and semantic fluency, nar-

Table 2

Differences in language skills between children groups with different ST in weekdays (Kruskal-Wallis)

	χ^2	df	p	ε^2
Verbal fluency	3,819	3	0,282	0,006
Semantic fluency	0,179	3	0,981	0,000
Narrative macrostructure	15,716	3	0,001	0,025
Narrative microstructure	9,606	3	0,022	0,015

rative macro-/microstructure) were found between Weekend ST groups.

Discussion

The results of the statistical analysis show the relationship between the duration of screen time (ST) in children and their language development.

The non-normal distribution of the data can be explained by the fact that most parents restrict the use of gadgets for preschool-aged children, particularly during weekdays, with three-quarters of children spending less than half an hour on gadgets during these days. However, in cases where children are not limited in screen time, they can spend up to 4 hours on weekdays and up to 6 hours on weekends.

Descriptive statistics reveal differences in gadget use across Moscow, Kazan, and Sochi. A trend can be observed, where the size of the city is inversely related to screen time duration. At the same time, no significant differences were found for screen time during weekends. This aligns with a study by Nigg et al. (2022), which showed that in recent years, the frequency of gadget use has significantly increased among children and adolescents in rural areas. However, in some studies (e.g., Dollman et al., 2012), longer screen times were noted among adolescents in large cities. In this case, the study refers specifically to adolescents aged 9–16, who choose the duration of their screen time themselves. We hypothesize that this is because the larger the city, the more opportunities children have for extracurricular activities and leisure during the weekdays, which consequently reduces their screen time. On weekends, however, parents are more lenient about gadget use, leading to a significant increase in screen time across all regions. This result is consistent with other studies, such as (Sigmundová and Sigmund, 2021), which found that screen time increases significantly on weekends, not only for children but also for their parents.

Regarding differences in language development indicators across regions, we found that only lexical-grammatical accuracy significantly differed in Kazan. We attribute this to Kazan being a bilingual region, where bilingual children, as shown in several studies, may lag behind their monolingual peers in terms of lexical and grammatical accuracy (e.g., Boese et al., 2023; Kovyazina et al., 2021; Nicoladis & Genesse, 1997).

The gender differences observed in screen time usage also align with findings from other studies. For instance, a large-scale international project examining physical activity and screen time in over 150,000 children across 25 countries found that the percentage of boys spending more than 3 hours per day on gadgets was significantly higher than that of girls (Whiting et al., 2021). However, it is important to note that some studies, such as one on Australian children aged 3–5 years (Downing, Hinkley, Salmon, 2017), did not find gender differences in screen time. In our view, the data on gender differences in screen time requires further verification using other methods of data collection, not only parental surveys.

As for the interaction between screen time and children's language development, our findings indicate that significant differences are found only at the level of narratives. The vocabulary of children with different screen time usage did not differ. As discussed earlier, the relationship between language development and screen time varies across studies. The lack of significant correlation between weekend screen time and language development in our study can mainly be explained by the fact that screen time is not a constant interaction with the device but rather is limited to one or two days a week.

However, when considering weekdays, no differences in vocabulary were observed, likely because the average screen time does not exceed the WHO's recommended limit of 2 hours per day. Therefore, no drastic reduction in vocabulary was observed. On the other hand, macrostucture of the narrative is the parameter that develops most actively in older preschool children (Kartushina et al., 2022), making it more susceptible to the effects of excessive screen time.

It is also important to note the variation in all language parameters in Group 2. These are children whose parents reported that the child uses a gadget on weekdays, but for less than 10 minutes. It is likely that this reflects a socially desirable response, rather than objective data. Moreover, as studies have shown (Fotekova, 2003), children often use various strategies to bypass parental restrictions on screen time.

It should be noted that this study only addresses the correlation between parameters, not a causal relationship. A common predictor for both the uneven development of macrostructure in narratives and the duration of screen time could be, for example, the family's socio-economic status, the number of siblings, family interaction patterns, or other external factors, which require further investigation, as indicated in studies (Veraksa et al., 2024; Gavrilova, Chichinina, 2023).

Conclusions

The results of the literature analysis show that the duration of screen time (ST) affects the cognitive and emotional development of children. In our study, we focused on the relationship between ST and language development in 5-6-year-old children. It was found that a significant interaction between ST and language development occurs only with daily prolonged ST (more than 30 minutes on weekdays) in relation to the development of narrative skills, especially the narrative macrostructure. The volume of active vocabulary was not related to the child's ST. Furthermore, the duration of ST on weekends was also found to have no significant relationship with language development.

In general, we can conclude that prolonged ST, especially on a daily basis, is particularly concerning.

Limitations. Social desirability, recall inaccuracy, or underestimation of actual screen time in parents' responses.

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The authors declare no conflict of interest.

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Learning motivation of older adolescents in different educational environments

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Abstract

Context and relevance. Learning motivation is the most important component of educational activity. The specification of educational motivation in different educational environments representing the modern context of secondary education in Russia should be based both on understanding of the processes of student's personal development and on the knowledge of the specifics of each educational environment. **Objective.** To analyze the specifics of educational motivation in the context of the personal development of older adolescents studying in three different educational environments (grades 10–11 of a regular secondary school and two colleges with different levels of entrance tests and academic performance requirements for applicants). **Hypothesis.** There are significant differences in the nature of students' learning motivation in three different educational environments, in the place of this motivation in the general structure of the motivation-need sphere of their personality and in a number of other personal characteristics of these adolescents. **Methods and materials.** The study involved 342 16,18-year-old adolescents studying in three different educational environments. The following research methods were used: the Method of Motivational Induction (MMI) by J. Nuttin, "Academic Motivation Scale for Schoolchildren" (AMS-S) created by T.O. Gordeeva et al., the questionnaire "Achievement Goal Questionnaire" (AGQ) — the Russian version of the questionnaire by E. Elliott et al. (M.G. Nikitskaya, I.L. Uglanova), "Satisfaction with Life Scale" (SWLS) by E. Diener adapted by E.N. Osin and D.A. Leontiev. **Results.** Statistically significant differences were revealed between the groups of adolescents studying in three educational environments in terms of the content of learning motivation and learning achievement goals, in the place of learning motivation in motivation-need sphere of adolescents, as well as in the relation of learning motivation to life satisfaction. **Conclusions.** The results may be used to improve the quality of education and upbringing of adolescents in schools and colleges of Russia with different contingent of students and various professional training programs.

Keywords: educational environments, older adolescents, learning motivation, personality development, life satisfaction

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Учебная мотивация старших подростков в разных образовательных средах

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Резюме

Контекст и актуальность. Учебная мотивация является важнейшей составляющей учебной деятельности. Конкретизация специфики учебной мотивации в разных образовательных средах, представляющих современный контекст среднего образования в России, должна опираться как на понимание особенностей развития личности обучающегося, так и на знание специфики образовательной среды. **Цель.** Выявить специфику учебной мотивации в контексте личностного развития старших подростков, обучающихся в трех разных образовательных средах (10–11 классы обычной общеобразовательной школы и два различающихся по уровню вступительных испытаний и требованиям к успеваемости поступающих колледжа). **Гипотеза.** Существуют значимые различия в характере учебной мотивации обучающихся в трех различных образовательных средах, в том месте, которое эта мотивация занимает в общей структуре мотивационно-потребностной сферы их личности, а также в ряде других личностных особенностей этих подростков. **Методы и материалы**. В исследовании приняли участие 16–18-летние подростки (n = 342), обучающиеся в трех разных образовательных средах. Использованы следующие методики: метод мотивационной индукции (ММИ) Ж. Нюттена, методика «Шкалы академической мотивации школьников» (ШАМ-Ш), разработанная Т.О. Гордеевой с коллегами, опросник «Цели учебных достижений» (ЦУД) — русскоязычная версия опросника Э. Элльиота с коллегами (М.Г. Никитская, И.Л. Угланова), «Шкала удовлетворенности жизнью» (ШУЖ) Э. Динера в адаптации Е.Н. Осина и Д.А. Леонтьева. **Результаты**. Выявлены статистически значимые различия между подростками, обучающимися в сравниваемых трех образовательных средах, по содержанию учебной мотивации и целям учебных достижений, по месту, которое занимает учебная мотивация в мотивационно-потребностной сфере подростков, а также по связи учебной мотивации с субъективным переживанием удовлетворенности жизнью. **Выводы**. Результаты могут использоваться для повышения качества образования и воспитания подростков в российских школах и колледжах с разным контингентом обучающихся и разными профессиональными программами подготовки.

Ключевые слова: образовательная среда, старшие подростки, учебная мотивация, развитие личности, удовлетворенность жизнью, цели учебных достижений

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Introduction

The current trend in organizing the process of obtaining full secondary education in Russia is toward diversifying available educational environments for adolescents aged 15–17. In recent years, there has been intensive development within the system of secondary professional education aimed at early entry into professions for older adolescents: the number of specialized secondary institutions has increased; their variety has expanded; and new forms of educational processes are being introduced.

Since 2023, a federal project called “Professionalitet” has been implemented within this system. Under this project, college students can both study and work directly in their chosen specialty. The impact of this combination on learning motivation has been widely discussed both domestically and internationally. During these discussions, various opinions have been expressed — including opposing views (Egorenko, 2019; Nimets & Tolstykh, 2024).

The educational context for senior grades in secondary schools is undergoing transformation — particularly due to ongoing controversies surrounding the unified state exam — their content, formats, preparation methods — and so forth.

Today’s diverse secondary schools and colleges represent different educational environments with varying objectives; however, their common goal remains providing adolescents with opportunities to obtain secondary education and organize meaningful learning activities.

It is generally recognized that learning motivation constitutes a crucial component of educational activity. Optimizing learning motivation across different environments presents a complex practical challenge that requires an understanding not only of personal development processes during late adolescence (early youth) but also knowledge about specific features unique to each educational setting.

The research problem lies in clarifying these specific features within the modern Russian secondary education context. Accordingly, this study aims to identify particular aspects of educational motivation related to personal development among older adolescents studying across various types of institutions. The main tasks are: first, selecting relevant educational environments for comparison; second, determining appropriate methodological tools and statistical methods for analyzing empirical data.

Materials and methods

This article presents the results of a comprehensive study of learning motivation in the context of general process of personal development of adolescents studying in three different educational environments: senior grades of secondary school, prestigious college training architects and designers (college 1) and much less prestigious college training cooks and automotive technicians (college 2). All these educational institutions are located in Moscow and Moscow region. The age of the study participants is 16–18 years old (10–11 school grades and 1–2 college courses). The sample characteristics can be found in Table 1.

The study was carried out during in 2021–2022.

Table 1

Sample characteristics

Sex	School	College 1	College 2	Total
Boys	87	28	25	140
Girls	88	99	15	202
Total	175	127	40	**342**

The general study hypothesis supposed the existence of significant differences in the nature of the learning motivation of students of three educational environments indicated above and in the place of this motivation in general structure of motivation-need sphere of students' personality and in a number of other personal characteristics of these adolescents.

The following research methods were used for empirical verification of the particular hypotheses arising from the general one:

- Method of Motivational Induction (MMI) by J. Nuttin (Nuttin, 2004; Tolstykh, 2005; Nuttin, 1980).
- "Academic Motivation Scale for Schoolchildren" (AMS-S) created by T.O. Gordeeva et al. (Gordeeva et al., 2017).
- "Satisfaction with Life Scale" (SWLS) by E. Diener adapted by E.N. Osin and D. A. Leontiev (Osin, Leont'ev, 2020).
- "Achievement Goal Questionnaire" (AGQ) — the Russian version of the questionnaire by E. Elliott et al. (Nikitskaya, Uglanova) (Nikitskaya, Uglanova, 2021).

The MMI research method allows us to consider the entire range of motivation in older adolescents. Completing unfinished sentences formulated in the first person encourages respondents to spontaneously list motivational objects that are desirable or, conversely, undesirable for them across various spheres (Nuttin, 2004; Tolstykh, 2005; Nuttin, 1980).

The AMS-S research method distinguishes scales of intrinsic motivation (cognitive motivation, achievement motivation, and self-development motivation), extrinsic motivation (motives of self-respect and introjected regulation), external regulation (positive — such as respect from parents — and negative), and amotivation (Gordeeva et al., 2017).

The authors of the Russian version of the SWLS research method state that it reflects the evaluative and reflexive components of subjective well-being. It describes the respondent's attitude toward life: an assessment of life circumstances as positive, a desire to change the past or their way of living, and so on (Osin & Leont'ev, 2020).

The AGQ research method analyzes learning goals related to (1) achievement of learning tasks, (2) self-development, and (3) demonstration of knowledge and skills in comparison to others. These are the goals that students seek to achieve or avoid (Nikitskaya & Uglanova, 2021).

Results

The place of learning motivation in the general structure of the motivation sphere of older adolescents

At the beginning of the analysis, let us consider the place of learning motives

within the general structure of the motivation sphere of older adolescents studying in different educational environments.

On one hand, the problem is interesting because the question of the leading activity of adolescence remains open. As a rule, discussions about it are of a general-theoretical nature. On the other hand, empirically, learning motivation is usually studied separately, and all research methods are aimed at that. We used the projective method of motivational induction (J. Nuttin), which allows us to identify the "weight" of learning motivation within the context of those substantive components to which the author categorizes all "motivational objects." According to Nuttin, "... the high frequency of indicating a certain motivation in the MMI is an indicator of the intensity of this motivation" (Nuttin, 2004, p. 545).

Based on the replies of the respondents the original list of substantive categories named by J. Nuttin was reduced in our study: those categories of responses that is difficult to attribute to a specific category as well as replies containing transcendental component that appeared very rare in our study were eliminated; the category of responses reflecting the will to have money (not to possess something, but *"to earn much"*, *"to have plenty of money"*, *"to be wealthy"*) was added. Thus, the following 9 motive categories remained for further consideration:

R3 — learning motives;

R — realization motives related to any other activity;

S — self motives related to one's own personality;

SR — self-realization motives;

C — communicative motives;

E — exploration motives;

P — possession motives related to the desire of possessing of material assets;

L — leisure motives related to recreation;

$ — motives related to money.

In this study the adolescents were to complete 10 unfinished sentences: 7 of them started from positive "inductors" (*"I want…", "I plan…"* and so on) and the other 3 started from negative ones (*"I don't want…"* and so on).

The distribution of adolescents' expressions completing the sentences-inductors, in % from the total amount of expressions in each group of respondents, can be found in Table 2.

As can be seen in Table 2, learning motives (R3) occupy different positions within the motivational sphere of adolescents studying in various educational environments. Learning is the most significant motive for school students (second place in the overall structure). It ranks fourth among college 1 students and sixth among college 2 students. According to J. Nuttin's coding rules for expression content, this category includes adolescents' responses related both to learning in general *("want to graduate from school well," "want to enter university," "want to study well")* and specific learning situations *("want to finish my project this week," "want to improve my score in Russian," "don't want to go to chemistry class").*

It is noteworthy that self-motives related to one's own personality (S) rank first in the motivation structure of adolescents across all three educational environments. Expressions such as *"I want all my dreams to come true," "I want to be successful," "I want to achieve all my goals,"* and others fall into this category.

Table 2

Place of learning motives (R3) in motivational structure of adolescents studying in different educational environments

School		College 1		College 2	
Category from MMI	**Rating (%)**	**Category from MMI**	**Rating (%)**	**Category from MMI**	**Rating (%)**
S	34,4	*S*	32,1	*S*	37,4
R3	18,4	*R*	16,9	*R*	15,4
R	16,1	*C*	15,8	*C*	14,2
C	12,9	*R3*	11,7	*P*	9,5
L	6,3	*L*	10,5	*L*	9,1
$	4,4	*$*	5,2	*R3*	7,4
SR	3,7	*SR*	3,3	*$*	3,1
P	2,3	*P*	2,6	*SR*	2,7
E	1,5	*E*	1,9	*E*	1,2

Another common feature among the three respondent groups is the placement of exploration motives. This category includes expressions related to a desire to explore or learn about something. For example: *"I would like to know how comics are created," "I want to know the traditions of other nations," "I would like to know more about my future profession,"* and others.

When testing the assumption that there are significant differences in the position of learning motivation within the overall motivation structure among older adolescents in different educational environments, a Kruskal-Wallis test was conducted (H = 12,841; df = 2; p = 0,002). Pairwise post-hoc comparisons with Bonferroni correction revealed statistically significant differences between the group of schoolchildren and college 2 students ($p < 0,01$): learning motivation is higher among schoolchildren.

In addition to analyzing the position of learning motives within the motivational sphere, we examined their relationship with other motives among older adolescents (based on MMI results) across different educational environments. The results of this correlation analysis (Spearman rank correlation coefficient) are presented in Table 3.

Table 3

Correlation between learning motives (R3) and other motives (MMI) in three groups of older adolescence

Category from MMI	School (R3)		College 1 (R3)		College 2 (R3)	
	ρxy	**α**	**ρxy**	**α**	**ρxy**	**α**
S	–0,319**	0,000	–0,356**	0,000	–0,185	0,345
R	0,065	0,430	0,170	0,076	0,390*	0,040

Category from MMI	School (R3)		College 1 (R3)		College 2 (R3)	
	ρxy	α	ρxy	α	ρxy	α
C	–0,394**	0,000	–0,292**	0,002	–0,289	0,136
L	0,018	0,828	0,164	0,089	–0,019	0,924
$	–0,072	0,381	–0,123	0,202	0,129	0,513
P	–0,018	0,826	–0,175	0,068	–0,281	0,148
SR	–0,143	0,081	–0,030	0,757	0,424*	0,025
E	–0,006	0,944	0,080	0,409	–0,200	0,309

Note: «**» — significance level $p \leq 0{,}01$; «*» — significance level $p \leq 0{,}05$.

Learning motives in school and in both colleges revealed inverse relation to motives related to one's own personality (*S*) and communication motives (*C*). College 2 results revealed direct relation of learning motives to motives related to any other activities (*R*) and self-development motives (*SR*).

Characteristics of learning motivation of older adolescents studying in different educational environments

Having considered the position of learning motives within the general motivation structure of older adolescents studying in different educational environments, we proceed to analyze learning motivation in each group using the AMS-S research method. The scores on each AMS-S scale for the three groups of older adolescents are presented below (Fig. 1).

The characteristics of learning motivation differ among different groups of older adolescents: when applying the Kruskal-Wallis test, significant differences were found on six out of nine scales (Table 4).

Subsequent pairwise post-hoc comparisons between the three groups of

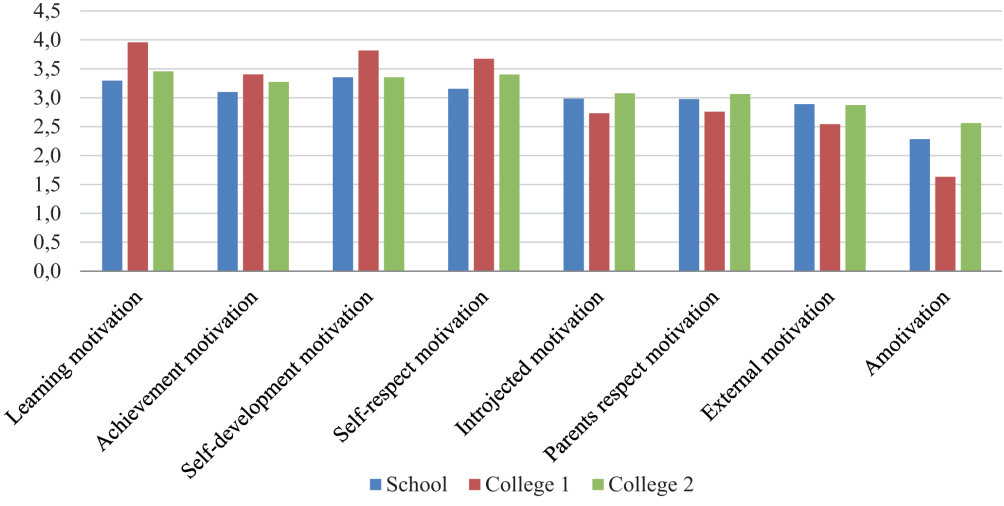

Fig. 1. Learning motivation in three groups of older adolescents

Table 4

Difference between learning motivation (AMS-S) in three groups of older adolescents

	Cognitive motivation	Achievement motivation	Self-development motivation	Self-respect motivation	Introjected motivation	Parents respect motivation	External motivation	Amotivation
Kruskal-Wallis	26,995	4,772	11,186	16,191	7,518	3,868	6,428	30,483
df	2	2	2	2	2	2	2	2
p	0,000**	0,092	0,004**	0,000**	0,023*	0,145	0,040*	0,000**

Note: «**» — significance level $p \leq 0{,}01$; «*» — significance level $p \leq 0{,}05$.

students (with the Bonferroni correction for several tests) revealed significant differences on five out of nine scales of the AMS-S research method.

Cognitive motivation and self-respect motivation differ significantly between groups of schoolchildren and students of both colleges (for schoolchildren, indicators on both scales are significantly lower: $p \leq 0{,}01$, $p \leq 0{,}05$). There are no significant differences between the students of the two colleges on these scales.

Significant differences between the groups of schoolchildren and college 1 students are obtained on the scales of "Self-development motivation" (the indicators are higher for college 1 students: $p \leq 0.01$) and "External motivation" (higher for schoolchildren: $p \leq 0{,}05$).

College 1 students had the lowest scores on the "Amotivation" scale: they are significantly lower than in the group of college 2 students ($p < 0{,}01$) and in the group of schoolchildren ($p < 0{,}01$). There are no differences on this scale between the groups of college 2 students and schoolchildren.

The data obtained during the processing of the AMS-S research method, which are the basis for the presented results, is available in the repository of psychological research and tools of MGPPU (Nikitskaya, 2024).

Learning motivation and the rate of life satisfaction of older adolescents studying in different educational environments

Nowadays the scholars note that the base of successful personality development is laid during the education period (Bondarenko, Fomina, 2023). Educational programs are aimed both at competence development of students and at the maintaining an optimal level of their psychological well-being. The relation of life satisfaction, which is an integral indicator of personality development, based on the subjective student's perception of the balance of positive and negative affects, to individual characteristics, learning motivation and educational environment is studied by many scientists (Golovei, Danilova, Gruzdeva, 2019; García-Ros, R., Pérez-González, F., Tomás, J.M. et al., 2023; Kaya, 2021; Klapp, Klapp, Gustafsson, 2924; Morosanova, Fomina, Bondarenko, 2021).

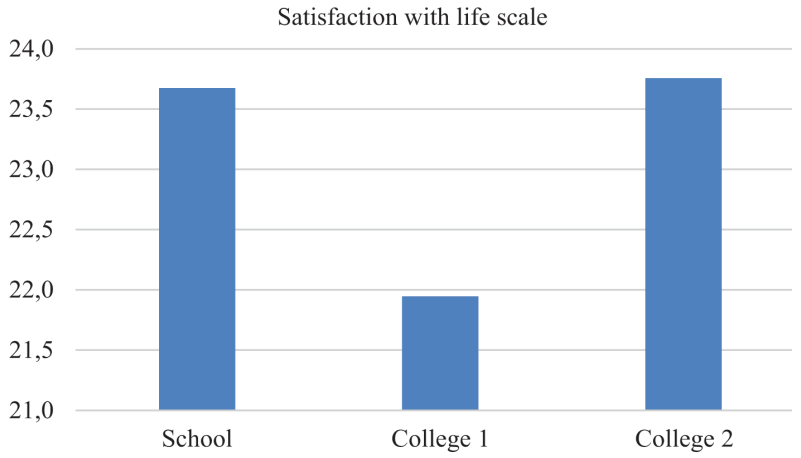

Fig. 2. Satisfaction with life in three groups of older adolescents

To form a more complete understanding of some of the personality traits of older adolescents studying in different educational environments, a correlation analysis (Spearman's rank correlation coefficient) was conducted between indicators of life satisfaction (SWLS) and various components of learning motivation (MMI, AMS-S, AGQ) of older adolescents.

Preliminarily a comparative analysis of the life satisfaction rate was carried out in three groups of participants (Fig. 2).

The empirical data obtained so far allow us to consider a life satisfaction score of 16 points as low, and scores of 25 points and above as high (Osin & Leont'ev, 2020). As can be seen in Figure 2, all three groups of older adolescents have a medium level of life satisfaction; however, the life satisfaction rates for school students and college 2 students are higher compared to those for college 1 students. The statistics do not reveal this difference when comparing the two colleges due to the relatively small sample size from college 2.

Correlation analysis using Spearman's rank correlation coefficient revealed the relationship between life satisfaction scores and learning motivation among older adolescents studying in each of the three educational institutions (Table 5).

In addition to examining the relationship between learning motivation and various aspects, we also considered the relationship between life satisfaction and learning achievement goals (AGQ).

The AGQ assessment method consists of six scales:

1 — self-achievement goals (to do better than I did before);

2 — self-avoidance goals (not to do worse than I did before);

3 — task-achievement goals (to cope with a task well);

4 — task-avoidance goals (not making mistakes when solving a task);

5 — performance-achievement goals (to do better than others);

6 — performance-avoidance goals (to do no worse than others).

Table 5

Correlations between life satisfaction rate (SWLS) and learning motives (R3 from MMI), educational achievement goals (AGQ), learning motivation (AMS-S) in three groups of older adolescents

Rate of various parameters from MMI, AGQ, AMS-S	School (SWLS)		College 1 (SWLS)		College 2 (SWLS)	
	ρxy	α	ρxy	α	ρxy	α
R3 (MMI)	–0,053	0,520	0,214*	0,025	0,455*	0,015
Self-approach goals (AGQ)	0,259**	0,001	0,193*	0,044	0,296	0,126
Self-avoidance goals (AGQ)	0,272**	0,001	0,118	0,221	0,244	0,210
Task-approach goals (AGQ)	0,357**	0,000	0,239*	0,012	0,283	0,144
Tak-avoidance goals (AGQ)	0,248**	0,002	0,165	0,086	0,107	0,587
Other-approach goals (AGQ)	0,191*	0,019	0,060	0,538	0,263	0,176
Other-avoidance goals (AGQ)	0,173*	0,034	0,170	0,078	0,215	0,272
Cognitive motivation (AMS-S)	0,467**	0,000	0,296**	0,002	0,425*	0,024
Achievement motivation (AMS-S)	0,415**	0,000	0,163	0,090	0,464*	0,013
Self-development motivation (AMS-S)	0,437**	0,000	0,209*	0,029	0,326	0,091
Self-respect motivation (AMS-S)	0,230**	0,004	0,129	0,181	0,265	0,173
Introjected motivation (AMS-S)	0,042	0,613	0,150	0,120	0,164	0,406
Parents respect motivation (AMS-S)	–0,049	0,550	0,005	0,961	0,261	0,180
External motivation (AMS-S)	–0,318**	0,000	–0,117	0,225	–0,160	0,417
Amotivation (AMS-S)	–0,278**	0,001	–0,243*	0,011	–0,345	0,072

Note: «**» — significance level $p \leq 0{,}01$; «*» — significance level $p \leq 0{,}05$.

In the group of schoolchildren, a high level of direct relation to life satisfaction is confirmed for all academic achievement goals (AGQ) and intrinsic motivation (AMS-S) ($p \leq 0{,}01$; $p \leq 0{,}05$). An inverse relation is observed between the life satisfaction score and external motivation as well as amotivation ($p \leq 0{,}01$).

Results for college 1 students demonstrate a statistically significant direct relationship between learning motives (MMI) ($p \leq 0{,}01$), self-achievement, and task-achievement goals (AGQ) ($p \leq 0{,}05$). An inverse relationship with amotivation (AMS-S) is also identified at $p \leq 0{,}05$.

For older adolescents studying at college 2, a direct relationship exists between life satisfaction and both learning motives (MMI) and intrinsic motivation (AMS-S) at $p \leq 0{,}05$; additionally, an inverse trend with amotivation was observed at $p \leq 0{,}072$.

By calculating correlation coefficients for each educational environment listed in Table 5, we used Fisher's z-transformation to compare these coefficients pairwise.

Significant differences in correlations between life satisfaction and learning motives — specifically R3 according to MMI — were found between groups of schoolchildren and college 1 students at $p < 0.05$, as

well as between groups of schoolchildren and college 2 students at $p < 0,01$. In both colleges, this relationship was positive but significantly different from that observed in the group of schoolchildren.

The correlation between cognitive motivation (AMS-S) and life satisfaction was significantly higher among schoolchildren than among college 1 students at $p < 0,05$; no significant difference was found with respect to college 2 students.

Furthermore, the relationship between achievement motivation and life satisfaction was lower among college 1 students compared to both schoolchildren ($p < 0,01$) and college 2 students ($p < 0,05$); no difference was observed between college 2 students and schoolchildren.

Finally, the association between self-development motivation — measured by AMS-S — and life satisfaction was higher among schoolchildren than among college 1 students ($p < 0,05$).

Thus, we observe that life satisfaction among adolescents studying in three different educational environments relates differently to various components of learning motivation.

Discussion

In our opinion, the selected groups of adolescents can serve as key reference points reflecting the diversification of the process of completing secondary education at this stage.

It is natural to suppose that the learning motivation of students in these educational institutions — being an equally important component of their learning activity — differs in content and level across them. The study confirmed this by identifying specific characteristics of older adolescents' learning motivation in three different educational environments.

First, a comparative analysis showed that learning motives occupy different positions within the overall structure of adolescents' motivation-need sphere and differ in their "weight" and significance. This conclusion was drawn based on using J. Nuttin's projective research method — motivational induction (MMI). By completing inductor sentences ("I want...", "I dream...", "I do not plan...", etc.), respondents can write extensively, briefly, or not at all about certain "motivational objects" (a term introduced by J. Nuttin). It is believed that the more frequently a respondent writes about certain motives, the more important those motives are for him. Based on this logic, it was found that learning motives are most important for school students and least important for students at college 2.

However, it was also revealed that learning motives do not occupy the first position in any of the adolescent groups. Instead, this position — by a wide margin — is occupied by motives related to one's own personality across all three groups. Following the logic of A.N. Leontiev, we may say that the dominance of such motives among older adolescents reflects the paramount importance they assign to self-determination, self-exploration, and identity formation. This general age-related characteristic of the motivational hierarchy — independent of specific educational environments — can serve as an argument in ongoing discussions about leading activities during older adolescence (early youth). It should be noted that educational-professional activity is widely accepted today as a leading activity for older adolescents; therefore, it would be logical to expect a dominance or combination of learning motives with motives that Nuttin classifies as work-related. This assumption has been refuted.

An important — though unfortunately expected — fact obtained through MMI is a clear discrepancy between learning motives and exploration motives, which in all three groups ranked last in terms of frequency of mention. Exploration motives are least expressed among college 2 students and most among college 1 students; school students show medium levels. This fact can also be considered expected because college 1 students are young people who have already chosen their future specialty and are striving for results — including creative achievements — that aim at self-fulfillment within their chosen profession.

Although college 1 students demonstrated, as expected, the most "productive" learning motivation (they exhibit higher intrinsic motivation and lower amotivation according to AMS-S data), our study shows that for this group of older adolescents it is not learning per se that matters most but rather self-development and a focus on professional growth as an ability to cope with tasks — evidenced by high significance levels in relationships between self-achievement goals and task-achievement goals based on AGQ, along with life satisfaction rates.

For school students, on the contrary, general learning appears to be more important. This conclusion is based firstly on their ranking second in learning motives within their motivational structure according to MMI results (R3), secondly on evidence from AMS-S showing a direct relationship between life satisfaction and intrinsic motivation as well as self-respect motivation — and an inverse relationship with external motivation and amotivation — and thirdly on findings from AGQ indicating a relationship between life satisfaction and all types of learning achievement goals. Presumably, the high importance placed on learning activity during senior grades stems from preparation for imminent university admission.

For college 2 students, however, learning as an activity does not seem to significantly influence their subjective sense of life satisfaction. It is no coincidence that their learning motives have the lowest "weight" within their motivational structure according to MMI compared to other groups; additionally, none of their learning achievement goals (AGQ) are related to life satisfaction (SWLS).

Having described the specifics of learning motivation of older adolescents from different educational environments, we consider it important to note another characteristic common to all groups of adolescents. The direct relation of life satisfaction to various scales favorable for learning motivation according to AMS-S and the inverse relation to amotivation in all three groups of students allows us to state the importance of learning activity in assessing the ratio of positive and negative affects in life by an older adolescent (which is revealed by the SWLS research method), regardless of the learning motives place in the motivation-need sphere and regardless of the specific characteristics of learning motivation. This fact confirms the results of previous studies conducted in Russia and abroad on the relation of the subjective perception of positive and negative affects in a student's life to learning motivation (Bondarenko, Fomina, 2023; Egorenko, 2019).

This conclusion is also correlates with the fact that, with medium rates of life satisfaction in all three groups of older adolescents, the lowest rates are dem-

onstrated by college 1 students (with the most "productive" learning motivation).

Apparently, college 1 students are characterized by a will to understand themselves, an increased level of anxiety, and a large number of fears. We make this conclusion not only based on the results of statistics, but also on the basis of an analysis of the content of the questionnaires. The forms filled out by students of this group of adolescents differ sharply from the other ones in both the nature of what is written and the volume of the responses.

Conclusions

1. The study reveals the following characteristics of the motivation-need sphere, common to all three groups of adolescents surveyed (senior grades school students and their peers from two diametrically different colleges in terms of prestige, with different levels of entrance tests and academic performance requirements for applicants):

1.1. The first place in importance is taken by motives related to one's own personality, which allows us to consider the activity of self-determination, the search for one's identity as leading in older adolescence.

1.2. Exploration motives take the last place in all three groups of adolescents, thus being the least subjectively significant, and, as it turned out, unrelated to learning motives.

2. The learning motivation of 16–18-year-olds studying in different educational environments varies both in place among other motives and in its specific characteristics.

3. The rates of life satisfaction are differently related to different aspects of learning motivation in the three surveyed groups, which confirm the above statements about the fundamental difference in the role of learning motivation both in the context of the activities of adolescents studying in different educational environments and in the context of their personality development. In our opinion, it is precisely the peculiarities of personality development that can explain the significantly lower rates of life satisfaction among students at a prestigious college.

Limitations. This study is limited by the disproportion among the three surveyed adolescent groups and by gender imbalance within these groups.

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Maria G. Nikitskaya — data collection and analysis; writing and design of the manuscript; application of statistical methods for data analysis; visualization of research results.

Nataliia N. Tolstykh — ideas; annotation, writing and design of the manuscript; planning of the research; control over the research.

All authors participated in the discussion of the results and approved the final text of the manuscript.

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The authors declare no conflict of interest.

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High school students' burnout in the context of exam preparation: the role of the educational environment

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Abstract

Context and relevance. School burnout is a fairly new concept that is beginning to be widely discussed due to the need for intensive and continuous learning in today's society. Researches show that students with high burnout level are less involved in studying, demonstrate lower academic results, drop out of school more often, and are prone to depressive symptoms. **Objective.** To study the problem of school students' burnout in the context of preparation for the exams and to identify burnout-related characteristics of the educational environment in a sample of highly motivated Russian high school students. **Methods and materials.** Online survey of students using the "School Burnout Inventory" and a specially developed author's questionnaire. **Results.** The analysis of answers of more than 1000 high school students shows the presence of significant links between burnout and the level of academic load, additional education, subjective assessment of the quality of relations between teachers and students. **Conclusions.** Results can be used to strengthen psychological and pedagogical support of high school students and design managerial decisions regarding preparation of high school students for the exams, because prevention and reduction of burnout in school are important for both individual well-being of students and well-being of the school climate, and they can also matter for adaptation of former high school students to the university environment.

Keywords: school burnout, schoolchildren's well-being, educational environment, teacher-pupil relations, preparation for the exams, highly motivated schoolchildren

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Выгорание старшеклассников в контексте подготовки к ЕГЭ: роль образовательной среды

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Резюме

Контекст и актуальность. Выгорание школьников является достаточно новым конструктом, который начинает широко обсуждаться в связи с необходимостью интенсивного и непрерывного обучения в современном обществе. Исследования показывают, что учащиеся с высокими показателями выгорания слабее вовлечены в учебу, демонстрируют более низкие академические результаты, чаще отсеиваются из школы, подвержены депрессивной симптоматике. **Цель**. Установить связи выгорания школьников с характеристиками образовательной среды в контексте подготовки к ЕГЭ на выборке высокомотивированных российских старшеклассников. **Методы и материалы**. Проведен онлайн-опрос учащихся с использованием «Опросника выгорания школьников» и специально разработанной авторской анкеты. **Результаты**. Анализ ответов более 1000 учащихся старшей школы показывает наличие значимых связей между выгоранием и уровнем академической нагрузки, насыщенностью дополнительного образования, а также субъективной оценкой качества отношений между учителями и учениками. **Выводы**. С учетом ограничений, обусловленных несбалансированностью выборки по полу, полученные результаты можно использовать для усиления психолого-педагогической поддержки учащихся старшей школы и проектирования управленческих решений в отношении подготовки старшеклассников к ЕГЭ, поскольку профилактика и снижение выгорания в школе важны как для индивидуального благополучия учащихся, так и для благополучия школьного климата в целом, а также они могут играть роль в адаптации бывших школьников к среде вуза.

Ключевые слова: выгорание школьников, благополучие школьников, образовательная среда, отношения «учитель-ученик», подготовка к ЕГЭ, высокомотивированные школьники

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Introduction

Research on burnout syndrome [6; 10], which is most commonly understood as a prolonged response to chronic emotional and interpersonal stressors at work — manifesting as emotional exhaustion, de-

personalization, and a reduced sense of professional accomplishment [14; 15] — has been conducted since the second half of the 20th century. However, since the early 2000s, studies have emerged indicating that burnout can also occur among students, particularly high school and university students, as their academic workload and level of responsibility are often comparable to those of working adults [23; 26]. Student burnout (academic burnout) follows a similar three-component structure, comprising: (1) emotional exhaustion, which manifests as a persistent sense of tension and chronic fatigue due to excessive academic demands; (2) cynicism toward learning (analogous to depersonalization in adults), characterized by a detached, indifferent attitude toward the educational process, loss of interest in studying and teachers, and a diminished sense of purpose in learning; and (3) a sense of inadequacy and reduced academic achievement, expressed in declining academic performance, a mismatch between the student's capabilities and school expectations, and decreased self-efficacy in learning [1; 23].

Academic burnout has several negative consequences for students. It is negatively associated with their psychological well-being, engagement in learning, and academic performance [4; 9; 18; 24]. Burnout-related disengagement can lead to withdrawal from the learning process and academic failure [21; 23]. Adolescents experiencing academic burnout are also at greater risk of school dropout and are more prone to depressive symptoms and suicidal ideation [17; 31].

Individual personality-related risk factors for burnout among students include gender (with girls being at significantly higher risk) [24] and perfectionistic tendencies [27]. Protective factors include perseverance in goal achievement [13; 29; 30] and socio-emotional skills (such as social engagement, a sense of belonging, and academic buoyancy), which mitigate the risk of burnout among adolescents [12; 25]. Among the social determinants of student burnout, school-related factors prevail — for example, the support received from teachers and classmates, teacher sensitivity to students' emotional states, and the presence of disrespectful and impolite relationships within the school environment [3]. Additionally, anxiety related to university admission has been identified as a significant school-related stress factor, particularly in connection with exam preparation [32].

The aim of this study is to examine the relationships between burnout indicators among highly motivated Russian high school students and characteristics of the educational environment, such as the nature of student-teacher relationships, the accessibility and diversity of extracurricular education, and the quantity and content of academic tracks during preparation for the Unified State Exam (USE).

Materials and methods

From February to March 2024, a survey was conducted at an online school specializing in preparing highly motivated students for the Unified State Exam (USE). Information about the survey was disseminated via the social media platform Telegram among students participating in remote USE preparation courses across multiple subjects. Additionally, the survey was introduced during online classes. Data collection was carried out using Yandex Forms after obtaining written informed consent for voluntary participation.

The sample consisted of 1,209 students in grades 10 and 11 (M = 17,00, SD = 0,57), including 1,112 female and 97 male participants. All respondents were enrolled in online USE preparation courses, lived in

various types of settlements, and studied in different types of educational institutions and academic tracks. However, due to the uneven distribution of students across these categories, differences between them were not analyzed. All participants attended online classes several times per week for USE preparation in different subjects, which allowed them to be classified as highly motivated students. The gender composition of the sample (92% female, 8% male) reflects the predominantly female target audience of the online school but also limits the generalizability of the findings.

To assess school burnout among 10th- and 11th-grade students, the School Burnout Inventory (SBI) [23], adapted for the Russian population by A.A. Bochaver and O.R. Mikhailova [1], was used. The response scale was reduced to a traditional 5-point Likert scale (ranging from 1 — completely disagree to 5 — completely agree). The inventory consists of three subscales: Exhaustion (4 items, score range 4–20; example item: "Problems at school often disrupt my sleep."), Cynicism (3 items, score range 3–15; example item: "I lack the motivation to study at school, and I often think about dropping out."), Sense of inadequacy (2 items, score range 2–10; example item: "I used to have higher expectations for my school performance than I do now.") [2].

Additionally, participants answered a set of questions developed based on a review of scientific literature. These questions addressed: 1) characteristics of the educational environment, such as the number of subjects and specialized courses available for selection (e.g., "Do you have the option to choose subjects and specialized courses?"), the availability of academic tracks ("How many specialized 11th-grade classes are there in your school?"), and the number of minutes spent daily on homework; 2) attitudes toward these characteristics (e.g., "Does the academic track you are enrolled in align with your intended field of study?"): 3) perceived relationships with teachers and school administration (e.g., "Do your teachers help you prepare for the USE?", "In your opinion, are teachers and school administrators interested in students' successful performance on the USE?").

Responses were either binary (yes/no) or measured on a 5-point Likert scale to assess the degree of agreement with the statements. Additionally, questions regarding sociodemographic characteristics (gender, age, and place of residence) were included.

Data analysis was performed using Jamovi. Scale reliability assessment (Table 1) demonstrated high internal consistency for the Cynicism subscale, questionable reliability for the Exhaustion subscale, and low reliability for the Sense of Inadequacy subscale, suggesting that results should be interpreted with caution [8]. Given that the scale distributions deviated from normality, nonparametric methods were employed, including the Mann–Whitney U test, Spearman's rank correlation coefficient, and the Kruskal–Wallis test. In cases of significant differences, post hoc analysis was conducted using the Dwass–Steel–Critchlow–Fligner method.

Results

A comparison of school burnout levels between female and male students using the Mann–Whitney test revealed significant differences: female students exhibited significantly higher scores across all three dimensions of burnout. However, the effect size, measured by the rank-biserial correlation coefficient, was low (see Table 2). These findings align with international research [24; 28]. However, given the substantial discrepancy in sample sizes between male and female students, the

Table 1

Descriptive statistics and indicators of consistency of the scales of the Burnout Questionnaire for school students

	Mean	SD	Skewness	Kurtosis	W Shapiro–Wilk	p	α Cronbach's	ω McDonald's
Exhaustion	12,78	3,39	–0,10	–0,35	0,99	0,00	0,62	0,63
Cynicism	11,16	3,09	–0,72	–0,22	0,93	0,00	0,82	0,82
Sense of inadequacy	7,13	1,97	–0,50	–0,44	0,94	0,00	0,58	0,58

97 male participants were excluded from further analysis. Consequently, all subsequent calculations were conducted exclusively on the sample of 1,112 female students. Although the discussion refers to students in general, it is important to acknowledge that the conclusions are based on a female student sample, and generalizing these findings to male students should be approached with caution.

Objective characteristics of the educational environment

Spearman's correlation analysis revealed a weak positive relationship between academic workload (measured as the number of daily lessons) and exhaustion ($\rho = 0{,}13$, $p < 0{,}001$), as well as a very weak association with a sense of inadequacy ($\rho = 0{,}06$, $p < 0{,}05$). Additionally, the number of minutes spent on daily homework exhibited a weak positive correlation with exhaustion ($\rho = 0{,}19$, $p < 0{,}001$). No significant correlations were found between burnout levels and the number of specialized 11th-grade classes in a school (an indirect indicator of school size) or the number of mock exams taken by students before the second semester.

A comparison of distributions using the Mann–Whitney test (see Table 3) demonstrated that cynicism and a sense of inadequacy were significantly higher among students who lacked the opportunity to choose their academic track or specialization, as well as among those who

Table 2

Differences between girls and boys on burnout indicators

Scale	Group	N	M	U Mann-Whitney	p	Effect size
Exhaustion	Female	1112	12,91	39943	**0,00**	0,26
	Male	97	11,29			
Cynicism	Female	1112	11,23	45585	**0,01**	0,16
	Male	97	10,31			
Sense of inadequacy	Female	1112	7,19	43651	**0,01**	0,19
	Male	97	6,47			

reported having no access to additional extracurricular activities. However, no significant differences were observed in exhaustion levels between these groups. Students engaged in sports activities exhibited significantly lower exhaustion and cynicism levels, although the effect size was weak. Furthermore, participation in foreign language courses was associated with significantly lower cynicism, whereas engagement in creative activities did not yield statistically significant differences in burnout levels.

No significant differences in burnout scores were found between students whose schools did or did not offer specialized academic tracks, nor between students who had taken mock exams at the time of the survey and those who had not.

Subjective characteristics of the educational environment

Findings indicate that subjective perceptions of various aspects of the educational environment — including both content-related and organizational factors

Table 3

Burnout scales and objective characteristics of the educational environment

Scale	Variable	Group	N	M	U Mann-Whitney	p	Effect size
Exhaustion	Opportunity to choose a study track and academic direction	Yes	220	12,70	94266	0,36	0,04
		No	892	12,96			
Cynicism		Yes	220	10,55	82909	**0.00**	0,16
		No	892	11,40			
Sense of inadequacy		Yes	220	6,82	85327	**0,01**	0,13
		No	892	7,28			
Exhaustion	Access to extracurricular activities	Yes	628	12,79	146142	0,27	0,04
		No	484	13,06			
Cynicism		Yes	628	10,82	126762	**0,00**	0,17
		No	484	11,77			
Sense of inadequacy		Yes	628	6,97	131091	**0,00**	0,14
		No	484	7,48			
Exhaustion	Participation in additional sports activities	Yes	181	12,47	76291	**0,04**	0,10
		No	931	12,99			
Cynicism		Yes	181	10,78	76521	**0,05**	0,09
		No	931	11,32			
Sense of inadequacy		Yes	181	7,22	80287	0,31	0,05
		No	931	7,22			
Exhaustion	Participation in additional foreign language classes	Yes	115	12,56	52632	0,15	0,08
		No	997	12,95			
Cynicism		Yes	115	10,32	48040	**0,00**	0,16
		No	997	11,34			
Sense of inadequacy		Yes	115	6,96	53235	0,20	0,07
		No	997	7,22			

(e.g., the range of subjects, specialized courses, and academic tracks available) as well as socio-communicative factors (e.g., perceived teacher support and attitudes) — are closely associated with burnout levels. Table 4 presents correlations between students' evaluations of several educational factors (e.g., satisfaction with subject and course selection, perceived engagement of teachers and school administration in students' success in the Unified State Exam, and perceived teacher support) and burnout components. Nearly all associations were statistically significant, with weak to moderate effect sizes.

Three factors–satisfaction with subject and course selection, alignment between students' academic track and their intended field of study, and satisfaction with school-based exam preparation — were further analyzed using the Kruskal–Wallis test, followed by pairwise comparisons with the Dwass–Steel–Critchlow–Fligner test (see Appendix, Tables 1–6). The results indicate significant differences depending on students' levels of satisfaction with these aspects of the educational environment. Although the effect sizes were generally weak, they reached 0,20 in the case of cynicism in relation to satisfaction with school-based exam preparation. Differences were observed not only between students at the extremes of the satisfaction scale (i.e., "completely satisfied" vs. "completely dissatisfied") but also among those with more moderate perspectives or uncertainty in their responses.

Students' perceptions of teacher attitudes play a critical role in burnout among high school students. Specifically, perceived teacher confidence in students' ability to pass the Unified State Exam, teacher support in exam preparation, and perceived in-

Table 4

Correlations between burnout components and respondents' assessment and perception of certain characteristics of the educational environment

Variables	Exhaustion	Cynicism	Sense of inadequacy
Satisfaction with the selection of subjects and specialized courses	–0,15*	–0,30***	–0,25***
Alignment of the study track with the intended field of further education	–0,04	–0,19***	–0,16***
Teachers' and administration's interest in students' successful performance on the Unified State Exam (USE)	–0,19***	–0,31***	–0,26**
Teachers' support in preparation for the Unified State Exam (USE)	–0,23***	–0,36***	–0,29***
Satisfaction with the school's preparation for the Unified State Exam (USE)	–0,29***	–0,44***	–0,37***
Perceived confidence and support from teachers toward the respondent	–0,33***	–0,42***	–0,39***
Perceived doubts from teachers regarding the respondent's abilities and success	0,35***	0,35***	0,41***

Note: *p < .05, **p < .01, ***p < .001

terest of teachers and school administrators in students' academic success were all moderately and negatively correlated with burnout. Conversely, perceived teacher doubt regarding students' ability to pass the exam was positively associated with burnout.

Table 5 presents differences in burnout levels between student groups based on whether they reported receiving teacher support, praise, and encouragement throughout the academic year or whether they experienced negative teacher interactions, such as harsh remarks, insults, or shouting.

Statistically significant differences were observed in all cases, with mean score

Table 5

Burnout scales and perceived attitudes of teachers

Scale	Variable	Group	N	M	U Mann-Whitney	p	Effect size
Exhaustion	Support	Yes	410	12,26	118034	**0,00**	0,17
		No	702	13,27			
Cynicism		Yes	410	10,23	103413	**0,00**	0,28
		No	702	11,79			
Sense of inadequacy		Yes	410	6,59	104783	**0,00**	0,27
		No	702	7,53			
Exhaustion	Praise	Yes	625	12,46	126290	**0,00**	0,17
		No	487	13,48			
Cynicism		Yes	625	10,65	114110	**0,00**	0,25
		No	487	11,98			
Sense of inadequacy		Yes	625	6,82	113529	**0,00**	0,25
		No	487	7,68			
Exhaustion	Approval	Yes	562	12,49	131013	**0,00**	0,15
		No	550	13,34			
Cynicism		Yes	562	10,80	129977	**0,00**	0,16
		No	550	11,67			
Sense of inadequacy		Yes	562	6,88	126877	**0,00**	0,18
		No	550	7,51			
Exhaustion	Harsh remarks	Yes	443	14,15	95765	**0,00**	0,35
		No	669	12,09			
Cynicism		Yes	443	12,34	97402	**0,00**	0,34
		No	669	10,49			
Sense of inadequacy		Yes	443	7,97	91456	**0,00**	0,38
		No	669	6,68			
Exhaustion	Insults	Yes	179	14,57	55508	**0,00**	0,34
		No	933	12,59			
Cynicism		Yes	179	12,64	56083	**0,00**	0,33
		No	933	10,96			

Scale	Variable	Group	N	M	U Mann-Whitney	p	Effect size
Sense of inadequacy		Yes	179	8,08	57206	**0,00**	0,32
		No	933	7,02			
Exhaustion	Yelling	Yes	298	14,01	91353	**0,00**	0,25
		No	814	12,50			
Cynicism		Yes	298	12,39	85077	**0,00**	0,30
		No	814	10,80			
Sense of inadequacy		Yes	298	6,95	89246	**0,00**	0,26
		No	814	7,85			

differences exceeding two points in some instances. The effect sizes were substantial, with a maximum value of 0,38 for harsh remarks. Overall, negative teacher interactions (e.g., harsh remarks, insults, shouting) demonstrated stronger effect sizes compared to positive interactions (e.g., support, praise, encouragement). Students who perceived negative teacher attitudes exhibited higher burnout levels, whereas those who viewed their teachers as supportive reported lower burnout levels. Furthermore, the association between perceived negative teacher attitudes and burnout was stronger than the association between perceived positive teacher attitudes and burnout.

Discussion

This study reveals multiple significant associations between school burnout and various characteristics of the educational environment.

First, we examined the relationship between school burnout and objective characteristics of the educational environment. The findings indicate no significant association between burnout and the availability of specialized academic tracks, the number of 11th-grade classes in a school, or the number of mock exams taken by the second semester. However, high academic workload demonstrated a weak but positive correlation with burnout. The potential link between burnout and the type of academic track requires further investigation. Overall, the results suggest that burnout is less related to objective indicators of the educational environment and more strongly associated with students' ability to make choices (e.g., selecting academic tracks and additional courses) and to extend their learning beyond the framework of the Unified State Exam (USE) through extracurricular education. Such activities may enhance students' well-being, reduce physical inactivity, and provide opportunities for self-actualization and achievement. Given that highly motivated high school students devote most of their time to USE preparation, our findings suggest that participation in voluntary activities such as sports and foreign language courses may serve as important psychological resources that help mitigate burnout.

Second, school burnout was analyzed in relation to students' perceived characteristics of the educational environment. The results indicate that higher satisfaction with the availability of subjects and specialized courses corresponds to lower burnout levels across all dimensions. Furthermore, the better a student's academic track aligns with their intended field of study, the lower their levels of cynicism and perceived inadequacy. Additionally, greater satisfac-

tion with school-based USE preparation was associated with lower exhaustion, cynicism, and perceived inadequacy. Thus, students' satisfaction with the opportunities provided by their schools, along with their ability to take advantage of these opportunities, plays a crucial role in burnout prevention and may serve as a protective factor against it.

Third, we examined the relationship between school burnout and students' perceptions of teacher and administrative attitudes toward them. The analysis revealed consistently significant statistical associations: positive teacher attitudes — such as confidence in students' success, support, praise, and encouragement — were linked to lower burnout levels. Conversely, a lack of confidence in students' abilities, harsh remarks, insults, and shouting were associated with higher burnout scores.

These findings largely align with previous international research. For example, studies indicate that additional physical activity is negatively associated with emotional exhaustion [7], while academic workload is closely linked to student exhaustion [5; 22]. Researchers have also emphasized the role of social support, particularly student-teacher relationships. Prior studies demonstrate that teachers' attentiveness and respect toward students are negatively correlated with school burnout [20], while support for struggling students is linked to lower burnout levels [16]. A survey of 2,400 Finnish students found that the level of emotional support received from teachers and classmates was positively correlated with academic engagement, which in turn was negatively associated with cynicism — one of the three core components of burnout [19]. Furthermore, a meta-analysis of studies on different types of social support and school burnout found a negative correlation between all forms of social support and students' sense of inefficacy in school [11].

Thus, teacher-student relationships play a significant role in students' emotional well-being, a finding supported by both international research and the results of the present study.

Conclusions

The identified relationships between perceived characteristics of the educational environment and the severity of academic burnout among students have significant practical implications and considerable managerial potential. These findings can serve as a foundation for targeted interventions and administrative decisions in schools aimed at preventing burnout. Key strategies may include (1) reducing academic workload, (2) enhancing students' self-regulation skills, fatigue recognition, and self-care practices, and (3) improving the overall school climate and the quality of student-teacher relationships. It is crucial to invest in teacher training, expanding their knowledge of student burnout, its antecedents, and its consequences. This will enable educators to effectively support students' emotional well-being, prevent burnout, and provide a more adaptive learning environment. Additionally, when designing USE (Unified State Exam) preparation programs, schools should consider students' intentions and incorporate their feedback as a potential indicator of program effectiveness.

Although the present study does not establish causal relationships, it suggests the existence of reciprocal links between school burnout and teacher behavior. On one hand, students experiencing exhaustion, cynicism toward learning, and a perceived mismatch with academic ex-

pectations may elicit more frustration and less empathy from teachers. On the other hand, negative teacher attitudes — such as a lack of praise, support, and encouragement — may contribute to increased exhaustion, cynicism, and feelings of inadequacy among students.

An important consideration is the role of universities, which admit emotionally exhausted first-year students who may already exhibit cynicism toward the educational process. The findings highlight potential challenges in student adaptation to the university environment and emphasize the need to address their emotional well-being to minimize the risk of escalating burnout and subsequent psychological and academic difficulties.

Future research directions include comparing burnout severity among students enrolled in different academic tracks, examining gender differences, and analyzing variations in burnout levels between high school students and vocational college students. Additionally, it would be valuable to compare students in traditional in-person schooling with those in distance learning programs. Further research could explore the relationship between student burnout and objective school characteristics, geographic and socioeconomic factors, academic workload, academic performance, and USE results. Employing methods beyond self-report measures would provide a more comprehensive understanding of academic burnout. These insights would support the development of empirically grounded programs tailored to high school students, aimed at preventing and reducing burnout, as well as informing administrative decisions that promote student well-being.

Limitations: Highly motivated high school students participated in the survey; however, the final sample included only girls, so caution should be exercised when extrapolating results to boys. Additionally, there is no objective data on the schools where the respondents study.

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The effectiveness of motivational interviewing on resilience, sense of purpose, and social interest among adolescent girls in middle school

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Abstract

Objective. The present study aims to investigate the effectiveness of motivational interviewing in enhancing resilience, sense of purpose, and social interest among adolescent girls in middle school (ages 13–14). **Methods.** This study employed a quasi-experimental design with a pre-test/post-test and a control group. The tools used in this study included the Connor-Davidson Resilience Scale, Crumbaugh and Maholick's Purpose in Life Test, and Crandell's Social Interest Scale. Data analysis was performed using multivariate analysis of covariance (MANCOVA). **Results.** The findings suggest that motivational interviewing significantly enhances adolescent girls' sense of purpose during the intervention phase (ηp^2 = 0,473) and follow-up phase (ηp^2 = 0,378). It also improves their resilience during the intervention phase (ηp^2 = 0,247) and follow-up phase (ηp^2 = 0,205). Furthermore, motivational interviewing is effective in increasing adolescent girls' social interest during the intervention phase (ηp^2 = 0,203) and follow-up phase (ηp^2 = 0,109). **Conclusions.** Overall, motivational interviewing can strengthen adolescents' resilience against challenges, foster a sense of purpose, and serve as a foundation for social interest, increased empathy, and greater social participation.

Keywords: motivational interviewing, resilience, sense of purpose, social interest, adolescent girls

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Эффективность мотивационного интервью в развитии устойчивости, целеустремленности и социального интереса у девочек-подростков в средней школе

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Резюме

Цель. Настоящее исследование направлено на изучение эффективности мотивационного интервью в повышении устойчивости, чувства целеустремленности и социального интереса у девочек-подростков средней школы (13–14 лет). **Методы.** В исследовании использовался квазиэкспериментальный дизайн с предтестом, посттестом и контрольной группой. В качестве инструментов применялись шкала устойчивости Коннора-Дэвидсона, тест смысла жизни Крамбо и Махолика, а также шкала социального интереса Кранделла. Анализ данных проводился с использованием многомерного ковариационного анализа (MANCOVA). **Результаты.** Полученные данные свидетельствуют о том, что мотивационное интервью значительно повышает чувство целеустремленности у девочек-подростков как на этапе интервенции (ηp^2 = 0,473), так и на этапе последующего наблюдения (ηp^2 = 0,378). Оно также способствует повышению их устойчивости на этапе интервенции (ηp^2 = 0,247) и последующего наблюдения (ηp^2 = 0,205). Кроме того, мотивационное интервью эффективно увеличивает социальный интерес подростков в период интервенции (ηp^2 = 0,203) и на этапе последующего наблюдения (ηp^2 = 0,109). **Выводы.** В целом мотивационное интервью может способствовать укреплению устойчивости подростков перед жизненными трудностями, формированию чувства целеустремленности, а также служить основой для развития социального интереса, повышения эмпатии и вовлеченности в социальное взаимодействие.

***Ключевые слова*:** мотивационное интервью, устойчивость, целеустремленность, социальный интерес, девочки-подростки

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Introduction

Adolescence is a pivotal period of transformation. During this time, teenagers are influenced by various internal and external emotions, which can sometimes be contradictory and may contribute to the challenges and issues faced during this stage. Thus, one of the essential skills during adolescence is the ability to master these emotions and enhance resilience against them (Mahmoud Alilou, Khanjani, Bayat, 2017). Resilience is defined as the capacity to withstand stress and return to a natural state of equilibrium after experiencing stressors (Karimi et all., 2016). Resilience is a dynamic process that reflects an individual's positive adaptation to significant life hardships, facilitated by protective processes that exist alongside risk factors and side effects, making it a crucial component in reducing negative emotions and solving problems during adolescence (southwick et all., 2014). Research indicates that increasing resilience is a necessary element for psychological adjustment, personal satisfaction, a sense of competence, social efficacy, academic success, and overall physical and mental health, and can be effective in regulating and balancing the contradictory and negative emotions of adolescents (Ghaempour, Esmailian, Sarafraz, 2019; Ong, Edwards, Bergeman, 2006).

One of the influential factors in enhancing resilience is having a purpose in life. Purposefulness can significantly increase resilience against various problems and issues (Ostafin, proulx, 2020). Purposefulness is a predictive concept regarding the fulfillment of goals that are meaningful to the individual and also impact the world around them (Malin, Liauw, Damon, 2017). Healthy and purpose-driven adolescents are characterized by their ability to establish positive interpersonal connections and possess a social interest. Social interest is not a singular concept but rather an amalgamation of feelings and behaviors. Essentially, social interest signifies a propensity for collaboration, which can be fostered through community and social life via cooperation, participation, understanding, and compassion (Sergazi, Hoseini, 2021). Individuals with social interests set positive life goals and lifestyles based on empathy, responsibility, cooperation, and sharing, enabling them to successfully resolve their issues (Poorseyed et all., 2016). Overall, the World Health Organization (2022) identifies four dimensions of mental health: functioning, adaptability, perfection, and connection (Organization WH , 2022).

Given the significance of resilience, purposefulness, and social interest in shaping mental health and the special importance of adolescence as a period where personality structure and demeanor are established, and individuals attain a definition of their identity, employing methods to create and enhance these variables is essential. One of the relevant and effective methods, due to its short-term sessions suitable for implementation in schools and interaction with adolescents, is therapy through motivational interview. Motivational interview enhances counseling effectiveness by increasing intrinsic motivation and guiding individuals through higher stages of psychological readiness for change and acceptance of health recommendations (Hosseini et all., 2020). This client-centered and directive therapeutic approach aims to strengthen and increase internal motivation for change by identifying, recognizing, and resolving doubts, ambivalence, and inconsistencies in behavior, using an interactive and empathetic listening style to boost motivation (Panahi et all., 2022).

Regarding the impact of motivational interview on the variables of the current research in Iran, no study has been conducted, and the existing studies involving motivational interview are implicitly related to the discussed variables. For instance, In a study, It was found that motivational interview impacts procrastination (intentional procrastination, fatigue-induced procrastination, and disorganization-induced procrastination), which can implicitly relate to the discussion of adolescents' purposefulness in education (Hosseini et all., 2020). Similarly, Researchers in a study, have identified motivational interview as an effective intervention in reducing academic procrastination and enhancing students' motivation and effort (Garavand et all., 2022). Re-

searchers in a study, have deemed motivational interview effective in enhancing self-efficacy and the power of tolerance and resilience against distress in patients (Bourojeni et all., 2021). In a study it was found that motivational interview effective in reducing academic procrastination and increasing academic resilience and motivation for educational purposefulness (Bagheri Hosein Abadi, Yoosefi, 2023). Researchers have considered a therapeutic package based on motivational interview (Rezaei et all, 2023), acceptance and commitment therapy, and compassion-focused therapy effective in increasing resilience against imperfection and health-related anxiety in female patients with MS. It was found that motivational interview effective in resilience and tolerance towards distress (Kashefizadeh, 2022).

In international research, the effectiveness of motivational interview has been examined in various dimensions, and regarding the variables of the current research, a few studies can be mentioned; motivational interview has been effective in increasing resilience and toughness in students with low academic scores (Roy, 2017). Motivational interview as effective in increasing resilience and self-esteem in students (Moss, 2010). Motivational interview effective in increasing tolerance and resilience in students against sexual violence (Muturi, 2022). In a study, it was found that motivational interview can be impactful in increasing meaning and purposefulness in life (Hwang et all., 2023). Motivational interview effective in increasing hope, meaning, empowerment, and effective participation (Glassman, 2013). It was found that social motivational interview to be effective in enhancing the desire, interest, and social participation of autism patients (Elias, White, 2020). Motivational interview to be effective in increasing the participation of patients diagnosed with acute psychosis in occupational, educational, and social dimensions (Hampson, Hicks, Watt, 2015).

Theoretical and empirical reviews of this research regarding the effectiveness of motivational interview indicate that it has indirectly influenced the increase in resilience, purposefulness, and social interest. However, since previous domestic and international studies have not directly addressed the effectiveness of motivational interview on these variables, especially in the adolescent group-acritical period for the formation of a purposeful and positive demeanor, socialization, and the foundation of cooperation, empathy, and social participation-the researchers in this study seek to answer whether motivational interview can influence resilience, purposefulness, and the creation of social interest in adolescent girls.

Method

Participants

The current research is a quasi-experimental study with a pre-test/post-test and control group. The statistical population consists of adolescent female students in the first grade of middle school in Khorramabad County during the academic year 2023–2024. Using random cluster sampling, initially, among Khorramabad's districts 1 and 2, district 2 was randomly selected. Then, using simple random sampling, 30 ninth-grade students were selected and randomly assigned into two groups of 15 each for the experimental and control groups. The demographic information of participating students, who were randomly assigned to two groups, experimental and control, was as follows: The father of 28 participating students was government-related or affiliated with governmental organizations, and the occupation of the fathers of two was independent. Twelve students' mothers were housewives, while 18 other students had working mothers, most of whom were employed in government-related professions. Nineteen of the students' fathers had a bachelor's degree, five had a master's degree, five had a doctoral degree, and one had a diploma. The literacy level of the mothers was also as follows: 21 had a bachelor's degree, seven had a master's degree, and two had a diploma. The economic status of 28 students was average, with two leaning toward the upper end. Thirteen students were only children, 11 had one sibling, and 6 had two siblings.

Ethical Considerations

Ethical principles adhered to in this research included obtaining informed verbal consent from students and their parents for participation, maintaining the confidentiality of members' infor-

mation and discussions, explaining the research objectives to students and their parents, and providing transportation for students to attend motivational interview training sessions. Additionally, upon the conclusion of the intervention and the follow-up phase, the students in the experimental group were informed that should they require counseling due to participation in motivational interview sessions, they could contact the researcher to facilitate access to a counselor.

Research Methodology

The instruction was conducted in eight three-hour sessions on Wednesday afternoons, from 3 to 6 PM, at the school. Before the motivational interview training sessions commenced, both the experimental and control groups completed the Connor-Davidson Resilience Scale, the Crumbaugh and Maholick's Purpose in Life Test, and Crandall's Social Interest Scale as a pre-test. Subsequently, the training sessions were conducted for the experimental group over two months, while no training was provided to the control group. At the end of the sessions, both groups completed the aforementioned questionnaires again. three months after the post-test phase, to assess the intervention's lasting effect, a follow-up phase was conducted with both groups completing the relevant questionnaires, and the results were compared with the pre-test and post-test scores of both groups. The data analysis was performed using Multivariate Analysis of Covariance (MANCOVA) with SPSS software version 28.

Research instruments:

Connor-Davidson Resilience Scale: This questionnaire, designed in 2003 with 25 items, is scored on a Likert scale. Connor and Davidson reported a Cronbach's alpha coefficient of 0,89 for the scale and a test-retest reliability coefficient of 0,87 over a four-week interval (Arkian, Jadidi, Mihandost, 2022). In The Iranian adaptation of this scale, Cronbach's alpha reliability coefficient of 0,89 and validated the scale through item-total correlations ranging from 0,41 to 0,64 (Farahani, Hamidi Poor, Heidari, 2021). In a study, Cronbach's alpha for the Connor-Davidson Resilience Scale among adolescents was 0,81. The average resilience score for this group was 67,51 with a standard deviation of 12,84 (Mehboodi, Amiri, Molavi, 2021).

Crumbaugh and Maholick's Purpose in Life Test: Crumbaugh and Maholick developed this 20-item scale to measure the meaning and purpose of life as conceptualized by Viktor Frankl (Crumbaugh, Maholick, 1964). They reported a split-half reliability of 0,81 and a correlation of 0,68 with Frankl's questionnaire. The Persian version of the scale has a Cronbach's alpha of 0,92 (Cheraghi, Arizi samani, Farahani, 2009). In this Persian study, raw scores of 121 and 71 were also determined as the 90th and 10th percentile cut-off points, respectively.

Crandall's Social Interest Scale (SIS): This instrument requires respondents to indicate which of the 15 pairs of characteristics they value most (Rahimi, Azadfallah, 2018). James Crandall reported the validity of his question-

Table 1

Summary of Motivational interview Training Session Content

Session	Educational Content
First	Introduction of members, expression expectations and rules, introduction to the concept of motivation.
Second	Training on the process and stages of change.
Third	Clarification of emotions using techniques such as empathy, reflective listening and acceptance.
Fourth	Working on members' ambivalence.
Fifth	Emphasizing members' self-efficacy in evaluating and measuring their ability to change.
Sixth	Emphasis on identifying values.
Seventh	Exploration and organization of members' values.
Eighth	Recognizing situations that cause demotivation and ways to counteract them.

naire as 0,77 (cheraghi, Arizi samani, Farahani, 2009), which, following research (Ghadamali, 2013), resulted in a Cronbach's alpha coefficient of 0,61 (Ghol mohammad, Mirhashemi, 2021; Esfahani et all., 2023). In another study by Iranian researchers, Cronbach's alpha for this scale was reported as 0,71, and the average score of Iranian university students on this scale was 6,86 with a standard deviation of 1,79 (Ghol mohammad, Mirhashemi, 2021). The reliability of the measurement tools in this research was examined using Cronbach's alpha method, yielding coefficients of 0,83 for the resilience scale, 0,85 for the purposefulness scale, and 0,76 for the social interest scale, confirming the reliability of the measurement instruments.

Results

The research findings were analyzed using SPSS software version 28, and the multivariate analysis of covariance (MANCOVA) test was employed to evaluate the effectiveness of motivational interview intervention. Controlling for pre-test scores, post-test scores of the groups were compared once, and follow-up scores were compared once, meaning two covariance analyses were conducted. Before performing the covariance analysis, the assumption of statistical homogeneity was examined. Initially, boxplot diagrams were used to identify outlier data, which were then corrected and placed within the minimum and maximum range. The normality of the distribution of variables was assessed using skewness and kurtosis statistics and the Shapiro-Wilk test. Given that the skewness and kurtosis values fell within the –2 to +2 range the significance level of the Shapiro-Wilk test for all variables was greater than 0,05 ($p > 0,05$), the normality assumption was confirmed, and there was no severe or problematic deviation in the data distribution. The homogeneity of variances assumption was examined using Levene's test, which showed significance levels for pre-test resilience scores of 0,725, purposefulness of 0,871, and social interest of 0,943, indicating that the homogeneity of variances assumption was met ($p > 0,05$).

The results in Table 2 indicated that the average resilience score in the intervention group increased from 79,87 in the pre-test to 83,07 in the post-test and 82,04 in the follow-up. The average score for purposefulness in the intervention group rose from 87,93 in the pre-test to 93,20 in the post-test and 92,27 in the follow-up, while the average score for social interest increased from 6,73 in the pre-test to 7,93 in the post-test and 8,07 in the follow-up.

The results demonstrated the intervention's effectiveness on the post-test scores in Tables 2 and 3 and on the follow-up scores in Tables 4 and 5.

Table 2

Descriptive statistics of mean and standard deviation of variables by group and time

Variable	Stage or Time	Mean ± SD	
		Intervention Group	Control Group
Resilience	Pre-test	79,87a ±10,42b	79,53±9,98
	Post-test	83,07±9,98	80,33±9,88
	Follow up	82,40±9,64	79,67±7,98
Purposefulness	Pre-test	87,93±14,23	86,73±13,65
	Post-test	93,20±13,65	86,73±14,15
	Followup	92,27±13,36	85,93±13,60
Social Interest	Pre-test	6,73±2,58	7,20±2,43
	Post-test	7,93±2,89	7,27±1,90
	Follow up	8,07±2,84	7,47±2,00

Note: a = Mean, b = Standard deviation.

Table 3

Wilks' Lambda Multivariate Test and Examination of the Homogeneity of Covariance Matrices Assumption

Wilks' Lambda				Test of Equality of Covariance Matrices		
Value	**F**	**p-value**		**Box's M**	**F**	**p-value**
0,424	10,42	<,001		6,97	1,03	0,406

The Box's M test, aimed at examining the homogeneity of covariance matrices assumption (Table 2), confirmed the aforementioned assumption (F=1,03, p=0,406). The multivariate effect examined with Wilks' Lambda indicated a confirmed effect of the motivational interview intervention on the linear combination of resilience, purposefulness, and social interest scores at the post-test time (Wilks' Lambda = 0,424, F = 10,42, p < 0,001). The results of the ANCOVA test within the MANCOVA context are presented in Table 3. The adjusted or marginal means (post-test means after controlling or neutralizing the pre-test scores in both groups) are also included in Table 3.

The analysis of covariance (ANCOVA) results, as shown in Table 3, substantiated the effectiveness of the motivational interview intervention across the three variables of resilience, purposefulness, and social interest (p > 0,05). The examination of adjusted means revealed that the motivational interview intervention successfully enhanced resilience, purposefulness, and social interest among the subjects. The partial eta squared (η_p^2) values indicated that the most significant impact of the intervention was on purposefulness (η_p^2 = 0,473), followed by resilience (η_p^2 = 0,247), and social interest (η_p^2 = 0,203). The findings related to the intervention's effectiveness over the follow-up period (sustainability of effect) are presented in Tables 4 and 5.

The Box's M test results (Table 4) confirmed the homogeneity of covariance matrices assumption (F = 0,96, p = 0,448). The multivariate effect assessed with Wilks' Lambda indicated a confirmed effect of the motivational interview intervention on the linear combination of resilience, purposefulness, and social interest scores at the follow-up time (Wilks' Lambda = 0,513, F = 7,28, p < 0,001). The ANCOVA test results within the MANCOVA context are detailed in Table 5.

Table 4

ANCOVA Test for Examining the Effectiveness of the Intervention on Research Variables (at Post-Test Time)

Variable	Marginal mean (Post-Test)		Mean difference	F value	p-value	η_p^2
	Control Group	Intervention Group				
Resilience	82,93a±,605b	80,47±,605	2,46±,859	8,21	0,008	0,247
Purposefulness	92,68±,806	87,26±,806	5,42±1,144	22,44	<,001	0,473
Social Interest	8,10±,280	7,10±,280	1,00±,397	6,38	0,018	0,203

Note: a = Mean, b = Standard error of mean.

Table 5

Wilks' Lambda Multivariate Test and Examination of the Homogeneity of Covariance Matrices Assumption

Wilks' Lambda				Test of Equality of Covariance Matrices		
Value	**F**	**p-value**		**Box's M**	**F**	**p-value**
0,513	7,28	0,001		6,55	0,96	0,448

Table 6

ANCOVA Test for Examining the Effectiveness of the Intervention on Research Variables (at Follow-Up Time)

Variable	Marginal mean (Post-Test)		Mean difference	F value	p-value	η_p^2
	Intervention Group	Control Group				
Resilience	82,29a±,700b	79,77±,700	2,51±,993	6,43	,018	,205
Purposefulness	91,73±,949	86,47±,949	5,26±1,347	15,22	,001	,378
Social Interest	8,23±,371	7,31±,371	,92±,527	3,05	,093	,109

Note: a = Mean, b = Standard error of mean.

The findings (Table 5) demonstrated that the sustainability of the motivational interview intervention's effect on resilience and purposefulness was confirmed at a 95% confidence level ($p < 0,05$). The sustainability of the intervention's effect on social interest was confirmed with some leniency at a 90% confidence level ($p < 0,10$). Similar to the post-test scores, the most significant effectiveness of the motivational interview intervention was on purposefulness ($\eta_p^2 = 0,378$). Overall, the findings indicated that the motivational interview intervention led to improvements in resilience, purposefulness, and social interest, and the sustainability of the intervention's impact was approximately confirmed over the follow-up period.

Discussion

This research aimed to examine the effectiveness of motivational interview on resilience, purposefulness, and adolescent girls' social interest. The findings suggest that motivational interview enhances the purposefulness of adolescent girls during the intervention phase ($\eta_p^2 = 0,473$) and follow-up phase ($\eta_p^2 = 0,378$). It also enhances their resilience during the intervention phase ($\eta_p^2 = 0,247$) and follow-up phase ($\eta_p^2 = 0,205$). Motivational interview is also effective in increasing adolescent girls' social interest during the intervention phase ($\eta_p^2 = 0,203$) and follow-up phase ($\eta_p^2 = 0,109$). Overall, the use of motivational interview can be effective in enhancing resilience, purposefulness, and to some extent, social interest.

Motivational interview, characterized by active dialogue, non-judgmental stance, and positive acceptance based on client-centered and humanistic therapy by Rogers, can mitigate negative emotions and feelings (Urfa, Aşçı, 2023), contributing to the development of resilience and fortitude against emotional challenges. In the construct of resilience, regulating and mastering negative emotions, as well as fostering motivation to resist and confront challenges, are influential. In this regard, motivational interview can validate emotions and create a sense of empowerment and motivation to control and address issues, thereby enhancing resilience. Some existing research in this field is consistent with this finding (Glassman et all., 2013; Baghеri Hosein Abadi, Yoosefi, 2023; Rezaei et all., 2023; Kashefizadeh et all., 2022; Moss, 2020; Muturi, 2022).

Motivational interview can encourage adolescent clients to articulate personal values and goals aligned with their beliefs and identity, effectively creating a sense of purposefulness in academic, professional, and social dimensions. It can facilitate change by reassessing clients' values and encouraging the selection of functional values toward desired goals (Caccavale, 2020). These findings are consistent with some research (Hosseini et all., 2020; Karimi et all., 2016; Hwang et all., 2023; Glassman et all., 2013).

Another variable assessed in this study, which increased among adolescents through motivational interview, is the level of social participation and empathy, discussed here as social interest. The core of motivational interview involves empathy and understanding the client's lived world. Such skills ultimately lay the groundwork for social interest and increased social participation among clients. These results are in line with some research (Baradaran et all., 2017; Seifollahzadeh

et all., 2021; Elias, White, 2020; Hampson, Hicks, Watt, 2015; Moss, 2010; Peters et all., 2019; Galal et all., 2018; Kim, Yang, 2016).

Conclusions

As discussed, employing motivational interview as a humanistic and hope-centered approach, feasible in limited session contexts within the school setting and in relation to adolescents with their unique age characteristics, has been effective. It has led to increased resilience, the creation of purpose and meaning, as well as the improvement of social skills and cooperation, and generally, an increase in social interest.

Limitations and Suggestions. Such research, due to its limitation to the group of girls, has constraints that may complicate the generalization of these findings. Additionally, the authenticity of the questionnaire responses by adolescent students may not be entirely reliable due to fear of disclosure; moreover, the research must be replicated in different cultural contexts and among other gender and age groups, and the validity of the participants' responses should be examined through other assessment methods and data collection, including observation and interviews with teachers and parents of the students. Overall, based on the findings, it is recommended that counselors and therapists working with adolescents become familiar with and trained in motivational interview, both individually and in groups. Furthermore, it is suggested that essential components of this therapeutic method be explained and taught in simple language, free from technical jargon, to teachers, parents, and educators of adolescent students during in-service training sessions.

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Contribution of the authors

Fatemeh Ghasemi Niaei — ideas; annotation, writing and design of the manuscript; planning of the research; control over the research.

Nafiseh Derakhshan — application of statistical, mathematical or other methods for data analysis; conducting the experiment; data collection and analysis.

Conflict of interest

No potential conflict of interest was reported by the authors.

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Psychological well-being of a school teacher: predictors and correlations of the PERMA model

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Abstract

Context and relevance. The PERMA model is basic for understanding what elements and their corresponding psychological mechanisms determine a teacher's positive functioning. **Objective.** The aim of the study is to identify the characteristics of psychological well-being of Russian teachers and to determine its social and demographic predictors and correlates. The predictors are age, gender, length of service, qualification category, his/her place of residence and region of residence, family status and the presence of his/her own children. The correlates of teacher's psychological well-being are teacher's attitude to school, motivation, energy, enthusiasm, satisfaction with work, relationships with colleagues, involvement in school life, self-assessment of effectiveness, professional achievements. An additional goal is to determine norms of psychological well-being for Russian teachers based on the PERMA-profiler instrument. **Methods and materials.** The volume of the aggregate sample amounted to 1018 people — secondary school teachers, 884 people (86,8%) are women, 134 people (13,2%) are men. **Results.** The Russian teachers have the same level of psychological well-being as a whole Russian sample. However, teachers are more involved in activities, there is an imbalance of negative/positive affect, positive assessments of their physical health are reduced. The component of relationships is not characterized by significant expression, which can be a limitation in the productive and effective performance of professional activities. Predictors of school teacher psychological well-being are older age, presence of family and children, as well as living in regions remote from the center, with lower population density and having national autonomies in their composition. The psychological well-being of a teacher is associated with the development of autonomous motivation, energy, enthusiasm, involvement in work, agency, high evaluation of self-efficacy. Characteristics of the school's organizational climate and organizational culture are related to the teacher' psychological well-being.

Keywords: psychological well-being, school teachers, PERMA model, social and demographic predictors, correlates of psychological well-being

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Психологическое благополучие школьного учителя: предикторы и корреляты модели PERMA

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Резюме

Контекст и актуальность. Модель благополучия PERMA является базовой для понимания того, какие элементы и соответствующие им психологические механизмы определяют позитивное функционирование учителя. **Целью** исследования было выявление характеристик психологического благополучия российских педагогов и определение его социальных и демографических предикторов и коррелятов. В качестве предикторов выступали возраст, пол, стаж работы, квалификационная категория учителя, его место жительства и регион проживания, семейный статус и наличие собственных детей. Коррелятами психологического благополучия педагога являлись отношение учителя к школе, мотивация деятельности, увлеченность работой, удовлетворенность работой, организацией, взаимоотношениями с коллегами, вовлеченность в деятельность школы, самооценка эффективности деятельности, профессиональные достижения. Дополнительная **цель** исследования состояла в определении нормировочных значений психологического благополучия учителей общеобразовательной школы на основе использования измерительного инструмента PERMA-profiler для российской выборки. **Методы и материалы**. Изучение психологического благополучия школьных учителей проводилось с использованием опросника PERMA-Profiler, адаптированного для русскоязычной выборки. Данные для исследования представляют обобщение результатов трех независимых исследований, включавших опросники о профессиональной мотивации, увлеченности деятельностью, субъектности, самоэффективности, самооценке достижений, взаимоотношениях с коллегами, родителями и учениками и информацию о поле, возрасте, стаже работы, семейном статусе и регионе проживания. Объем совокупной выборки составил 1018 человек — учителей общеобразовательной школы (средние и старшие классы), из них 884 человека (86,8%) — женщины, 134 человека (13,2%) — мужчины.

Результаты. Психологическое благополучие российского учителя имеет тот же уровень количественного выражения, что и в целом у респондентов российской выборки. Однако у педагогов больше выражена вовлеченность в деятельность, присутствует дисбаланс негативного/позитивного аффекта, снижены оценки своего физического здоровья. Компонент взаимодействия в структуре психологического благополучия не отличается значительным выражением, что может выступать ограничением в продуктивном и эффективном выполнении профессиональной деятельности. Предикторами психологического благополучия школьного учителя выступают возраст, регион проживания, семейный статус и наличие собственных детей. Более старший возраст, наличие семьи и детей, а также проживание в регионах, удаленных от центра, с меньшей плотностью населения и имеющих национальные автономии в своем составе, способствуют сохранению психологического благополучия.

Психологическое благополучие учителя связано с развитием у него автономной мотивации, энергичности, энтузиазма, вовлеченности в работу, субъектности, высокой оценкой самоэффективности. Характеристики организационного климата и организационной культуры школы связаны с психологическим благополучием учителя.

Ключевые слова: психологическое благополучие, школьные учителя, модель PERMA, социальные и демографические предикторы, корреляты психологического благополучия

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Introduction

The study of psychological well-being (PWB) among adults is inseparable from the study of professional activity. Research findings indicate that PWB enhances work performance (Jiménez et al., 2021), stress tolerance (Lakioti, Stalikas, & Pezirkianidis, 2020), and promotes health (Kern et al., 2015). Findings also demonstrate that teacher PWB affects teaching effectiveness, student development, and educational management (Duckworth, Quinn, & Seligman, 2009), as well as increases educators' commitment to school (Cameron & Lovett, 2015). It has been shown to contribute to self-development (Parker et al., 2012) and to reduce stress and professional burnout (Buric et al., 2019). Among various approaches to understanding well-being, a common and relevant focus of research is the search for psychological mechanisms that ensure the achievement of PWB. These mechanisms may include personal attributes such as proactive coping strategies (Dekhtyarenko, Savchenko, & Shlyagina, 2023), agency (Volkova, 2024), self-development and self-esteem (Minyurova & Zausenko, 2013), and self-assessment of appearance (Labunskaya, 2023).

In the PERMA model, PWB is attributed to five core components (domains): positive emotions, engagement in activities, relationships, meaning and achievement; along with four additional domains that describe negative emotions, happiness, health, and loneliness (Seligman, 2011). The primary strength of the PERMA model lies in its holistic approach to PWB, contrasting with more limited conceptualizations (e.g., job satisfaction, job engagement, occupational stress, and burnout). Additionally, it integrates hedonic and eudaemonic traditions (Goodman et al., 2018). Research on the PERMA model explores educational strategies aimed at enhancing students' PWB (Brunzell, Stokes, Waters, 2016; Lambert, Passmore, Joshanloo, 2019). Empirical evidence demonstrates a positive correlation between teacher emotions and the development of students' self-confidence (Brunzell et al., 2016; Fredrickson, 2001); engagement in activities has been shown to promote high-complexity tasks (Seligman et al., 2009). The establishment of positive relationships with students has been shown to improve learning outcomes (Gable et al., 2004). Furthermore, meaningful activities have been identified as a means to optimize students' maturation processes (Brunzell et al., 2016; Seligman et al., 2009). Finally, achievement has been shown to provide a foundation for overcoming challenges (Brunzell et al., 2016).

Although there are studies of PWB based on the PERMA model (Adler & Seligman, 2016; Donaldson, van Zyl, & Donaldson, 2022; Jim nez et al., 2021; Kroencke et al., 2023; Seligman & Csikszentmihalyi, 2000; Shaik, Baboo, & Rajan, 2023), there are not enough studies on teachers' PWB (Haschera & Waberb, 2021; Nguyen, 2024; Reppa et al., 2023). Pedagogical activity is characterized by a number of peculiarities, including, first of all, its communicative nature and, consequently, the inherently high semantic load of relationship components in the PERMA model. This requires specialized research into teachers' PWB.

The objective of the present study was to identify the characteristics of Russian teachers' PWB and to determine its social and demographic predictors and correlates. The study focused on the PWB of general education school teachers (middle and high school), considering the predictors and correlates of PWB. These characteristics are proposed for use in comparative studies in accordance with OECD recommendations for inclusion as results in the Program for International Student Assessment (PISA) and the Teaching and Learning International Survey (TALIS).

An additional task of the study was to establish normative values for Russian teachers' PWB based on the PERMA profiler tool.

Materials and methods

The study of teachers' PB was conducted using the PERMA-Profiler questionnaire. This tool enables the assessment of the expression of five main components (domains) of the PERMA model - "Positive Emotions" (P), "Engagement" (E), "Relationships" (R), "Meaning" (M), "Achievements" (A), and four additional components- "Happiness" (H), "Negative Emotions" (NE), "Health" (HE), "Loneliness" (L).

The data represent a synthesis of the results of three independent studies, each of which included an adapted Russian-language version of the questionnaire as a part of diagnostic package (Isaeva, Akimova, Volkova, 2022b) and questions about social and demographic characteristics of the respondents. These studies used convenience samples, which were used to study PWB indicators and characteristics of teachers' professional and personal development. The methodological tools employed in the three studies differed depending on the specific objectives of each study.

Sample 1. The first study included a sample of 447 teachers from two federal districts of the Russian Federation. The sample consisted of teachers from these districts, including educators in general education schools, of whom 376 (84,1%) were women and 71 (15,9%) were men. The average age of the participants was 37.2 years (standard deviation SD = 12,5). Their work experience ranged from a minimum of one year to a maximum of 47 years. The objective of the research was to explore personal resources in professional teaching activity and included the study of motivation and passion for the profession using the "Professional Motivation Questionnaire" (PMO-2) (Osin et al., 2017), the Utrecht Work Engagement Scale (UWES) (Kutuzova, 2006; Schaufeli & Bakker, 2004), as well as an examination of teacher agency characteristics using the "Structure of Agency" questionnaire (Volkova, 2024).

Sample 2. The sample included 141 teachers from general education schools in a large city, among whom 123 (87,2%) were women and 18 (12,8%) were men. The mean age of the participants was 44.6 years (standard deviation SD = 11,9). The range of work experience varied from one year to 43 years. The objective of the study was to explore retention in the profession

and included the Utrecht Work Engagement Scale (UWES) (Schaufeli & Bakker, 2004), the Q12 (Gallup) questionnaire to measure teachers' commitment to their school (Fredrickson, 2000), and a questionnaire to assess teachers' self-efficacy.

Sample 3. The sample included 430 teachers: 385 (89,5%) identified as female and 45 (10,5%) as male. The average age of the participants was 43.4 years (standard deviation SD = 12,5), and their work experience ranged from 0 to 52 years. This subsample was selected from a larger study of PWB participants. The study was conducted in 37 regions across four federal districts of the Russian Federation. It employed a multifaceted approach, encompassing not only the examination of teachers' PWB but also their self-assessment of professional achievements, job satisfaction, and interactions with pupils and colleagues.

The sample of the study included 1,018 general education teachers, of whom 884 (86,8%) were female and 134 (13,2%) male. However, it should be noted that only the results obtained from middle and high school teachers were selected for subsequent analysis. Data were collected from 2022 to 2023 and stored in the database of an affiliated organization. The study employed an online survey form and was conducted on a voluntary, non-reimbursable, and anonymous basis. The results were processed using methods of descriptive statistics, frequency analysis, analysis of variance (ANOVA), and correlation analysis (Pearson). The statistical software package IBM SPSS Statistics 26 was used for data processing.

Results

Social and demographic characteristics of teachers of the research samples are presented in Table 1; descriptive statistics for the total sample of teachers are presented in Table 2.

Table 1

Social and demographic characteristics of respondents of research samples

	Sample 1	Sample 2	Sample 3	Total sample**
	N (%)	N (%)	N (%)	N (%)
Total number of respondents	447	141 чел.	430	1018
Gender				
Men	71 (15,9%)	18 (12,8%)	45 (10,5%)	134 (13,2%)
Women	376 (84,1%)	123 (87,2%)	385 (89,5%)	884 (86,8%)
Age group				
18–35	238 (53,2%)	35 (24,8%)	131 (30,5%)	404 (39,7%)
36–55	161 (36,0%)	76 (53,9%)	213 (49,5%)	450 (44,2%)
55+*	48 (10,7%)	30 (21,3%)	86 (20,0%)	164 (16,1%)
Region				
CFD	305 (68,2%)	-	18 (4,2%)	323 (31,7%)
VFD	142 (31,8%)	141 (100%)	37 (8,6%)	320 (31,4%)

	Sample 1	Sample 2	Sample 3	Total sample**
	N (%)	N (%)	N (%)	N (%)
NWFD	-	-	177 (41,2%)	177 (17,4%)
FEFD	-	-	198 (46,0%)	198 (19,4%)
Settlement				
City	447 (100%)	141 (100%)	254 (59,1%)	
Village	-	-	176 (40,9%)	
Length of service				
Up to 3 years	111 (24,8%)	16 (11,3%)	66 (15,3%)	193 (19,0%)
3–10 years	235 (52,6%)	27 (19,2%)	77 (17,9%)	339 (33,3%)
more 10 years	101 (22,6%)	98 (69,5%)	287 (66,7%)	486 (47,7%)
Qualification category				
No	75 (16,8%)	32 (22,7%)	104 24,2%)	211 (20,7%)
First	226 (50,6%)	60 (42,6%)	106 (24,7%)	392 (38,5%)
Highest	146 (32,7%)	49 (34,8%)	220 (51,2%)	415 (40,8%)
Marital status				
Married	246 (55,0%)	87 (61,7%)	252 (58,6%)	585 (57,5%)
Unmarried	201 (45,0%)	54 (38,3%)	178 (41,4%)	433 (42,5%)
Children				
No	195 (43,6%)	40 (28,4%)	97 (22,6%)	332 (32,6%)
Yes	252 (56,4%)	101 (71,6%)	333 (77,4%)	686 (64,4%)

Note: * — for men, age group 60+; ** — only teachers of general education schools (middle and high schools).

Table 2

Descriptive statistics for the total sample of teachers (N = 1018)

	Mean	Median	SD	Min	25th	50th	75th	Max
P	7,25	7,33	1,65	1,00	6,00	7,33	8,33	10,00
E	7,48	7,67	1,47	0,67	6,67	7,67	8,67	10,00
R	7,21	7,33	1,84	0,00	6,00	7,33	8,67	10,00
M	7,44	8,00	1,76	1,00	6,33	8,00	8,67	10,00
A	7,68	8,00	1,45	1,00	7,00	8,00	8,67	10,00
HAP	7,53	8,00	1,87	0,00	6,52	8,00	9,00	10,00
NE	5,63	5,67	1,97	0,00	4,00	5,67	7,00	10,00
H	5,88	6,00	2,11	0,00	4,33	6,00	7,33	10,00
L	4,64	5,00	2,96	0,00	2,00	5,00	7,00	10,00
Overall psychological well-being (GWB)	7,41	7,60	1,26	1,67	6,67	7,60	8,33	10,00

The general level of well-being, as well as the domains of P, E, R, M, and A, are above average and have shifted toward high values. Compared to the research samples of the authors-developers of the questionnaire (Butler & Kern, 2016), as well as to samples of teachers from other countries (Haschera & Waberb, 2021; Nguyen, 2024; Reppa et al., 2023), the values of PWB in the Russian teachers' sample are higher, while the values of NE, L, and HE are lower.

In comparison to respondents from the general Russian sample (Isaeva, Akimova, Volkova, 2022a), teachers demonstrated equivalent overall levels of PWB as their peers engaged in other activities (values of indicators for the 18–35 age group): Welch's t-test = 0,5755, p = 0,57. There is no significant difference in the scores of the domains R, M, A, and H (Welch's t-test values ranging from 0,2024 to 0,4002; $0,06 \leq p \leq 0,84$). However, the remaining domains differ: educators have significantly higher engagement scores (Welch's t(2,1658) = 2.17, p = 0,03), are significantly worse at assessing their health (Welch's t(8,5181) = 8,52, p = 0,00), experience more positive emotions (Welch's t(2,9844) = 2,98, p = 0,00), more often experience negative emotions (Welch's t(2,6741) = 2.67, p = 0,00), and feel lonely (Welch's t(5,0986) = 5,10, p = 0,00). Compared to preschool teachers (Volkova et al., 2023), school teachers show lower expression across all domains of PWB (Welch's t-values ranging from 6,0859 to 11,79; p = 0,00). Teachers also have lower happiness and health scores and higher scores on the L and NE scales (Welch's t-values ranging from 11,80 to 16,01; p = 0,00) than preschool teachers.

Predictors and correlates of school teachers' PWB in the research samples are presented in Table 3.

Table 3

Predictors and correlates of teachers' psychological well-being

	P	E	R	M	A	HAP	NE	H	L	GWB
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
Social and demographic predictors, F(df), p, η2 (для ОБ)										
Gender^{total}	F = 0,290 (df = 1; 1016), p = 0,591, η^2 = 0,000									
Age groop^{total}	**F = 13,906 (df = 2; 1015), p = 0,000, η^2 = 0,027**									
18–35	7,03 (1,69)	7,31 (1,62)	7,09 (1,92)	7,14 (1,97)	7,26 (1,66)	7,19 (1,92)	6,08(2,05)	5,76 (2,16)	5,27 (2,83)	7,17 (1,34)
36–55	7,32 (1,70)	7,55 (1,35)	7,22 (1,84)	7,59 (1,59)	7,99 (1,25)	7,68 (1,83)	5,47 (1,85)	5,87 (2,12)	4,45 (2,97)	7,53 (1,19)
55+*	7,60 (1,31)	7,71 (1,35)	7,51 (1,61)	7,77 (1,50)	7,83 (1,13)	7,95 (1,69)	4,95 (1,80)	6,22 (1,93)	3,60 (2,89)	7,68 (1,13)
Region^{total}	**F = 8,556 (df = 3; 1014), p = 0,000, η^2 = 0,025**									
CFD	6,84 (1,69)	7,25 (1,60)	7,12 (1,70)	7,37 (1,76)	7,27 (1,79)	7,35 (1,55)	5,99 (2,04)	5,44 (2,09)	5,78 (2,69)	7,17 (1,14)
VFD	7,50 (1,46)	7,70 (1,26)	7,44 (1,66)	7,63 (1,61)	7,91 (1,27)	7,70 (1,78)	5,67 (1,84)	6,13 (2,04)	4,32 (2,72)	7,64 (1,04)
NWFD	7,18 (1,80)	7,51 (1,53)	7,06 (2,06)	7,42 (1,85)	7,91 (1,25)	7,38 (2,15)	5,23 (1,95)	5,92 (2,23)	4,12 (3,12)	7,42 (1,44)

	P	E	R	M	A	HAP	NE	H	L	GWB
	M(SD)	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**	**M(SD)**
FEFD	7,31 (1,74)	7,28 (1,58)	6,99 (2,10)	7,16 (1,91)	7,51 (1,37)	7,54 (2,11)	5,46 (2,06)	5,92 (2,10)	4,33 (3,24)	7,25 (1,51)
Settlement[3]	F = 0,176 (df = 1; 1016), p = 0,675, η^2 = 0,000									
Length of service[total]	F = 1,291 (df = 2; 1015), p = 0,275, η^2 = 0,003									
Qualification category[total]	F = 0,910 (df = 2; 1015), p = 0,403, η^2 = 0,002									
Marital status[total]	**F = 26,628 (df = 1; 1015), p = 0,000, η^2 = 0,026**									
Unmarried	7,16 (1,79)	7,32 (1,65)	6,74 (1,99)	7,12 (1,97)	7,55 (1,62)	7,15 (2,03)	5,78 (1,99)	5,72 (2,23)	5,37 (2,73)	7,18 (1,40)
Married	7,32 (1,54)	7,59 (1,30)	7,56 (1,64)	7,67 (1,54)	7,77 (1,31)	7,81 (1,68)	5,52 (1,95)	6,01 (2,02)	4,10 (3,00)	7,58 (1,11)
Children[total]	**F = 34,281 (df = 1; 1016), p = 0,000, η^2 = 0,033**									
No	6,95 (1,76)	7,28 (1,64)	6,95 (1,95)	7,00(1,99)	7,24 (1,63)	7,03 (1,95)	6,13(1,93)	5,59 (2,15)	5,36 (2,69)	7,09 (1,34)
Yes	7,39 (1,58)	7,57 (1,37)	7,34 (1,78)	7,65 (1,59)	7,89 (1,31)	7,77 (1,78)	5,39 (1,94)	6,02 (2,09)	4,30 (3,02)	7,57 (1,18)
Correlates of psychological well-being (Pearson's r, two-way correlation)										
Autonomous motivation (RAI)[1]	0,11*	0,14**	0,12**	0,12**	0,14**	0,17*	-0,08	0,06	-0,03	0,127**
Vigor[1, 2]	0,32**	0,41**	0,08	0,47**	0,45**	0,22*	-0,31**	0,20*	0,03	0,43**
Dedication[1, 2]	0,42**	0,43**	0,08	0,59**	0,45**	0,24**	-0,35**	0,23*	0,05	0,50**
Absorption[1, 2]	0,27**	0,39**	0,05	0,45**	0,36**	0,27**	-0,28**	0,14	-0,06	0,38**
Agency[1]	0,29**	0,28**	0,28**	0,34**	0,40**	0,31**	-0,25**	0,20**	-0,18*	0,36**
Self-efficacy[2]	0,26**	0,16	0,11	0,31**	0,50**	0,21*	-0,25**	0,18*	-0,05	0,33**
Commitment to the organization[2]	0,31**	0,05	0,18*	0,42**	0,15	0,19*	-0,30**	0,17*	-0,09	0,30**
Professional achivements[3]	0,08	0,09*	0,02	0,06	0,07	0,08	-0,04	-0,04	-0,07	0,07
Job satisfaction[3]	0,53**	0,42**	0,35**	0,52**	0,43**	0,42**	-0,25**	0,38**	-0,13**	0,52**
Good relationships with colleagues[3]	0,36**	0,25**	0,34**	0,31**	0,24**	0,34**	-0,21**	0,30**	-0,17**	0,35**
Good relationships with students[3]	0,47**	0,44**	0,37**	0,46**	0,49**	0,36**	-0,15**	0,28**	-0,10**	0,51**

Note: GWB — General indicator of psychological well-being; N — number of respondents; M — mean; SD — standard deviation; F — Fisher's test value; df — number of degrees of freedom; p — level of statistical significance; η2 — effect size; RAI — relative autonomy index; 1 — data from sample 1; 2 — data from sample 2; 3 — data from sample 3; total — data from the total sample; * — p < 0,01; ** p < 0,001.

A multitude of social and demographic factors have been identified as predictors of school teachers' PWB. These factors include age, region of residence, marital status, and the presence of children. Older age, being married, and having children have been shown to increase the level of PWB. Conversely, a decrease in PWB was observed in regions located closer to the center, characterized by higher population density and

the absence of ethnic autonomies in their composition. The study found no significant associations between teachers' PWB and gender, place of residence (urban or rural), work experience, or qualification category.

The correlates of the general level of school teachers' PWB and the domains P, E, M, and A are as follows: autonomous motivation, energy, enthusiasm, absorption in activities, developed agency, high self-esteem, commitment to school, job satisfaction, and good relations with colleagues and students (predominantly of medium strength). Of the five main domains of PWB, the relationships domain exhibited the fewest links with the characteristics under consideration and was associated with job satisfaction, relationships with colleagues and students, autonomous motivation, teacher agency, commitment to the organization, and was not associated with passion for activity or professional achievements. Teachers' self-esteem regarding their professional achievements was found to be unrelated to PWB, except for a weak relationship with involvement in activities.

Discussion

Russian teachers exhibited higher levels of psychological well-being compared to their international counterparts. Variations in PWB levels among residents of different regions are associated with factors such as geographical distance from the capital city, population density, and the presence of national autonomy. The type of settlement (city or village) was found to be non-significant. The findings suggest that PWB is a predominantly socially and culturally influenced characteristic, not only in the context of studying the organizational culture of schools but also in the context of examining the social, national, and even political cultures of the regions where teachers reside and work. This is particularly relevant in the context of contemporary migration policy issues. However, the question of PWB's social and cultural conditionality requires further investigation and may represent a promising avenue for future research.

Our study does not confirm the viewpoint about the low level of PB among modern teachers (Minyurova, Zausenko, 2013; Pisarevskaya, 2019; Taylor et al., 2024; Toropova, Myrberg, Johansson, 2021). However, the content of the PWB domains has its own specifics. Modern Russian teachers are similar to their peers in terms of the expression of the general level of PWB. They feel happy to the same extent, believe that their lives have significance and meaning, strive to achieve their goals, and feel capable of accomplishing the tasks set for them. However, teachers appear to be more engaged in their work: school teachers have higher levels of work engagement. Moreover, school teachers' work engagement increases with age. Nonetheless, this involvement in work presents a serious challenge for teachers: balancing work activity and personal life. Teachers' involvement is a correlate of their self-efficacy assessment: teachers are not just absorbed in work; they feel competent and effective in their professional activities, which is an important component of PWB in adult professional life.

In the present study, the hypothesis that PWB is associated with autonomous motivation, passion for activity, and teacher agency was confirmed. The prevalence of autonomous motivation types in teacher activities, compared to externally controlled motivation (Fuller, Waite, Torres, 2016; Klaeijsen, Vermeulen, Martens, 2017; Töre, 2020), was further investigated. The teacher's PWB was found to be influenced by the following factors: passion for activity (Granziera & Perera, 2019; Pourtousi & Ghanizadeh, 2020), and developed agency (Volkova, 2024).

A distinguishing characteristic of contemporary educators is a pervasive tendency to diminish their own joy and contentment in life, while concurrently exhibiting symptoms of sadness, anxiety, and anger. This phenomenon likely reflects challenges in emotion regulation, particularly in the context of emotional intelligence development among teachers (Monteagudo et al., 2019). Concurrently, these tendencies may indicate suboptimal organizational structures within teachers' work environments, a substantial emotional burden, inadequate multitasking abilities, and a high degree of external control.

Given the communicative nature of pedagogical activity, it was hypothesized that the Relationships domain would exhibit higher values in the overall model of the teacher's PWB. However, the findings of this study indicated that the domain of a contemporary teacher is expressed to the same extent as that of other respondents, which may suggest a decline in teachers' communicative competence and a concomitant devaluation of the significance of pedagogical communication.

Another limitation in the development of PWB was teachers' perception of their own health. Modern school teachers are not satisfied with their physical health and consider themselves less healthy than other people of the same age and gender. Meanwhile, subjective representations of health are an important resource for PWB (Deaton, 2008; Howell, Kern, Lyubomirsky, 2007), without which its analysis in modern education becomes incomplete.

Work experience and qualification category were not related to teachers' PWB, just as it was noted in the analysis of preschool teachers' PWB, which shows the predominant influence of general conditions in teachers' lives compared to professional activity. However, characteristics of professional activity act as correlates of PWB. In particular, certainty of work expectations, working conditions, respect and care, opportunities for self-development — these characteristics of school organizational culture, which form a teacher's commitment to school as a specific organization, are significantly related to PWB.

Conclusions

Summarizing our discussion and the results of the study, we note the following:

1. The PWB of Russian teachers has a similar level of quantitative expression as in the general population of respondents in the Russian sample. However, the expression of PWB domains among Russian teachers is specific: teachers are more involved in activities, there is an imbalance of negative affect (negative emotions are expressed to a greater extent and positive emotions to a lesser extent), and positive assessments of their physical health are reduced.

2. The interaction component within the structure of PWB is not characterized by significant expression, which may be a limitation in the productive and effective performance of professional activity.

3. School teachers' PWB is more influenced by variables reflecting their well-being in their personal lives.

4. Stratification variables such as age, region of residence, marital status, and having children are predictors of school teachers' PWB.

5. Older age, presence of family and children, as well as living in regions far from the center with lower population density and having national autonomies contribute to the preservation of PWB.

6. Teacher PWB is associated with the development of autonomous motivation,

vigor, enthusiasm, engagement, subjectivity, and high self-efficacy scores.

7. A relationship has been established between teachers' PWB and school organizational culture; however, the nature of this relationship requires further study and could be the subject of separate research.

8. The descriptive statistics for the overall PWB measure and the core domains of the PERMA model can be considered normative when studying teacher PWB.

Limitations. One important limitation of the study was the sample's gender distribution. Although the study sample reflected the trend of men and women in Russian schools, the insufficient number of men in the sample may have been the reason for the unidentified relationship between PWB and gender.

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Научная статья | Original paper

Eye tracking study of the specificity of visual information processing in children with hearing impairment in a learning situation

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Abstract

Context and relevance. The article considers the problem of the consequences of early auditory deprivation on the reorganization of visual information processing. Auditory deprivation causes a reorganization of visual information processing in children with hearing impairments, which affects the perception of visual teaching materials in the learning process. **Objective.** Using eye tracking, track changes in visual information processing in children with hearing impairments. Using the example of perception of visual teaching materials, the task was to identify how the specificity of visual information processing manifests itself in children with hearing impairments in a learning situation. **Hypothesis.** The specificity of perception of educational materials in children with hearing impairments will be associated with the reorganization of visual information processing, which can be recorded by tracking eye movements. **Methods and materials.** A comparative study was conducted among a sample of preschool children aged 5-7 years (N = 35), typically developing children (N = 20; M = 6,1; SD = 0,4) and hearing impaired children with sensorineural hearing loss after cochlear implantation (N = 15; M = 6; SD = 0). Illustrations from the ABC book for hearing-impaired children by N.Yu. Donskaya and N.I. Linikova were used as stimulus material. Data were recorded using a stationary eye tracker GP3. The auditory-visual presentation of visual aids and with visual lexical supports was varied. **Results.** The features of visual information processing in children with hearing impairments were revealed through the analysis of shifts in visual attention (including those indicating the features of perception of visual aids in educational material). Through markers of fixation duration, number of fixations it is shown that children with hearing impairment have a large cognitive load, differences in depth, intensity of visual information processing in the perception of visual aids of educational materials, differences in the sequence of visual attention, visual search strategies, spatial distribution of attention, temporal characteristics of visual information processing are revealed. **Conclusions.** With the help of eye tracking it was possible to expand the understanding of the cross-modal effects of sensory deprivation on the processes of visual information processing in children with hearing impairment. The understanding of the influence of forms of using visual aids of educational materials, their presentation in an auditory-visual format or with the use of visual lexical supports in the process of teaching children with hearing impairment is supplemented.

Keywords: preschool age, visual gnosis, visual attention, learning, auditory deprivation, atypical development, hearing impairment, cochlear implantation, oculography, eye tracker

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Айтрекинг исследование специфики обработки зрительной информации у детей с нарушением слуха в ситуации обучения

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Резюме

Контекст и актуальность. Материалы статьи посвящены проблеме реорганизации обработки зрительной информации впоследствии ранней слуховой депривации, а конкретно — как при нарушении слуха у дошкольников изменения в обработки зрительной информации влияют на восприятие наглядностей учебных материалов в процессе обучения. **Цель**. При помощи айтрекинга через анализ движения глаз у детей с нарушением слуха выявить специфику обработки зрительной информации, которая будет сказываться на особенностях восприятия учебных материалов в процессе обучения. **Гипотеза**. Специфика восприятия учебных материалов у детей с нарушением слуха взаимосвязана с реорганизацией обработки зрительной информации, которую можно зафиксировать путем отслеживания движения глаз. **Методы и материалы**. Проведено сравнительное исследование выборки дошкольников 5–7 лет (N = 35): типично развивающихся детей (N = 20; M = 6,1; SD = 0,4) и с нарушением слуха с сенсоневральной тугоухостью после кохлеарной имплантации (N = 15; M = 6; SD = 0). В качестве стимульного материала использованы иллюстрации из букваря для слабослышащих детей Н.Ю. Донской, Н.И. Линиковой. Фиксация данных осуществлялась стационарным айтрекером GP3. Варьировалось слухо-зрительное предъявление наглядности и с зрительными лексическими опорами. **Результаты.** Выявлены особенности переработки зрительной информации у детей с нарушением слуха через анализ сдвигов зрительного внимания (в том числе свидетельствующих об особенностях восприятия наглядностей учебного материала).

Через маркеры продолжительности фиксаций, количества фиксаций показано, что у детей с нарушением слуха большая когнитивная нагрузка, отличия в глубине, интенсивности обработки зрительной информации при восприятии наглядностей учебных материалов. Выявлены отличия в последовательности зрительного внимания, стратегиях визуального поиска, пространственного распределения внимания, временных характеристиках обработки зрительной информации. **Выводы**. При помощи айтрекинга удалось расширить представления о кросс-модальных эффектах сенсорной депривации на процессы обработки зрительной информации у детей с нарушением слуха. Дополнены представления о влиянии форм использования наглядностей учебных материалов, их предъявления в слухо-зрительном формате или с применением зрительных лексических опор в процессе обучения детей с нарушением слуха.

Ключевые слова: дошкольный возраст, зрительный гнозис, зрительное внимание, обучение, слуховая депривация, атипичное развитие, нарушение слуха, кохлеарная имплантация, окулография, айтрекер

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Introduction

Sensory deprivation, such as deafness, can alter the processing of information from other sensory modalities (Pisoni et al., 2007; Conway et al., 2011; Sur, 2004). Neural plasticity — the brain's capacity to adapt and reorganize its structure — facilitates adaptive changes following sensory deprivation (Thakur et al., 2023; Conway et al., 2011). The loss of one sensory modality may thus trigger reorganization in intact sensory systems. Evidence suggests that early auditory deprivation (Marschark et al., 2019) induces widespread changes in neurocognitive functions (Lima et al., 2023; Lauriello et al., 2024), particularly in visual information processing (Dawson et al., 2002), which is critical for calibrating visual functions (Bavelier et al., 2010).

Notably, prior studies have predominantly focused on visual attention, often neglecting a comprehensive examination of visual gnosis and broader visual information processing strategies. Nevertheless, some research confirms that children with hearing impairments exhibit deficits in processing both auditory and visual information concurrently. Children with cochlear implants attend to visual information but may process it differently from their peers, potentially resulting in

slower overall responses (Bottari et al., 2014). This manifests in atypical strategies for processing visual and visuospatial information (Conway et al., 2011), as well as difficulties in tasks involving visual sequence discrimination, visual memory, and visuomotor sequencing (Bottari et al., 2014).

Historically, it has been assumed that deaf individuals possess superior visuospatial abilities compared to their hearing peers, prompting the widespread use of visual aids in their education (Marschark et al., 2019; Pisoni et al., 2007; Kornienko, 2021). However, studies on learning difficulties indicate that these challenges are frequently linked to visual functions. For example, 20% of preschool children experience difficulties with visual analysis and recognition, impacting their academic performance (Akhutina et al., 2001; Korsakova et al., 2022). Furthermore, children with hearing impairments exhibit distinct patterns of visual attention during learning tasks (Monroy et al., 2021) and perform less effectively in tasks requiring the monitoring and sequencing of visual stimuli (Dawson et al., 2002; Kyle et al., 2011; Thakur et al., 2023). Failure to account for these specificities in visual processing can lead to reduced academic success (Kyle et al., 2011) and the adoption of ineffective teaching methods. This is evidenced by a 4% disparity in learning efficacy between hearing and hearing-impaired groups, particularly in reading skills, comprehension, and vocabulary acquisition (Thakur et al., 2023; Yurkovic-Harding et al., 2022).

Moreover, while deaf children may possess typical visual attention mechanisms, they often struggle with encoding and processing stimuli into phonological representations (Almomani et al., 2021; Chen et al., 2010; Daza et al., 2013; Pisoni et al., 2007). Their performance in visual tasks largely depends on whether stimuli can be verbally encoded or named (Daza et al., 2013; Pisoni et al., 2007) and on their preferred language skills, irrespective of modality (Marschark et al., 2019). Consequently, it is imperative to investigate not only the role of visual aids but also their mode of presentation.

Drawing on prior research, this study addresses two key issues. First, it employs eye-tracking to explore the cross-modal effects of sensory deprivation on both spatial and temporal aspects of visual attention and the overall processing of visual information in children with hearing impairments. Unlike previous studies, this research aims to extend knowledge beyond the reorganization of visual attention to encompass visual gnosis and comprehensive visual information processing strategies. Second, it examines the influence of different presentation formats of visual aids — such as auditory-visual formats or visual lexical supports — on the learning process in children with hearing impairments.

Thus, the primary objective of this study is to use eye-tracking to identify the distinctive characteristics of visual information processing in children with hearing impairments resulting from early auditory deprivation. By utilizing visual educational materials, the study seeks to determine how these processing specificities manifest in learning situations, particularly in relation to the

format of visual aid presentation and the use of visual, auditory-visual, and lexical supports.

Materials and methods

Study Sample. The study involved preschool children aged 5.5-7 years. The sample included 15 children with hearing impairments (sensorineural hearing loss, class H90 per ICD; average hearing threshold at frequencies of 0.5, 1, 2, and 4 kHz >90 dB), comprising 8 boys and 7 girls, with a mean age of 6 years. Cochlear implants were fitted at age 3. The sample was matched for the timing of hearing defect onset and cochlear implantation. Post-implantation rehabilitation occurred in a specialized kindergarten where the study was conducted. All participants demonstrated sufficient cognitive development, speech recognition thresholds, and comprehension of spoken language to participate. They also had adequate experience with sound-amplifying devices. The control group consisted of 20 typically developing preschoolers (8 girls, 12 boys; mean age 6.1 ± 0.4 years).

Procedure. Given that post-cochlear implantation efforts focus on speech development and vocabulary expansion, visual educational materials were selected to activate the children's vocabulary. Illustrations from the ABC book for hearing-impaired children by N.Yu. Donskaya and N.I. Linikova were used as stimuli. These materials establish connections between auditory and visual representations of objects and their verbal labels, serving as visual aids to enhance vocabulary and phonemic hearing. The materials included:

— Subject and plot illustrations for learning object names and expanding vocabulary.

— Visual word representations: some illustrations featured lexical items (object vocabulary) in frames beside the objects, functioning as visual word supports (see Figure 1). Hearing-impaired preschoolers, as part of pre-literacy training, use visual aids such as word cards for speech development and are proficient in reading them.

Illustrations with and without captions were employed to assess how visual lexical supports influence visual attention in children with hearing impairments. Both subject illustrations (single objects) and plot illustrations (scenes) were included, differing in complexity, with plot illustrations being more abstract and thus more challenging to interpret.

The method of instruction delivery by the adult experimenter was varied:

— Verbal instruction only (triggering auditory-visual perception): The adult provided a verbal instruction specifying which object the child should identify and point to (e.g., "Show me where the doll is in the picture").

— Instruction with visual lexical support (triggering visual perception): The adult provided the instruction by pointing to the lexical label of the object (e.g., saying "Show me where…" and indicating the word "Ball" in the frame).

The control group of typically developing children underwent the same procedure under identical conditions.

Equipment. Data were recorded using a stationary GP3 eye tracker, with a tracking accuracy of 0.5–1°, a sampling rate of 60 Hz, and 5- or 9-point calibra-

tion. The head movement range was 25 cm horizontally and 11 cm vertically, with a desktop mount setup. Calibration was accepted if the average error was less than 0.30° of visual angle. Data were processed using the "Neurobureau" software (Neuroiconica assistive).

Stimuli were presented on a 15.6-inch laptop screen (1920 x 1080 resolution, 16:9 aspect ratio). The viewing distance was 60 cm, and images were 600x480 pixels. Image transitions were controlled by the experimenter via key presses following the child's response.

For comparing oculomotor activity between the two experimental series in children with hearing impairments, the Wilcoxon signed-rank test was used. To compare oculomotor activity between children with hearing impairments and typically developing children, the t-test was applied. Quantitative data were analyzed using SPSS V.23.0.

Results

Initially, we compared the oculomotor activity of children with hearing impairments and typically developing children when identifying objects in educational illustrations (both with and without visual lexical supports). The t-test was employed for this analysis (Table 1).

Table 1

Descriptive statistics of oculomotor activity in children with hearing impairment and typically developing children

		M (SD)	t-test		
			t	**degree of freedom**	**Significance**
number of fixations before the first fixation	typically developing children	0	–4,58	23	0,003
	children with hearing impairments	0,75 (0,16)			
time to first fixation	typically developing children	0	–4,52	23	0,003
	children with hearing impairments	0,24 (0,05)			
total viewing time	typically developing children	10,47 (0,73)	–5,37	23	0,0001
	children with hearing impairments	26,62 (2,91)			
number of returns to the area of interest	typically developing children	2,81 (0,4)	–4,83	23	0,0001
	children with hearing impairments	14,85 (2,46)			
average duration of fixations	typically developing children	0,41 (0,03)	–2,18	23	0,051

		M (SD)	t-test		
			t	degree of freedom	Significance
	children with hearing impairments	0,71 (0,13)			
total number of fixations	typically developing children	28,36 (3,95)	–2,37	23	0,030
	children with hearing impairments	54 (10,04)			

Children with hearing impairments exhibited a higher number of fixations before the first fixation on the target area, longer time to first fixation, and increased average fixation duration. These findings indicate prolonged temporal characteristics of visual information processing compared to typically developing children. Additionally, these children made more fixations and spent more time viewing the illustration before identifying the target object, suggesting that objects were less noticeable or harder to detect. The extended viewing time and higher average fixation duration point to an increased cognitive load during perception, further supported by the greater number of returns to the area of interest and the elevated total number of fixations during the viewing period.

Next, we analyzed how oculomotor activity in children with hearing impairments varied when identifying subject and plot illustrations under different presentation conditions: auditory-visual presentation (verbal instruction with visual aid) and presentation with visual lexical support (instruction with a visual word label). The Wilcoxon signed-rank test was used for this comparison (Table 2).

When visual aids were presented with visual lexical supports, children with hearing impairments exhibited fewer returns to the area of interest, fewer fixations, and fewer saccades, indicating easier perception and reduced cognitive load compared to identification via auditory instruction alone. The total scan path length was also shorter with visual lexical supports, suggesting less need for detailed scanning and reinforcing the reduction in cognitive load. Additionally, the ratio of the area of interest to the total stimulus area decreased with visual lexical supports, reflecting a more focused search area and clearer identification of the target region. These patterns were consistent across both subject and plot illustrations.

Further analysis of eye movement graphs and heat maps (Figure 1) confirmed that visual lexical supports reorganized visual attention and information selection in children with hearing impairments.

Table 2

Descriptive statistics of oculomotor activity of children with hearing impairments with different forms of presentation of visual aids

	***M* (*SD*)**				
Subject illustrations	**number of returns to the area of interest**	**total number of fixations**	**total number of saccades**	**total scan path length**	**total ssan path langth**
	***M* (*SD*)**				
Visual clarity without lexical designation	14,85 (2,46)	54 (10,04)	38,14 (8,43)	150,30 (26,06)	0,82 (0,000001)
Visual aids with lexical designation	8,28 (1,72)	29,71 (9,19)	20,42 (7,61)	71,43 (21,38)	0,75 (0,000001)
Criterion statistics					
Z	–2,17	–2,35	–2,11	–2,35	–3,74
Significance	0,03	0,01	0,03	0,018	0,000
	M (SD)				
Plot illustrations	**number of returns to the area of interest**	**total number of fixations**	**total number of saccades**	**total scan path length**	**total ssan path langth**
A series of experiments without lexical designation	8,8 (0,57)	41,8 (11,77)	32 (9,235)	167,84 (50,64)	0,88 (0,0001)
A series of experiments with lexical designation	3 (1,05)	24,4 (8,04)	20,4 (7,013)	91,84 (27,625)	0,86 (0,0001)
Criterion statistics					
Z	–2,53	–2,81	–2,53	–2,11	–3,162
Significance	0,011	0,005	0,011	0,035	0,002

When visual aids were paired with lexical supports, children with hearing impairments displayed fewer fixations and transitions, shorter scan paths, and more targeted fixations. Fixations were more sequential, with reduced need to revisit previously viewed areas, and the areas of interest were more clearly defined (narrowing the operational search field and reducing chaotic scanning). The spatial density of fixations was more concentrated, with attention focused on central areas of interest. In contrast, auditory-visual presentation resulted in broader

Fig. 1. Eye Movement Graphs and Heat Maps of Children with Hearing Impairments

attention distribution, with peripheral areas processed more extensively.

Compared to typically developing children, children with hearing impairments exhibited differences in the spatial distribution of attention, including the direction and sequence of visited areas, repeatability, and number of shifts. Their operational field dynamics (areas of interest and search zones) were broader, often encompassing peripheral and non-target areas. Typically developing children showed more sequential fixations in target zones, with clearer areas of interest and less need for detailed scanning.

Discussion

The primary aim of this study was to investigate the unique characteristics of visual information processing and the reorganization of visual attention in children with hearing impairments when perceiving educational visual aids. Analysis of eye movement patterns revealed several key insights.

First, our eye-tracking data complement previous findings that auditory deprivation in children with cochlear implants alters the sequence of visual information processing (e.g., Marschark et al., 2019), the spatial distribution of visual attention (e.g., Bavelier et al., 2010), and results in a broader attentional range (e.g., Chen et al., 2009; Tharpe et al., 2005). We also observed distinct visual search strategies and frequent attentional shifts and distractions in children with hearing impairments.

Consistent with earlier research, our results suggest that children with hearing impairments may employ parallel rather

than sequential processing of visual information (Stivalet et al., 1998), leading to an expanded search area and a shift of interest boundaries to the periphery. Additionally, their processing strategy appears more "bottom-up," characterized by chaotic, non-sequential selection of informational features, frequent strategy changes (particularly under difficulty), and less efficient perceptual actions.

The study also supports the view that temporal (sequential) processing of visual information is altered in children with hearing impairments, potentially affecting visual-temporal processing thresholds (e.g., Nava et al., 2008; Iversen et al., 2015; Heming et al., 2005). This may influence the time required to detect stimuli, identify and compare multiple stimuli, and the order of stimulus inspection. Increased temporal characteristics (e.g., detection time, viewing time) may be attributed to delays in auditory signal input from the cochlear implant, disrupting the synchronization of auditory and visual stimuli. This effect may be compounded by the cognitive complexity of perception due to limited vocabulary and challenges in linking word sounds to visual objects.

Furthermore, our findings indicate that children with hearing impairments exhibit variations in the depth and intensity of visual information processing, as well as in the noticeability ("recognizability") of images and the mental load associated with perceiving educational visual aids.

Conclusions

Through eye-tracking, this study has expanded our understanding of the cross-modal effects of sensory deprivation on both spatial and temporal processes in visual information processing among children with hearing impairments.

Additionally, it provides new insights into the impact of different presentation formats of educational visual aids — specifically auditory-visual formats versus visual lexical supports — on the learning process in these children.

Our results confirm that the effectiveness of visual perception in children with hearing impairments depends on the modality of presentation, including whether stimuli can be verbally encoded (Dawson et al., 2002; Pisoni, 2007) or supported by visual lexical cues. The presentation format significantly influences how visual attention is structured in these children. Specifically, using visual aids with auditory instructions alone is less effective than combining visual aids with visual lexical supports. The latter reduces cognitive load, requires less detailed scanning, and facilitates faster, more efficient selection of visual information. Auditory-visual presentation is less effective, likely due to delays in auditory input from the cochlear implant, which may hinder the processing of sequential auditory-visual stimuli. This is further complicated by difficulties in linking auditory word representations to visual objects, exacerbated by limited vocabulary. Thus, a bimodal approach incorporating visual supports is essential.

These findings have practical implications for the education and rehabilitation of children with hearing impairments post-cochlear implantation. Effective processing of sequentially presented visual stimuli, such as educational visual aids, is vital for speech development, vocabu-

lary acquisition, and reading skills. In the learning and rehabilitation process, transitioning from auditory-visual to purely auditory perception of spoken language is a key goal for children with cochlear implants. Our data illustrate how visual aids can be integrated into this process to support this transition.

Limitations. The primary limitations stem from the small and unique sample of preschool children with cochlear implants, which may limit the generalizability of the results. Future research should aim to expand this sample. Additionally, further studies should compare different age groups of children with hearing impairments to explore age-related differences in visual information processing and the role of cochlear implant duration in compensating for early auditory deprivation.

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Contribution of the Authors
Smirnova Ya.K. — research ideas; annotation, writing and design of the manuscript; research planning; monitoring the conduct of the study, application of statistical, mathematical or other methods for data analysis; conducting the experiment; data collection and analysis; visualization of the research results. The author took part in the discussion of the results and agreed on the final text of the manuscript.

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ПСИХОЛОГИЯ ОБРАЗОВАНИЯ
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Psychological bases for teaching elementary schoolchildren simple experimentation

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Abstract

Context and relevance. Experimentation as a general way of acting and thinking provides the basis for understanding all the natural sciences. That is why the ability to experiment is considered an important outcome of modern primary education. However, the conditions of effective training of junior schoolchildren in experimentation and the age possibilities of mastering this method of action have not been identified, which determines the relevance of this study. **Objective.** To describe the peculiarities of the simplest experimentation as a way of action and to characterise the age possibilities and conditions of mastering this way by junior schoolchildren through the design of experimental teaching. **Hypothesis.** Planning of the simplest experiments is included in the age possibilities of junior schoolchildren. The effectiveness of mastering the mode of action depends on the independence of pupils in discovering the need to control the conditions of the experiment. **Methods and materials.** Logical and logical-psychological analysis of the simplest experimentation. Formative experiment (analysis of video recordings). Comparative survey: an experimental class (27 pupils, 14 girls and 13 boys), which was taught experimentation in accordance with the principles of the D.B. Elkonin-V.V. Davydov system, and three control classes (two second classes, a total of 50 pupils, including 20 girls and 30 boys, and one fourth class, 25 pupils, including 10 girls and 15 boys), taught according to the traditional method. **Results.** Second grade students who were taught experimentation through setting and solving a learning problem demonstrated an understanding of the differences between experimental and control conditions and planned experiments at the level of fourth graders taught using the traditional curriculum (Mann-Whitney U-criterion, $p = 0{,}117$). Analysis of lesson videos and control measurements revealed dynamics and a key difficulty in mastering experimentation related to the need to simultaneously perform two opposite actions — opposing and equalising conditions for experimental and control subjects. **Conclusions.** It is shown that the simplest experimentation is accessible for mastering by junior schoolchildren, but the essential condition of mastering is the pupils' independent discovery of the necessity of controlling the conditions of experience. It is recommended to strengthen the activity

character of teaching experimentation in traditional primary schools in order to achieve this important meta-subject result.

Keywords: elementary experimentation, learning task solving, mode of action, experiment planning, logical-subject analysis, logical-psychological analysis, age-appropriate

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Психологические основания обучения младших школьников простейшему экспериментированию

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Резюме

Контекст и актуальность. Экспериментирование как общий способ действия и мышления создает базу для понимания всех естественных наук. Поэтому умение экспериментировать считается важным результатом современного начального образования. Однако условия эффективного обучения младших школьников экспериментированию и возрастные возможности усвоения этого способа действий не выявлены, что определяет актуальность данного исследования. **Цель**. Установить особенности простейшего экспериментирования как способа действия и охарактеризовать возрастные возможности и условия освоения этого способа младшими школьниками через проектирование экспериментального обучения. **Гипотеза**. Планирование простейших экспериментов входит в возрастные возможности младших школьников. Эффективность освоения способа действий зависит от самостоятельности учеников в открытии необходимости контроля условий эксперимента. **Методы и материалы**. Логико-предметный и логико-психологический анализ простейшего экспериментирования. Анализ видеозаписей формирующего эксперимента. Сравнительное обследование: экспериментальный класс (27 учеников, 14 девочек и 13 мальчиков), который обучался экспериментированию в соответствии с принципами системы Д.Б. Эльконина-В.В. Давыдова, и три контрольных класса (два вторых класса, всего 50 учеников, из них 20 девочек и 30 мальчиков, один четвертый класс, 25 учеников, из них 10 девочек и 15 мальчиков), обучавшиеся по традиционной методике. **Результаты.** Ученики второго класса, обучавшиеся экспериментирова-

нию через постановку и решение учебной задачи, продемонстрировали понимание различий между экспериментальными и контрольными условиями и планировали эксперименты на уровне четвероклассников, обучающихся по традиционной программе (U-критерий Манна-Уитни, p = 0,117). Анализ видеозаписей уроков и контрольные замеры выявили динамику и ключевую трудность в освоении экспериментирования, связанную с необходимостью одновременного выполнения двух противоположных действий — противопоставления и уравнивания условий для экспериментальных и контрольных объектов. **Выводы**. Показано, что простейшее экспериментирование доступно для освоения младшими школьниками, однако существенным условием освоения является самостоятельное открытие учениками необходимости контроля условий опыта. Рекомендовано для достижения этого важнейшего метапредметного результата усилить деятельностный характер обучения экспериментированию в традиционной начальной школе.

Ключевые слова: простейшее экспериментирование, решение учебной задачи, способ действия, планирование эксперимента, логико-предметный анализ, логико-психологический анализ, возрастные возможности

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Introduction

Among the modern requirements for primary education outcomes, so-called metadisciplinary educational results play a significant role. These include the ability to experiment, establish cause-and-effect relationships, draw conclusions, and justify them based on experimental results and measurements. Similar requirements are also recorded in the subject-specific outcomes of the “The World Around Us” course (Order of the Ministry of Education of Russia, 2021). The achievement of these results is assessed, for example, in one of the tasks of the All-Russian Verification Work (VPR) in the 4th-grade “The World Around Us” test (VPR, 2023). This task assumes that a primary school graduate is not only capable of reading and understanding informational texts but also of planning an experiment to test a hypothesis, recognizing the differences between an experiment and a control test, and identifying the necessity for appropriate measurements.

However, methodological literature lacks justification for the necessity of introducing experimentation in primary school, an understanding of the extent to which these skills should be mastered, and an analysis of approaches teachers use to implement this task. This gap is partly due to the insufficient psychological research on the issue. Most psychological and pedagogical studies show the positive impact of early training in scientific methods on students’ cognitive development, abilities, knowledge, and personal qualities (Abualrob, 2019; Levy & Mensah, 2021; Oktaviani et al., 2023; Siti et al., 2023; Twizeyimana et al., 2024; Zainil et al., 2023).

These studies emphasize students' growing interest in studying the world around them when learning is based on real experimentation (Trofimova, 2024; Lewis, 2019) and highlight the teacher's role in setting tasks and the need for changes in teacher training (Sanina, 2023; Estapa & Tank, 2017; Stari et al., 2020). Only a small portion of the research focuses on analyzing the actual process of experimentation and studying difficulties in mastering it (Osterhaus et al., 2016; Valanides et al., 2014). Some researchers (Osterhaus et al., 2016) note that children struggle to learn how to control experimental conditions and conclude that this skill can only be fully developed between the 4th and 6th years of schooling.

To develop or evaluate methodological approaches to teaching, it is first necessary to provide a psychological characterization of experimentation as an activity to be mastered in primary school. This involves conducting a logical-subject matter and logical-psychological analysis of educational content. V.V. Rubtsov states: "According to V.V. Davydov, psychological and pedagogical research must integrate logical-subject matter and logical-psychological analyses of educational content and teaching methods. The approach to children's developmental potential should be seen not as something predetermined but as something that unfolds and takes shape during formative experimentation" (Rubtsov, 2005, p. 17). The results of these analyses serve as the foundation for designing formative experiments that allow researchers to identify and describe the process and outcomes of mastering this content, as well as to determine students' developmental potential and possible difficulties. This, in turn, helps develop both methodological approaches to teaching and strategies for training teachers to achieve the Federal State Educational Standards (FSES) results.

Experimentation, as a method of obtaining answers to questions posed to nature, has been known since antiquity. Over centuries, it has evolved and improved, becoming the foundation of modern science (Akhutin, 1976; Stepin, 2000; Suvorov, 1972). Unlike targeted observation or practical trials, experimentation involves comparing two identical objects (or one object at different points in time) under different conditions. In modern scientific experiments, issues of reliability, accuracy, and reproducibility are crucial (see Stepin, 2000). However, these issues are not relevant to teaching young students. Thus, we focus on **basic** experimentation, emphasizing only its fundamental aspects. Basic experimentation involves comparing two objects rather than two large (statistically meaningful) groups of objects. Another key characteristic of basic experiments is their single-variable nature — only one factor is manipulated at a time.

Experimentation is a conscious and planned activity primarily defined by a hypothesis, a proposed explanation of a process. In science, hypotheses are often derived "from theory" through deduction, meaning they are logical conclusions. However, in basic experimentation, hypotheses are usually formulated through intuitive insights about potential relationships between objects or processes — similar to how new theories are created (see Suvorov, 1972). This has implications for teaching: students cannot be directly taught how to formulate hypotheses. Instead, learning environments should provoke students into making hypotheses, thereby stimulating the development of this ability.

Some hypotheses may be unverifiable due to a lack of necessary tools, while others are fundamentally unverifiable. In basic experimentation, students often propose hypotheses with vague formulations that can-

not be operationalized, such as “Dandelions close because of the weather”[1].

As a result of mastering basic experimentation, students should be able to plan an experiment according to a given hypothesis. The key components of such a plan include:

- Two comparable objects (experimental and control).
- Identification of different conditions for experimental and control objects, based on the hypothesis.
- Equalizing other conditions for the experimental and control objects.
- Formulating predictions about the expected outcomes for both scenarios (if the hypothesis is correct or incorrect).

An important aspect of experimentation, even in its simplest forms, is the recording and description of results as well as the derivation of conclusions (for more details, see Chudinova & Shishkina, 2024). These aspects have also been highlighted in studies on young children’s understanding of experimental design. However, such studies primarily focus not on how these skills can be developed, but rather on measuring children’s achievements (Osterhaus et al., 2016). The questions of distinguishing what is observed from what is inferred, as well as differentiating between results and conclusions, are highly interesting. However, they require a separate study and will not be addressed in this paper.

A logical-subject matter and logical-psychological analysis of experimentation allows us to understand its significance for the development of thinking and consciousness. Mastering basic experimentation lays the foundation for understanding causality and enables a clear distinction between temporal and cause-and-effect sequences of events. Erroneous conclusions such as “*My wife got sick after vaccination, therefore the vaccine caused the illness*” are common not only among children but also among many adults.

Causal reasoning is fundamental to scientific knowledge and school subjects built upon it. A.V. Akhutin, describing Galileo’s experiments, notes: “These countless experiments possess the ability to prove even before they are actually conducted… Galileo thinks experimentally, within experiments, through experiments, yet he is always already convinced of the truth of the result before conducting the experiment” (Akhutin, 1976, p. 3). Essentially, Galileo demonstrates the explicit verbalization of scientific reasoning, a process that in modern scientific articles is often implicit.

The above means that textbooks on physics, chemistry, biology, and astronomy cannot be fully understood by students without mastering this fundamental way of thinking and acting. Therefore, introducing basic experimentation in primary school is essential.

Unlike other primary natural science courses (grades 1–4), in the Elkonin-Davydov educational system, the method of basic experimentation is discovered by children through collaborative and distributed learning activity, using the example of pinecones closing in humid weather. The learning task of finding a method of action arises when trying to explain what happened to the pinecones that were lying open on the path yesterday with spread-out scales and are now closed. A concrete-practical version of the task is formulated as “make the open pinecones close.” The versions proposed by the students (“be-

[1] A more detailed description of basic experimentation and the specifics of working with children's hypotheses has been provided in our previous work (Chudinova & Shishkina, 2024).

cause of the cold," "because of the darkness," "because of the humidity," etc.) are initially not hypotheses; they become hypotheses in the process of encountering different possible answers and realizing that it is unknown which one is correct. The familiar method of observation, which the students attempt to use to confirm one of the versions, does not work because the teacher creates a situation where all the mentioned conditions change simultaneously.

The students search for a new method, coming up with a way to ensure that only one condition changes (has an effect), for example, cold. The idea of placing a pinecone in the refrigerator turns out to be insufficient because "what if it would close even without the refrigerator?" This reveals the necessity of a control object (another pinecone), which needs to be placed in a warm environment. Another mental step involves the idea of equalizing all other conditions: "if it is dark in the refrigerator, then the pinecone placed in warmth must also be in darkness; otherwise, it will be unclear whether it closes due to cold or darkness."

The newly discovered method of answering questions is compared to previously known observation techniques, and the necessary actions are recorded in a symbolic-representational scheme. The method is then practiced through experimentation with other natural objects (see Chudinova & Shishkina, 2024). The duration of this stage of learning is approximately eight lessons.

Materials and Methods

The research hypothesis stated that full mastery of experimentation, even in its simplest form, requires students to independently discover this method of action and understand it within the framework of structured learning activities. A simple explanation and demonstration of experiments, as well as the independent execution of simple experiments according to ready-made instructions (the traditional teaching approach in the *World Around Us* course within the *School of Russia* system, which is used in the majority of schools in the country), cannot ensure the development of the skills required by the Federal State Educational Standards (FSES).

Accordingly, the first objective of our study was to conduct a logical-subject matter and logical-psychological analysis of experimentation as a method of action that should be mastered by primary school students. This analysis was partially conducted earlier (Chudinova & Shishkina, 2024) and was briefly described as basic experimentation in the introduction of this study.

To assess the ability of primary school students to plan a simple experiment, understanding the differences between an experiment and a control test, a diagnostic method was developed, consisting of three tasks. All these tasks were used only for diagnostics and were not included in the teaching process. In the first task, students were required to predict the result of a given simple experiment in case the hypothesis was correct. In the second, they had to indicate the conditions necessary for control, in accordance with the hypothesis. In the third, they had to choose the appropriate conditions for conducting the experiment in accordance with its objective:

1. Masha thinks that seeds need moisture to germinate. She took a saucer (A) with wet cotton and placed 5 seeds on it. Then Masha took another saucer (B) with dry cotton, placed 5 seeds on it, and put both saucers in a warm place. What will happen if Masha is right?

2. Kolya hypothesized that saltwater freezes faster than tap water. He took two plastic cups. In the first cup, he poured water, added and stirred in salt, then placed the cup in the freezer. Fill in the table to indicate what

should be done with the second cup to test Kolya's hypothesis.

First Cup	*Second Cup*
100 g of water	*?*
One tablespoon of salt	*?*
Placed in the freezer	*?*

3. Different objects (cubes, spheres, eggs) were placed near seagull nests to observe how the seagulls would interact with them. Some rounded objects (spheres, eggs) were rolled into the nests by the seagulls, while objects of other shapes were ignored. This allowed scientists to conclude that seagulls recognize shapes.

What objects should be offered to seagulls to determine whether they can distinguish colors? Mark the appropriate objects with a cross (☒).

☐ *small wooden red spheres*
☐ *small metallic shiny spheres*
☐ *small wooden blue eggs*
☐ *small wooden white spheres*
☐ *large wooden yellow spheres*
☐ *small wooden yellow spheres*

This work was offered to students completing the fourth grade in a Moscow public school (25 students, including 10 girls and 15 boys) as well as to students from two second-grade classes at the end of their second year of study in the same school (50 students, including 20 girls and 30 boys). For comparison with this group and to analyze the process and difficulties involved in mastering basic experimentation, we included a second-grade class from another Moscow public school where students studied the World Around Us course within the Elkonin-Davydov system (27 students, including 14 girls and 13 boys). This comparison was preliminary; therefore, we did not account for many other factors that could influence students' results — such as the educational level of parents or teachers' teaching experience.

Among the research tasks, in addition to testing the hypothesis, was the analysis of children's difficulties in discovering and mastering the method to clarify the age-related capabilities of younger students. Therefore, in the school where teaching was conducted according to the Elkonin-Davydov system, participatory observation was carried out, and an analysis was made of video recordings of lessons introducing experimentation and lessons for specification (three video recordings), as well as the results of three small assessment tasks (variations of task 2 from the diagnostic work, differing in the hypotheses and materials of the described experiments).

Two similar assessment tasks were conducted one week apart, the third one a month after studying the topic, and at the end of the school year, the final diagnostic work presented above was carried out.

Results

The learning task of discovering experimentation, conducted in a class taught according to the Elkonin-Davydov system, was challenging for students. In particular, the question that prompted the idea of comparing two pinecones posed significant difficulties. When this idea arose in class, the teacher proposed a straightforward approach to contrasting and equalizing conditions in planning specific experiments with the pinecones (Fig. 1).

This allowed the children to work both at the board and at their desks (in groups), reasoning about the conditions of the experiment while arranging corresponding labels with written condition options in front of them. The experiment with the pinecones was con-

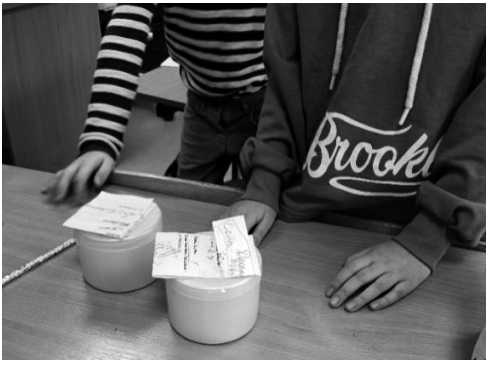
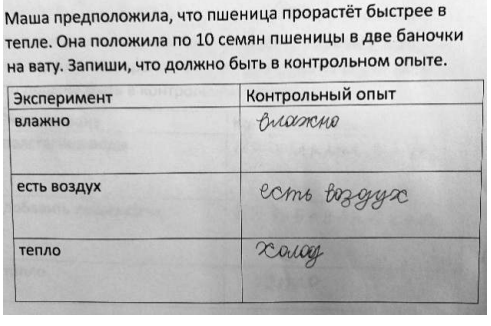


Fig. 1 (left). Pupils discuss the conditions of a possible experiment, working in a group
Fig. 2 (right). The pupils put the cones into two lightproof containers according to their plan. In one of them the cone is on a wet sponge, in the other container the cone is dry

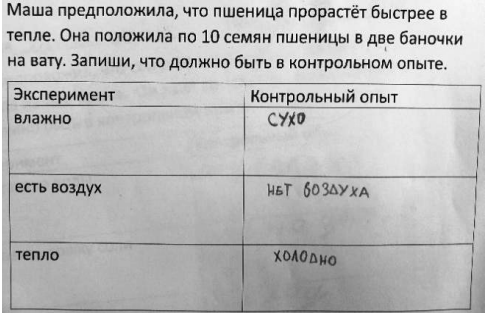
ducted (Fig. 2), and its results were discussed in the next lesson.

The first assessment, conducted at the beginning of the lesson following the lesson on discovering the new method of action, showed that 33% of the students clearly understood how to proceed in testing their hypothesis and were able to consciously plan the verification of another hypothesis independently (Figs. 3 and 4). This indicates that they grasped and retained the essence of the method since they had to apply it to a new, unfamiliar material.

In subsequent lessons, the learning task was extended to other similar materials (e.g., experiments with water and snow, planning experiments on seed germination). In solving each task, students had to construct logical reasoning about possible outcomes based on their hypotheses: what would happen to the experimental and control objects if the hypothesis was correct, and what if it was


Маша предположила, что пшеница прорастёт быстрее в тепле. Она положила по 10 семян пшеницы в две баночки на вату. Запиши, что должно быть в контрольном опыте.

Эксперимент	Контрольный опыт
влажно	влажно
есть воздух	есть воздух
тепло	холод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Эксперимент	Контрольный опыт
влажно	СУХО
есть воздух	НЕТ ВОЗДУХА
тепло	ХОЛОДНО

Fig. 3, 4. On the left is a typical successful test paper. In the work on the right, the student grasped the idea of contrasting the conditions in the experiment and the control experiment, but did not realise that in order to investigate the effect of one of the conditions, the other conditions must be equated

incorrect? If experimental conditions were not properly organized, a binary assessment of results became impossible because other factors could not be excluded. When two conditions changed simultaneously, it was unclear which change led to a particular result. Consequently, there was a need to revise the experimental plan.

Over a month (two lessons per week), students were given various tasks related to planning and conducting basic experiments. Afterward, the class moved on to studying the next topic. The comparative results of the diagnostic test conducted at year's end are presented in Table 2.

Discussion of results

The table shows that fourth-grade students studying under the traditional program do not sufficiently possess the skills required by the Federal State Educational Standards (FSES), with only a 46% success rate in solving problems. Similar findings are reported by other researchers: large-scale studies indicate that fifth — and sixth-grade students correctly solve experimental tasks in about 50% of cases when provided with contextual support such as illustrations or multiple-choice answers (Osterhaus et al., 2016). Second-grade students who purposefully discovered and mastered basic experimentation performed tasks on planning experiments and predicting their results at approximately the same level as primary school graduates, and significantly outperformed second-grade students studying under the most widely used World Around Us program. To compare the success rates among children with different levels of mastery in experimentation, the Mann-Whitney U-test was employed. Statistically significant differences were found between second-grade control and second-grade experimental classes (p = 0,009), while no significant difference was observed be-

Table

Results of the final diagnostic work (average problem solving index in %)

	Basic experimentation learning, Elkonin-Davydov system, 2nd grade classes	Traditional learning in the World Around Us course, 2nd grade classes	Traditional learning in the World Around Us course, 4th grade classes
Prediction of the result if the hypothesis is correct (0/1 points)	50[2]	22	44
Identification of control conditions (0/1 points)	69	52	80
Selection of objects for the experiment (0/1/2 points)	19	7	30
Average result for the three tasks (out of 4 points)	39	22	46

[2] Twenty-four people wrote the final project.

tween fourth-grade control and second-grade experimental classes (p = 0,117).

Tracking the progress of individual students in the experimental class in mastering basic experimentation shows that, for a significant number of students, this learning was still not sufficiently effective. Based on the dynamics of individual progress from the first to the final assessment, we divided the class into three groups:

1. Unstable results or lack of progress — 11 students

2. Gradual progress under extended task-solving conditions (solving similar tasks with analogous problem structuring) — 4 students

3. Quick grasp of the method during the first or second lesson of the topic, followed by consistently correct solutions to similar tasks of equal difficulty using different materials — 14 students

The absence of visible progress in mastering the new method of action did not correlate with lesson absences (Spearman's correlation coefficient r = 0,16; p = 0,426). Apparently, what a student vividly discovers becomes an insight that is effectively learned immediately and firmly retained in memory. Thus, a student from the third group — who attended the first two lessons of the topic but missed the next five — successfully completed the delayed assessment task.

It is likely that the lack of progress observed in many students is related to their insufficient engagement in the learning process. This may be due both to low cognitive motivation and other factors, such as poor comprehension of Russian speech by some children.

Observations of the experimental learning process indicate that a key psychological foundation for understanding the meaning of experimentation — and for being able to plan an experiment based on a hypothesis — is students' ability to distinguish between experimental and control objects. This involves contrasting and equalizing conditions under which selected objects are placed during joint practical activities. When students fail to draw logical conclusions from comparisons — particularly when this work with conditions has not been properly conducted — it can lead to the development within their logical reasoning system of a new, non-binary way of assessing results. In such cases, answers to experimental questions may be "yes," "no," or "possibly" (Bugrimenko, 2004). This situation often arises when conditions for controlling objects are not precisely organized, making it impossible to confirm or refute hypotheses without conducting additional experiments.

Conclusion

• The logical-subject matter analysis of experimentation shows that mastering this method of action forms the foundation for understanding causality and clearly distinguishing between temporal and cause-and-effect sequences of events, thus serving as a basis for comprehending educational texts in natural science subjects in secondary school.

• The logical-psychological analysis indicates that the educational content in primary school can and should be limited to basic experimentation. The essence of this approach involves comparing two objects placed in different conditions based on a tested hypothesis, while ensuring that all other conditions in the experimental and control trials are equalized. This method of action should be distinguished from practical trials, "children's experimentation" (as described by N.N. Poddyakov), demonstration experiments, traditional laboratory work, and scientific experiments.

• The diagnostic data indicate that mastering **basic experimentation** falls

within the developmental capabilities of younger schoolchildren. However, a teacher's explanation, demonstration, and independent execution of simple experiments — following a ready-made instruction — are practiced in the traditional "*World Around Us*" course within the *School of Russia* system (which is used in the vast majority of schools in the country). These methods do not fully ensure an understanding of the meaning of basic experimentation. Regarding the ability to plan a basic experiment, primary school graduates achieve similar results to second-grade students under activity-based learning conditions (Elkonin-Davydov system).

• The qualitative analysis of the process of forming the method of experimentation shows that the need to simultaneously perform two mutually opposite actions in meaning (contrast and equalization) is the main stumbling block in children's understanding of the new method. This may be related to the failure to distinguish between the goal of the experiment (testing a hypothesis) and the goal of practical influence on an object (achieving a practical effect) (Osterhaus et al., 2016), but this requires further research. It is also necessary to examine how well students differentiate and correlate their experimental plans with the reality of the experiment itself. Additionally, it is important to assess the impact of experimental learning on overcoming Piagetian phenomena that characterize the stage of concrete operations in younger students' thinking.

• In future research, we plan to examine whether changes in the form of learning (introducing basic experimentation not through a real-world task but in a virtual laboratory (Chudinova, 2022)) influence motivation and the effectiveness of teaching experimentation to children with various learning difficulties.

Limitations. In comparing the results of the final diagnostics, we did not take into account many factors that can influence the results of pupils' work, such as, for example, parents' educational level, teachers' teaching experience, etc. The progress of experimental formation and the dynamics of pupils' work was investigated within the framework of one experimental class, which, of course, requires verification and comparison with the dynamics of learning in other classes using the same methodology.

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Contribution of the Authors
Elena V. Chudinova — ideas; annotation, writing and design of the manuscript; planning of the study; control over the study, data analysis.

Irina A. Shishkina — ideas; search for methodological solutions in the formative experiment, conducting surveys, analysing data.

All authors participated in the discussion of the results and agreed on the final text of the manuscript.

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The authors declare no conflict of interest.

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Opportunities for preschoolers mathematical skills training using a digital mathematical application

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Abstract

Context and relevance. Digital devices are an integral part of the lives of most modern preschoolers. In this regard, the study of the developmental and educational potential of these devices is becoming an important and urgent task for modern science and practice. **Objective.** This study was aimed at exploring the possibilities of improving mathematical skills in preschoolers using a digital math application in situations of joint discussion with an adult or independent use of the application. **Hypothesis.** We assumed that preschoolers who use a digital math app in a situation of joint discussion with an adult will be more successful at completing math tasks for quantity and counting, as well as magnitude, than children who used the app on their own. **Methods and materials.** The study involved 64 preschoolers (42,1% of boys) aged 5–6 years, pupils of the senior kindergarten groups in Moscow. In the course of the study, preliminary testing of mathematical skills and the level of non-verbal intelligence in preschoolers was conducted; then, based on the diagnostic results, the children were divided into 2 experimental groups, each of which was given a series of six developmental classes. The final stage was the repeated testing of mathematical skills in children who took part in educational activities. Methods for comparing numbers, arithmetic skills, comparing intervals between numbers and a sense of number were used to evaluate mathematical representations of preschoolers about quantity, and tasks for measuring by measure and the ability to find a correspondence between objects in size were used to evaluate representations of magnitude. To diagnose the level of nonverbal intelligence, the technique of “Raven’s Color Progressive Matrices” was used. **Results.** The results showed that more significant improvements in children’s performance of counting and magnitude tasks occurred in children who had the opportunity to discuss math tasks performed in the application with an adult. **Conclusions.** The conducted research allows us to conclude that when using digital educational applications to train mathematical skills in preschoolers, the help and participation of an adult plays an important role.

Keywords: cognitive abilities, mathematical skills, digital devices, educational applications, preschool age

Supplemental data. Data set is available in the Laboratory of Child Psychology and Digital Socialization, Federal Scientific Center for Psychological and Interdisciplinary Research (FSC PMI).

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Возможности развития математических умений дошкольников с помощью цифрового математического приложения

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Резюме

Контекст и актуальность. Цифровые устройства являются неотъемлемой частью жизни большинства современных дошкольников. В связи с этим изучение развивающего и образовательного потенциала данных устройств становится важной и актуальной задачей для современной науки и практики. **Цель**. Выявление возможностей улучшения математических умений у дошкольников с помощью цифрового математического приложения в ситуациях совместного обсуждения со взрослым или же самостоятельного использования приложения. **Гипотеза**. Успешность выполнения математических заданий на количество и счет, а также величину у дошкольников, которые используют цифровое математическое приложение в ситуации совместного обсуждения со взрослым, будет выше, чем у детей, которые использовали приложение самостоятельно. **Методы и материалы**. В исследовании приняли участие 64 дошкольника (42,1% мальчиков) в возрасте 5–6 лет, воспитанники старших групп детских садов г. Москвы. В ходе исследования было проведено предварительное тестирование математических умений и уровня невербального интеллекта у дошкольников; затем на основании результатов диагностики дети были разделены на 2 экспериментальные группы, с каждой из которых была проведена серия из шести развивающих занятий. Заключительным этапом стало повторное тестирование математических умений у детей, принявших участие в развивающих занятиях. Для оценки математических представлений дошкольников о количестве были использованы методики на сравнение чисел, на арифметические умения, на сравнение интервалов между числами и чувство числа, а для оценки представлений о величине были использованы задания на измерение меркой и на умение находить соответствие между предметами по величине. Для диагностики уровня невербального интеллекта была использована методика «Цветные прогрессивные матрицы Равена». **Результаты.** Полученные результаты показали, что более значимые улучшения при выполнении детьми заданий на счет и величину произошли у детей, которые имели возможность совместного обсуждения выполняемых в приложении математических заданий со взрослым. **Выводы**. Проведенное исследование

позволяет сделать вывод о том, что при использовании цифровых образовательных приложений для тренировки математических умений у дошкольников большую роль играют помощь и участие взрослого.

Ключевые слова: познавательные способности, математические умения, цифровые устройства, образовательные приложения, дошкольный возраст

Дополнительные данные. Набор данных, собранных в рамках государственного задания ФНЦ ПМИ: лаборатория психологии детства и цифровой социализации ФНЦ ПМИ (с данными можно ознакомиться в лаборатории). Пример одного развивающего занятия и список занятий, а также подробное описание диагностических методик можно запросить у автора (Д.А. Бухаленковой).

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Introduction

Currently, the digital devices use is an integral part of the most preschool children's lives (Veraksa et al., 2021; Kalabina, Progatskaya, 2022; Smirnova et al., 2022; Chichinina et al., 2023; Konca, 2022). Depending on the amount of screen time, the type of digital content consumed, the organization of interaction with digital devices, and the parental involvement presence, the digital devices use can be developmental, including for children's mathematical skills and abilities (Belova, 2022; Denisenkova, Taruntayev, 2022; Belolutskaya, Vachkova, Patarakin, 2023; Benavides-Varela et al., 2020). The mathematical skills development level in preschool children is a significant predictor of the child's subsequent academic success in school (Duncan et al., 2007; Jordan et al., 2009). Thus, this research examined the possibility of improving mathematical skills in preschool children via a digital mathematical application, provided that it is used in situations of joint discussion with an adult or independent use by children.

In senior preschool age, elementary mathematical concepts and skills are actively formed. While learning mathematics, preschool children develop elementary knowledge about the set, number, magnitude and shape of objects, they learn to navigate in time and space, master counting and measuring objects. In addition, children acquire knowledge of special mathematical terminology (i.e. names of geometric figures, mathematical operations with numbers, etc.) and become familiar with certain mathematical relationships, patterns, and dependencies (Gabova, 2014; Jordan et al., 2009). In this work, we focused on studying the mathematical representations of senior preschoolers about quantity and magnitude as the most basic and significant for further successful mastery of mathematics in elementary school (Benavides-Varela et al., 2020; Jordan et al., 2009).

The association between digital device use and mathematical knowledge and skills in preschool children is still poorly underexplored, however it is important to mention several studies that confirm the presence

of such an association. In the research by Zaranis and colleagues (Zaranis, 2012; Zaranis, Kalogiannakis, 2011), the effectiveness of traditional mathematics teaching was compared with computer-based teaching built on the Hill model, which assumes the development of geometric thinking at five complexity levels, with only the first two levels used for kindergarten. At the first level, children recognize geometric figures, identify them with surrounding objects (for example, a rectangle is like a door). At the second, descriptive-analytical level, they recognize the geometric figures' properties. The study was conducted in a Greek kindergarten among children of 4 to 6 years old. The control and experimental groups, which received traditional and computer-based teaching respectively, studied similar material with the same frequency. The lessons included a story/explanation for each of the ten numbers, introduced the child to various aspects of counting situations, and involved the child actively in solving gamified tasks for counting. The computer tasks were selected in accordance with the kindergarten program and were a supplement to the material learnt. The results demonstrated that additional computer training can improve the mathematical skills development in preschool children (Zaranis, 2012; Zaranis, Kalogiannakis, 2011).

Despite the fact that there is very little data on the importance of joint (with parents) digital devices use for teaching preschoolers mathematics (Belova, Shumakova, 2022; Veraksa et al., 2022), a number of studies show that children's digital devices use becomes more developmental when utilizing them together with parents and siblings, when communicating and discussing digital content (Veraksa et al., 2022; Karabanova, 2022; Bukhalenkova, Chichinina, Almazova, 2023; Dore, Zimmermann, 2020; Wannapaschaiyong et al., 2023). Kim's meta-analysis found a link between parental involvement in children's digital devices use and academic achievement of children at school age (from preschool to final-year classes) (Kim, 2022).

There are several mechanisms through which sharing digital devices with adults can help a child learn better via digital content. Firstly, adults can direct a child's attention to important parts in digital content by highlighting information that needs to be mastered. Secondly, adults can help children interpret digital content when it is unclear or more complex than the child could understand on his/her own. Finally, adults can help children understand how media content relates to their own lives and the real world (Dore, Zimmermann, 2020).

Research demonstrates that active mediation by an adult improves children's understanding and learning (Archer, Wood, De Pasquale, 2021; Dore et al., 2020; Strouse, Ganea, 2021). In a study by Strouse and colleagues, one group of parents was trained to pause an educational video while watching it with their child, ask questions, and encourage their child to recount parts of the story. Another group of parents was asked to watch the video with their child as usual. Results indicated that when parents were encouraged to interact with their child, children understood the story in the video better and learned more new words from it (Strouse, O'Doherty, Troseth, 2013).

Thus, the research conducted points to the importance of children using digital devices together with adults, and that more active forms of shared use have a more significant impact on learning (Ar-

cher, Wood, De Pasquale, 2021; Dore et al., 2020; Strouse, Ganea, 2021). Although many Russian studies written by V. Davydov, L. Obukhova, N. Talyzina, N. Salmina and other scientists have already revealed the adult's role in teaching children mathematics, there is very little modern research that would investigate and prove the importance of the joint (with an adult) digital devices use by preschoolers for teaching them mathematics.

Since theoretical analysis of studies has demonstrated the importance of interaction with an adult when using a digital device for teaching preschool children mathematics (Benavides-Varela et al., 2020; Kim, 2022; Konca, 2022; Zaranis, Kalogiannakis, 2011), this research focused on the possibilities identification to improve mathematical skills in preschoolers via a digital math application. For this purpose, a comparison was made of the developmental effect of mathematics classes using a digital math application in the case of joint discussion with an adult or independent application use by preschoolers.

Materials and methods

Data processing methods. At the beginning of the study, the cluster analysis was applied to identify children with different levels of mathematical skills mastery. Non-parametric criteria of statistical analysis were also used, since the distribution differs from normal (Kolmogorov-Smirnov criterion): the Mann-Whitney criterion was used to compare the two experimental groups' results, the Wilcoxon criterion was used to determine the significance of changes in these groups before and after the classes; the effect size Cohen's d was calculated.

Statistical data analysis was performed via the statistical package SPSS 22.0.

The search and selection of an educational math application was carried out based on the following criteria: 1) the child's involvement in the interaction with the app's content, 2) the material's presentation form as well as the correspondence of the number concept forming method to the age characteristics of preschool age, 3) the mathematical concepts' formation logic, 4) ensuring the principle of continuity with the school curriculum in relation to mathematical content, 5) the possibility of involving an adult in the process. None of the found applications fully met the described criteria, and none of them implemented the joint use possibility nor involving adults. In accordance with the described criteria, the most suitable for preschoolers was the application called "Luntik. Mathematics" (for more details on the mathematical digital applications' analysis, see the article (Aslanova et al., 2020). This app is designed to develop mathematical knowledge and skills in children of 4 to 6 years old and includes several mathematical blocks: about quantity and counting, shape, magnitude, time, space orientation. Within each block, the child first listens to a short story about the characters from the famous cartoon "Luntik" followed by an explanation of the material, and then the child completes mathematical tasks that are a logical continuation of the story — this ensures the child's involvement in interaction with the app's content. The application has voice-over for tasks and the ability to replay instructions again while completing a task. Thus, the content and the material's presentation forms correspond to the preschoolers' age characteristics, and the mathematical concepts' formation logic is consistent with the requirements of the Federal State Educational Standard (On Approval of the Federal State Educational

Standard for Preschool Education..., 2013), which ensures continuity with the primary school educational program. The only criterion that this application does not meet is the ability to involve an adult, which is what we tried to implement in this study.

Based on literature review (Veraksa et al., 2022; Karabanova, 2022; Kim, 2022), we hypothesized that preschoolers who use a digital math app in a joint discussion with an adult will be more successful in completing math tasks on quantity, counting, and magnitude than children who use the app on their own.

Study sample. The research involved 64 preschoolers (out of these 42.2% were boys) of 5 to 6 years old (M = 5,8; Sd = 0,34), pupils of senior groups of kindergartens in Moscow. These senior groups were located in three kindergartens that belonged to the same educational complex, where all pupils were taught according to the same educational program ("From Birth to School", 2019) in accordance with the Federal State Educational Standard (On Approval of the Federal State Educational Standard for Preschool Education..., 2013).

Among the pupils from seven senior groups, 64 children were selected who regularly attended kindergarten and did not participate in additional math classes. It should be noted that all children who took part in the study had experience using a tablet and did not have difficulties in managing it and working with a digital math application. In addition, (this information was clarified in advance through kindergarten teachers) all research participants were allowed by their parents to play digital games.

Based on the mathematical skills' diagnostics results via cluster analysis, several groups of children were identified that differed in the mathematical skills' development level: "Low level" (3 people), "Average level" (35 people), "High level with a low arithmetic proficiency level" (15 people), "High level with a high arithmetic proficiency level" (11 people). As a result of this analysis, 14 children were excluded from further research: 3 subjects due to an extremely low mathematical skills level (insufficient for conducting developmental classes) and 11 children with the initially highest mathematical skills level. The remaining 50 children were randomly divided into two experimental groups, in which the ratio of children with average and high mathematical skills levels was maintained. The first group, where children used the tablet independently, included 24 children (13 girls and 11 boys), and the second group, in which children interacted with an adult while working with the tablet, included 26 children (13 boys and 13 girls). Another 13 children were excluded from the study because they did not complete all the classes or were absent during the final mathematical skills' diagnostics. Thus, only 38 children completed all the developmental classes and the final diagnostics: 18 from the first experimental group (12 girls and 6 boys) and 20 from the second (10 boys and 10 girls).

Research methods. To assess the preschoolers' mathematical skills, different methods were used: some — to evaluate those skills that were trained via digital application's tasks, while others — to assess those skills that were not directly trained via the application. In this way, we wanted to look at the transfer of preschoolers' ideas and skills to similar, but not identical tasks within the framework of children's ideas about quantity and magnitude. Most of the methods used in this study were previously

tested on a sample of Russian-speaking preschoolers and primary school children (Sidneva, Aslanova, Bukhalenkova, 2022; Vasilieva et al., 2021).

The following methods were used to evaluate preschoolers' mathematical representations of quantity: 1) the "Numbers Comparison" (Vasilieva et al., 2021) technique assessed the ability to compare single-digit and double-digit numbers; 2) the "Arithmetic Skills" technique estimated addition and subtraction skills within 10; 3) the "Numerical Distance Comparison" technique (Laski, Siegler, 2007; Vasilieva et al., 2021) evaluated understanding and ability to compare "distances" between numbers; 4) the "Number Sense" (Ginsburg, Baroody, 1990) technique assessed the non-symbolic sense of number in preschoolers (Kuzmina et al., 2022).

The following methods were used to evaluate preschool children's mathematical representations of magnitude: 1) the "Houses" technique was developed within the framework of this study to assess children's ability to find correspondences between objects by magnitude; 2) the "Measuring by Units" technique estimated the development of children's ability to take measurements using a unit (the detailed description of the methods can be requested from the author (D.A. Bukhalenkova)).

To control the non-verbal intelligence development level, the children were engaged with the "Raven's Coloured Progressive Matrices" technique (Raven, Raven, Kort, 2012). The method included three series of 12 tasks. For the correct completion of each task, the child received 1 point (maximum = 36 points).

Research procedure. At the first stage of the research, the "Raven's Coloured Progressive Matrices" method and diagnostics of mathematical knowledge and skills were carried out with all children individually. Although, technically the diagnostics of mathematical skills were conducted in pairs, each child worked on his/her tasks independently. Diagnostics took about 20 minutes on average and took place mainly in the first half of the day. In testing for non-verbal intelligence, all subjects showed results that were within the age norm.

Based on the preliminary mathematical skills' diagnostics results, the children were divided into two experimental groups. Each of the experimental groups underwent a cycle of 6 developmental lessons, each lasting 15–20 minutes, in subgroups of 3 people. The children attended only one lesson per day, with at least 3 days between lessons.

The study was conducted in the second half of the school year: diagnostics were carried out in February, a series of developmental classes in March and early April, and the final diagnostics at the end of April.

Developmental lessons program. Based on the "Luntik: Mathematics" app there was developed a program of 6 lessons, including tasks on counting, comparing sets, making up sets, arithmetic operations, and comparing objects by magnitude. Each lesson had specific tasks from the educational application, which were combined into groups according to the principle from simple to complex (first, counting the number of objects was mastered, then addition and subtraction). For each lesson, 3–4 games were selected so that the total lesson time did not exceed 20 minutes.

In case of questions and difficulties while playing with the application, children from the group without the participation of an adult were offered to listen again to the voice instruction built into the application. If the child

still could not cope with the task, he/she was offered to move on to the next task or, if all the tasks in this lesson were completed, to finish the game. In the event of questions or difficulties, children from the group with an adult's participation were either asked to listen to the voice instructions again or were given a simplified explanation of the task (for an explanation's wording example, see. After each lesson, a discussion was held with this group of children. They were asked to answer several questions posed by an adult related to the lesson's content and to complete similar simple tasks using material objects (for example, pencils). The plan for all lessons and an example of a lesson can be requested from the author (D.A. Bukhalenkova).

Results

Descriptive statistics for both groups based on preliminary diagnostic results

As a result of the preliminary testing data analysis, no significant differences were found in the success of completing all mathematical tasks in children from the two experimental groups, with the exception of the quantities comparison (Table 1). It is important to highlight that children from the group with the participation of an adult initially coped more successfully with the finding correspondences between objects by magnitude. According to the non-verbal intelligence assessment results, all children participating in the study corresponded to the age norm and no significant statistical differences were found between the experimental groups.

Results comparison of preliminary and final mathematical skills testing in two experimental groups

The analysis revealed that in the group of children who played games on the tablet without adult's participation, there were significant differences between the results obtained before and after the

Table 1

Descriptive statistics based on the results of a preliminary assessment of mathematical skills and non-verbal intelligence (N = 38)

	Group without adult M (SD)	Group with an adult M (SD)	Significance of the differences		
			Mann-Whitney criterion	Level of significance	Cohen's D
Numbers Comparison	27,56 (3,1)	27,35 (4,2)	88,5	0,967	0,09
Arithmetic skills	4,33 (3,2)	4,00 (2,8)	164,0	0,478	0,21
Numerical Distance Comparison	8,89 (1,8)	7,45 (2,2)	131,5	0,101	0,55
Number sense	37,39 (8,1)	35,40 (5,5)	160,0	0,411	0,20
Quanities comparison	**3,11 (1,3)**	**4,25 (1,2)**	**114,0**	**0,033**	**0,81**
Measuring by units	1 (0,9)	0,90 (0,9)	177,5	0,728	0,11
The level of non-verbal intelligence	13,37 (6,9)	14,31 (7,1)	167,0	0,531	0,16

developmental classes in the success of completing such tasks as “Numbers Comparison”, “Number Sense”, “Quantities Comparison”, and there were also significant improvements at the trend level according to the “Arithmetic Skills” technique (Table 2).

As a result of comparing the completing mathematical tasks success before and after developmental classes in a group with the participation of an adult, significant differences were identified for all diagnostic tasks, with the exception of the “Quantities Comparison” (Table 3).

Table 2

Differences in the success of mathematical tasks before and after educational activities among children from the group without adult participation

	Pretest M (SD)	Posttest M (SD)	The significance of the differences		
			Wilcoxon criterion	Level of significance	Cohen’s D
Numbers Comparison	27,56 (3,1)	29,33 (2,029)	–2,8	0,006	**0,67**
Arithmetic skills	4,33 (3,2)	5,61 (3,47)	–1,9	0,052	0,45
Numerical Distance Comparison	8,89 (1,78)	8,94 (2,24)	–0,32	0,975	0,02
ЧNumber sense	**37,39 (8,1)**	**43,56 (6,67)**	**–3,4**	**0,001**	**1,26**
Quanities comparison	**3,11 (1,32)**	**4 (1,33)**	**–2,5**	**0,014**	**0,67**
Measuring by units	1 (0,88)	1,42 (0,96)	–1,3	0,186	0,31

Table 3

Differences in the success of mathematical tasks before and after educational activities among children from the adult group

	Pretest M (SD)	Posttest M (SD)	Significance of the differences		
			Wilcoxon criterion	Level of significance	Cohen’s D
Numbers Comparison	**27,35 (4,21)**	**29,45 (2,93)**	**–2,5**	**0,015**	**0,58**
Arithmetic skills	**4 (2,79)**	**6,96 (4,3)**	**–3,186**	**0,001**	**0,94**
Numerical Distance Comparison	**7,45 (2,24)**	**9,2 (2,04)**	**–2,7**	**0,006**	**0,72**
Number sense	**35,4 (5,56)**	**47,3 (5)**	**–3,9**	**< 0,001**	**1,81**
Quanities comparison	4,25 (1,21)	4,6 (1)	–0.9	0,334	0,27
Measuring by units	**0,9 (0,91)**	**1,9 (1,1)**	**–2,7**	**0,006**	**0,80**

Comparison of the changes in the group with adult participation and in the group without adult participation

To analyze changes in mathematical skills, the difference between the scores for each technique obtained by children in the posttest and the scores obtained in the pretest was calculated. Significant differences were discovered in the magnitude of changes between the two groups in the success of completing the "Number Sense" and "Numerical Distance Comparison" tasks. Children from the group with the participation of an adult began to cope with these tasks significantly better than children from the group without the participation of an adult (Table 4).

Discussion

It was previously mentioned that the purpose of this study was to identify possibilities to improve mathematical skills in preschool children using a digital mathematical application in situations of joint discussion with an adult or independent use of the application. To achieve the stated goal, a comparison was made of the mathematical application's "Luntik. Mathematics" developmental effect in situations of joint discussion with an adult and when used independently by preschoolers.

The research results allow us to partially confirm the hypothesis that the success of completing mathematical tasks in children who use a digital mathematical application in a situation of joint discussion with an adult will be higher than in children who used the application independently. Firstly, the results of the experiment show that in the group with the participation of an adult, children significantly improved their performance in completing a greater number of mathematical tasks. Moreover, in the group with the participation of an adult, as opposed to the other group, there were significant improvements in such techniques as "Measuring by units" and "Numerical Distance Comparison". These

Table 4

Comparison of the magnitude of changes in the success of mathematical tasks before and after educational classes in two experimental groups

	Group without adult M (SD)	Group with an adult M (SD)	Significance of the differences		
			Mann-Whitney criterion	Level of significance	Cohen's D
Numbers Comparison	1,78 (2,67)	2,1 (3,65)	174,5	0,870	0,33
Arithmetic skills	1,28 (2,84)	2,94 (3,14)	127,5	0,188	0,60
Numerical Distance Comparison	**0,06 (2,34)**	**1,75 (2,43)**	**113**	**0,050**	**0,78**
Number sense	**6,17 (4,88)**	**11,9 (6,58)**	**0,94**	**0,011**	**0,96**
CQuanities comparison	0,89 (1,32)	0,35 (1,31)	0,194	0,290	0,14
Measuring by units	0,42 (1,34)	1 (1,26)	143	0,194	0,45

differences are particularly interesting and important because the digital app's games were not directly aimed at mathematical concepts and skills development that these methods assessed. Thus, a correct understanding of how objects can be measured using a unit reflects a correctly formed idea of magnitude (Vasilieva et al., 2021; Veraksa et al., 2022), which seems to us to be an important effectiveness indicator of the developmental activities carried out. The numerical distance comparison technique is more complex than the method of pairs of numbers comparison; it can be classified as a task that is more in the zone of proximal than actual development for preschoolers. Secondly, as a result of comparing the changes magnitude before and after developmental activities in the two groups, it was found that children from the groups with the participation of an adult began to perform the tasks on "Number Sense" and "Numerical Distance Comparison" significantly better than children from the group without an adult.

Therefore, our results demonstrate that in the case of using an educational application with the participation of an adult, the mathematical skills' effectiveness training in preschoolers was higher and there were more significant improvements than in the case of children playing with the application independently. This highlights the importance of external support when preschoolers use educational applications and indicates the limitations of independent application use by children. Moreover, when using a math app with the help of an adult, a child can not only practice their math skills, but actually improve and deepen their existing skills and basic math concepts.

To better understand how an adult can participate in a child's interaction with a digital app, we should clarify that in our experiment in the group with an adult, the tester was nearby and observed the children's play, if difficulties arose, the child could turn to an adult for an explanation and help; after each lesson, the adult initiated a discussion of the material covered and offered the child several small tasks to complete, similar to the tasks from the application, but using material objects from the space surrounding the children (for example, pencils). It can be said that the adult's role consisted of some generalization and practice of the acquired knowledge through ordinary practical activities familiar and understandable to children, which is very important for consolidating knowledge in preschoolers ("From Birth to School"..., 2019). This study shows that a digital device can only be an effective tool in children's acquisition of mathematical concepts and skills, but cannot completely replace an adult and fulfill his/her functions in transmitting cultural experience to a child (Karabanova, 2022; Solovieva et al., 2023; Veraksa et al., 2021).

Conclusion

The conducted research demonstrated the possibility of improving mathematical skills in preschoolers via the digital educational applications' use and confirmed the importance of cooperation with an adult in the process of preschoolers' interaction with digital devices.

The results obtained allow us to formulate some recommendations for parents and teachers to ensure that the digital educational applications' use has the most developmental effect on children:

• It is important to familiarize yourself with the digital educational application, its features, capabilities and content before offering it for use to your child. If necessary, it is worth organizing the process of the application use (for example, think through the order of completing games and tasks; set up voice guidance and prompts).

• An adult's involvement in a child's use of a digital educational application contributes to a greater developmental effect. Even just being nearby and observing, an adult already supports the child to some extent and can help him/her in case of both technical and semantic difficulties, explain what needs to be done in the task, which increases the child's understanding of the tasks being performed.

• The adult's participation can also be manifested in subsequent discussions with the child about the material covered and the tasks completed in the application. Thus, a child can be asked to tell what he/she has learned, or asked to act as a teacher (for example, asked to explain the essence of some mathematical operation, to teach another to perform it).

• In addition, to help the child better assimilate the knowledge and skills acquired, an adult can offer him/her to complete practical tasks similar to what the child did in the digital application (for example, counting toys/furniture in a room together, comparing their sizes, etc.).

Thus, the active participation and involvement of an adult in the child's interaction with digital educational applications plays a significant role in the acquisition and consolidation of mathematical knowledge and skills in preschoolers.

Limitations. It is important to note the limitations and prospects of this study.

Firstly, the most significant limitation in this experiment is the absence of a control group with which no educational classes were conducted. The inclusion of such a group in the study will further allow us to evaluate and take into account the learning effect as a result of repeated completion of mathematical tasks during the posttest. In addition, it will allow us to compare how much the digital application itself, without taking into account the participation of an adult, affects the results compared to traditional kindergarten education.

Secondly, we note the small sample size, which does not allow us to generalize the results obtained to all modern Russian preschoolers. In the future, it will be necessary to test the results obtained on more children.

Thirdly, children with extremely low mathematical skills levels (3 people) and children with initially high levels (11 people) were excluded from the study, which limits the research results application to a wider population of children with different mathematical skills levels. However, from our point of view, children with a high mathematical knowledge level simply did not need this application, and for children with an extremely low mathematical knowledge level, its use would be difficult.

Fourthly, due to a decrease in the sample of children during the experiment, the final analysis of the results revealed some shortcomings in the distribution of children into two groups: 1) in the group with adult participation, preschoolers initially performed significantly better with the "Houses" task; 2) in the group without adult participation, girls turned out to be twice as

many as boys. These factors could also affect the reliability of the results obtained, and they need to be monitored when repeating the experiment on a larger sample.

Fifthly, we note the short duration of this study, which consisted of only six sessions. To assess the sustainability and long-term effect of using the digital application, it is necessary to further conduct a longer study and a delayed assessment of the children's results.

Sixthly, these results were obtained for a specific digital mathematical application and further require verification on other digital applications, both mathematical and teaching other skills.

Seventhly, the study did not control some external and internal factors that could affect the results of the mathematical skills development in preschoolers (for example, parents conducting additional classes at home, the individual characteristics of children, etc.).

In addition, the prospects of this study include studying the extent to which the digital application's use can develop cognitive abilities related to mathematical skills (e.g., logical thinking, spatial perception) and how their development can be associated with the effectiveness of teaching mathematics in this way.

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Margarita S. Aslanova — ideas and planning of the research, control over the research, visualization of research results.

Malikat Sh. Mikhitaeva — conducting an experiment; data collection and analysis; application of statistical, mathematical or other methods for data analysis; writing and design of the manuscript.

All authors participated in the discussion of the results and approved the final text of the manuscript.

Вклад авторов

Бухаленкова Д.А. — идеи исследования; планирование исследования; аннотирование, написание и оформление рукописи.

Асланова М.С. — идея исследования; планирование исследования; контроль за проведением исследования; визуализация результатов исследования.

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Family social climate and social skills of fourth and fifth-year high school students in a public school in Callao, Peru

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Abstract

Context and relevance. The family's social climate is a crucial variable in the development of social skills. This research is based on Moos's family social climate theory, which posits that the characteristics and dynamics of the familial environment influence the mental health of its members. **Objective**. The general objective of this study was to determine the relationship between family social climate and the social skills of fourth and fifth-year high school students at a public school in Callao. **Methods and materials.** A retrospective, cross-sectional, correlational, non-experimental design was employed. Additionally, to determine if other variables act as moderators, a moderation analysis has been carried out. A sample of 137 students was selected using random probability sampling. The Family Climate Scale (FES) and the Social Skills Scale were administered. **Hypothesis.** there is a direct and significant relationship between family social climate and social skills of fourth and fifth-year high school students at a public school in Callao. **Results**. Is demonstrated a direct correlation (rho 0,418) with a medium effect size between the two variables. Additionally, direct and significant correlations were found between social skills and all three dimensions of the family social climate, with large effect sizes for each, with values that ranged between 0,69 and, 0,88. **Conclusions.** It is concluded that family social climate and social skills share a similar covariation in approximately 17% of cases. To confirm that this relationship is moderated by other factors, a moderation study was conducted with age, level of education, and sex. None of these variables were found to moderate the relationship between family social climate and social skills because the p values were greater than 0,05.

Keywords: family social climate, social skills, adolescence, family

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Семейный социальный климат и социальные навыки учеников 4 и 5 классов средней школы государственной школы в Кальяо, Перу

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Резюме

Контекст и актуальность. Социальный климат семьи является ключевой переменной в развитии социальных навыков. Это исследование основано на теории семейного социального климата Мооса, которая утверждает, что характеристики и динамика семейной среды влияют на психическое здоровье ее членов. **Цель.** Общая цель исследования заключалась в определении взаимосвязи между семейным социальным климатом и социальными навыками учеников четвертого и пятого курсов средней школы в государственной школе Кальяо. **Методы и материалы.** Был использован ретроспективный, поперечный, корреляционный, неэкспериментальный дизайн. Для выяснения, выступают ли другие переменные модераторами, был проведен анализ модерации. Случайным вероятностным методом была выбрана выборка из 137 учеников. Участникам были предложены Шкала семейной среды (FES) и Шкала социальных умений (EHS). **Гипотеза.** Предполагалось наличие прямой и значимой связи между семейным социальным климатом и социальными навыками учеников четвертого и пятого курсов средней школы в государственной школе Кальяо. **Результаты.** Была обнаружена прямая корреляция (rho = 0,418) со средним размером эффекта между двумя переменными. Кроме того, были выявлены прямые и значимые корреляции между социальными навыками и всеми тремя измерениями семейного социального климата с большими размерами эффекта для каждого, значения которых колебались между 0,69 и 0,88. **Выводы**. Выявлена схожая ковариация между семейным социальным климатом и социальными навыками примерно в 17% случаев. Чтобы проверить влияние других факторов, был проведен анализ модерации, учитывающий возраст, уровень образования и пол. Ни одна из этих переменных не оказалась модератором связи между семейным социальным климатом и социальными навыками, так как значения p оказались больше 0,05.

Ключевые слова: семейный социальный климат, социальные навыки, подростки, семья

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Introduction

The long confinement of the pandemic generated a kind of embalming of emotions, bad tempers, and disappointments; In addition, pressures due to chaos, confinement, and the risks of prolonged social isolation (Hernández-Rodríguez, 2020; Ozamiz-Etxebarria, 2020; Barranco-Cuevas et al., 2021). This situation had a great impact on the family social climate, which could be strengthened or broken, depending on some factors that determined the quality of confinement, including the quality of life in isolation and the availability of resources for such a state, the cultural aspects specific to each family group, each social group, etc. (Galindo-Vázquez et al., 2020; Ozamiz-Etxebarria et al., 2020) It could be said that mental health and the family social climate were significantly affected by this pandemic phenomenon to a lesser or greater degree, favorably or unfavorably, depending on the other factors around each family nucleus in a state of social isolation, as well as the way and measures they adopted to cope with it (Beraún, 2022); Urquijo, 2020).

It is important to study the family social climate in both pandemic and post-pandemic environments, along with other potentially affected parameters of adolescent psychology, such as social skills. The family climate, understood as the perceived atmosphere of interactions among its members, significantly impacts children's and adolescents' cognitive, emotional, behavioral, social, and physical development. Moreover, it can be influenced by parents' health status (Iacopetti et al., 2021).

On the other hand, social skills encompass a wide range of competencies related to building and maintaining relationships, understanding and managing emotions, achieving goals, and learning from experience (Napolitano et al., 2021). During adolescence, social skills play a crucial role in managing the stressors and challenges associated with developmental transitions, thereby protecting individuals from adverse outcomes. Supporting this, cross-sectional and longitudinal studies have reported a correlation between strong social skills and fewer depressive symptoms in adolescents. Therefore, it is essential that social skills training programs can be adapted to meet the needs of those who require improvement in this area. Despite advancements in technology, it is crucial to investigate how various factors influence the effectiveness of mobile health interventions (Nilsen et al., 2017).

Adolescence is a crucial period of social expansion, during which the development of social cognitive skills is essential for healthy integration into society (Martinsone et al., 2022). The family, a complex emotional system, is considered the cornerstone and foundational structure of any society, serving as the crucible for human emotions and intimate relationships. It is evident that the functioning of the family significantly impacts the functioning of society (Kharazmi et al., 2011). Consequently, the family plays a pivotal role in adolescents' social development. However, there is a dearth of information regarding the impact of the family climate on adolescents' social adaptation and, subsequently, its relationship with social skills.

En 1990, Margalit and Eysenck's study, one of the oldest but most cited in Scopus, investigated how gender, social skills, personality, and family climate predict an adolescent's sense of coherence. The authors examined a sample of 732 adolescents, evenly divided by gender. While gender did not affect the sense of coherence, significant differences were found in the perception of family climate, social skills, and personality (Margalit, Eysenck, 1990).

Another highly cited research investigated the relationship between the family social climate and social skill performance. However, unlike the present study, their participants were children aged two to three (Izasa, Henao, 2011).

Among the studies reviewed, the relationship between family social climate and social skills in fourth-grade secondary students at a public school in Cajamarca stands out. The sample consisted of 132 students aged 15 to 16. Results indicate a significant correlation between the variables (r = 0,730). Furthermore, direct and significant correlations were observed between social skills and the dimensions of relationships (0,606), development (0,622), and stability (0,445) (Ozamiz-Etxebarria et al., 2020). The first two correlations exhibited a large effect size [TE], while the third demonstrated a medium effect size (Cohen, 1988).

A study of 366 adolescents aged 10 to 19 at Túpac Amaru Educational Institution in Tarapoto, conducted in 2018, found no significant correlation between family social climate and social skills, nor between the climate and its dimensions (Benavides, Calle, 2021).

Another study examining the relationship between social skills and family social climate was conducted in 2019 at a school in the Tambo, Huancayo district. Involving 275 students, the research found a significant correlation of 0,151, with a small effect size (TE), between family social climate and social skills. A significant correlation was also found between social skills and the relationships dimension of family social climate. Conversely, no significant correlations were observed between social skills and the stability or development dimensions of family social climate (Quispe, 2020).

Ultimately, a study of 159 students from first to fifth grade in a secondary school in Jaén, Cajamarca, Peru, investigated the relationship between social skills and family social climate. A significant correlation of 0,177, indicating a small effect size (TE), was found between the two variables. However, no relationship was observed between basic social skills, advanced social skills, those related to emotions, or aggression management skills and any dimension of family social climate. Finally, only the family social climate dimension of development correlated significantly (Rho: 0,16) with the social skills of coping with stress and planning, both with small effect sizes (Bances, 2020).

The reviewed studies present inconsistent findings and have primarily focused on inland Peruvian provinces. Consequently, it is essential to investigate the relationship between family social climate and social skills among fourth and fifth-year students in Callao secondary schools? Based on this question, the general objective is to determine the relationship between family social climate and social skills of fourth and fifth-year high school students at a public school in Callao, likewise, the following specific objectives are proposed:

1. Determine the relationship between the relationship dimension of the family social climate and social skills.

2. Determine the relationship between the development dimension of the family social climate and social skills.

3. Determine the relationship between the stability dimension of the family social climate and social skills.

4. Investigate whether age, educational level, and gender moderate the relationship between family social climate and social skills.

This research is grounded in Moos's family social climate theory, which posits that the characteristics and dynamics of the family environment affect the mental health of its members. The theory's structural components, cohesion and adaptability, vary significantly across family environments, influencing individual behaviors, including social skills. Cohesion refers to the extent to which family unity is emphasized,

while adaptability denotes the degree to which appropriate interpersonal behavior is encouraged (Moos, R., Moos, B.S., 1981; Moos, R., Moos, B.S., 1994).

Hypothetically, it is assumed that there is a direct and significant relationship between family social climate and social skills of fourth and fifth-year high school students at a public school in Callao. Specifically, it is hypothesized that there are direct and significant relationships between the dimensions of family social climate and social skills. Lastly, it is hypothesized that age, educational level, and gender do not moderate the relationship between family social climate and social skills.

Material and methods

This is a quantitative, correlational, cross-sectional study that focuses on the numerical measurement of statistically related variables through the application of instruments at a single point in time (Nilsen et al., 2017). The study employs an explanatory comparative associative strategy and an explanatory design with an observable variable (Ato, López, Benavente, 2013). This approach examines the moderating effects of age, grade, and sex on the relationship between family social climate and social skills. The population consisted of 210 fourth and fifth-grade secondary school students from a public school in Callao, Peru (Ministry of Education of Peru, 2023). A sample size of 137 students was determined using the formula for finite populations proposed by Abad and Servín in 1981 (Grajeda-Montalvo, 2018) with a 95% confidence level and selected through random sampling. All students have access to the internet, sufficient computing experience, and familiarity with online technologies since their primary education. Therefore, we assume there will be no sampling bias. Participants ranged in age from 14 to 18 years, with a mean age of 15,26 and a standard deviation of 1,15. The study found that 77% of single individuals from low socioeconomic backgrounds were women, and the remaining 33% were men, 62% are fourth graders and 38% are fifth graders. The findings of this study can only be applied to the population of fourth and fifth-year high school students at the Heroines Toledo state school in Callao. The school is at Cercado del Callao, a city on the Peruvian coast with an average altitude of thirteen meters above sea level and a temperate, oceanic climate (Geophysical Institute of Peru, 2024). The students come from families with low socioeconomic status, belonging to levels D and E, with monthly incomes of up to $535 and $340, respectively. These families comprise 33,6% of the population of Callao (Peruvian Association of Market Intelligence Companies, 2024).

The Family Climate Scale (FES), published for the third time by Moos & Moos (Moos, R., Moos, B.S., 1981), was utilized as an instrument. This scale has been validated and applied to populations in Latin America, Peru, and Lima on multiple occasions, consistently demonstrating a coefficient of internal consistency exceeding 0,85. This indicates high levels of coherence and internal consistency. The scale's validity and relevance have been accredited by successive expert panels. The FES offers segmented measurement for each of the three dimensions and their corresponding indicators. For the "relationships" dimension, it measures cohesion, expressiveness, and conflict. For the "personal development" dimension, it measures autonomy, performance, cultural intellectuality, social recreation, morality, and religiosity. For the "stability" dimension, it measures organization and control. A psychometric study of 1,384 students from state secondary schools in Lima demonstrates that the test maintains high content validity based on the Aiken V coefficient, which was greater than 0,80. Reliability was obtained with Cronbach's alpha, which was equal to 0,85 (Mallma, 2020). These data demonstrate that the instrument adapts to the context of the Peruvian adolescent and specifically the Lima region, both in its reliability and validity indices (Ozamiz-Etxebarria, 2020).

The other instrument used was the Social Skills Scale (EHS), (Gismero, 2020). Its latest version comprises 33 items divided into six dimensions. Notably, 28 items focus on a lack of assertiveness or social skills deficits, while five items are positively worded. The scale is

primarily intended for clinical and educational settings. Construct validity was established through Exploratory Factor Analysis (EFA), identifying six factors in the Spanish population. Reliability, assessed using Cronbach's Alpha, yielded a coefficient of 0,88. In Peru, a recent study determined validity through expert judgment, finding all 33 items highly significant (p: 0,0001). The same author reported a Cronbach's Alpha of 0,85, demonstrating the scale's reliability among adolescents in southern Lima (Moos, R., Moos, B.S., 1994). A pilot study of 150 students from state secondary schools in Lima demonstrates that the test maintains high construct validity obtained with the correlation dimension test in which the coefficients were 0,29 with expression of anger and 0,74 with expression in social situations. Reliability was 0,89 using Cronbach's alpha and 0,90 using Omega (Guzman, Villalta, 2021). Those coefficients demonstrate that the instrument adapts to the context of the Peruvian adolescent and specifically the Lima region, both in its reliability and validity indices (Ñaupas, 2018).

Initially, coordination with the educational institution director was sought to obtain authorization for the research. Subsequently, personal data, email addresses, and contact numbers of 210 fourth and fifth-grade secondary students from Heroínas Toledo School in Callao were collected for the 2023 academic year. A random sample of 137 students was selected and administered questionnaires via Google Forms. Informed consent to participate in the study was obtained from all participants. Data was collected and tabulated as it was received from each student and subsequently processed.

To assess data normality, the Kolmogorov-Smirnov test was conducted. Findings indicated normal distribution for the variables and one dimension, allowing the use of Pearson's r correlation. However, two dimensions exhibited non-normal distribution, necessitating the application of Spearman's correlation. Effect sizes (ET) were calculated using Cohen's r^2, because this is the appropriate estimator for correlations, as suggested by David Cohen. The magnitude of the effect, as measured by r^2, enables us to estimate the percentage of variation in the second variable that can be attributed to the variation in the first (Cohen, 1988). It is crucial to examine whether other variables moderate the correlation. To this end, a moderation analysis was conducted to determine if the relationship is independent or influenced by additional factors (Igartua, Hayes, 2021).

Additional materials block

The complete dataset underlying this research is available in RusPsyData (Grajeda-Montalvo, 2024).

Results

Table 1 shows a strong positive correlation between the relationships dimension of the family social climate and social skills. Showing that the covariation of both occurs in 56% of cases. This indicates that in 56 percent of cases, when the relationship dimension changes, social skills also change in the same direction.

Table 2 demonstrates a strong positive correlation with a large effect size (TE) between the development dimension of the family social climate and social skills. This relationship accounts for 77% of the covariation of both.

Table 1

The relationship between the Relationships Dimension of the Family Social Climate and Social Skills of fourth and fifth-year high school students at a public school in Callao (N = 137)

			Social skills
Rho of Spearman	**Relationships**	Correlation coefficient	0,75**
		r^2	0,56
		Sig. (bilateral)	0,000

Note. ** Indicates a significant correlation at the 0,01 level (two-tailed).

Table 2

The Relationship Between the Development Dimension of the Family Social Climate and Social Skills of fourth and fifth-year high school students at a public school in Callao (N = 137)

			Social skills
Pearson	**Development**	*r*	0,88**
		r^2	0,77
		Sig. (bilateral)	0,000

Note. ** Indicates a correlation significant at the 0,01 level (two-tailed).

Table 3 shows a strong positive correlation with a large effect size between the stability dimension of the family social climate and social skills. 48% of the time, the two variables move in the same direction.

Table 4 indicates a direct, significant correlation with a medium effect size between family social climate and social skills. In 17% of the time, the two variables move in the same direction.

Table 3

The Relationship Between the Stability Dimension of the Family Social Climate and Social Skills of fourth and fifth-year high school students at a public school in Callao (N = 137)

			Social skills
Rho of Spearman	**Stability**	Correlation coefficient	0,69**
		r^2	0,48
		Sig. (bilateral)	0,000

Note. ** Indicates a significant correlation at the 0,01 level (two-tailed).

Table 4

Family Social Climate and Social of fourth and fifth-year high school students at a public school in Callao (N = 137)

			Social skills
Pearson	**Family social climate**	*r*	0,42**
		r^2	0,17
		Sig. (bilateral)	0,000

Note. ** Indicates a significant correlation at the 0,01 level (two-tailed).

Table 5

A moderation analysis of age, grade and sex in the relationship between family social climate and social skills (N = 137)

	Estimate	***SE***	***Z***	***p***
Family social climate	0,48850	0,0906	5,391	<0,001
Age	–2,35044	0,6301	–3,730	<0,001
Family social climate ✻ age	0,00921	0,0836	0,110	0,912
Family social climate	0,5120	0,0935	5,476	<0,001
Grade	–3,3321	1,5374	–2,167	0,030

	Estimate	***SE***	***Z***	***p***
Family social climate ✻ grade	–0,0422	0,1908	–0,221	0,825
Family social climate	0,522	0,0948	5,499	<0,001
Sex	–1,128	1,7820	–0,633	0,527
Family social climate ✻ sex	0,248	0,2112	1,176	0,240

Since the p-values for the interactions of social climate with age, grade, or sex are all greater than 0,05, there is insufficient evidence to conclude that these variables moderate the relationship between family social climate and social skills.

Discussion

When examining the relationship between family social climate and social skills of fourth and fifth-year high school students at a public school in Callao, a Spearman's Rho coefficient of 0,42 was found, with a bilateral significance of p = 0,000 (p < 0,0001). This indicates a positive correlation with a medium effect size (TE) between the two variables. These findings align with previous research demonstrating direct and significant correlations between family social climate and social skills (Peralta, Quispe, 2019; Quispe, 2020; Bances, 2020). Conversely, one study reported no significant relationship between these variables (Benavides, Calle, 2021). This discrepancy with the previous study could be attributed to the differing samples. The earlier research included adolescents aged 10 to 19, attending grades 1 to 5 of secondary school, and residing in a Peruvian jungle province. In contrast, the present study focused on students aged 14 to 18, enrolled in grades 4 and 5 of secondary school, and living in a district of the Peruvian capital. These sociodemographic disparities might have influenced the responses, potentially introducing a bias that prevented the validation of the hypotheses proposed by Benavides and Calle (Benavides, Calle, 2021). However, such a bias was not observed in the current research, which found a direct and significant correlation, aligning most of the findings from previous studies (Bances, 2020; Peralta, Quispe, 2019; Quispe, 2020). Given that most studies have found a direct and significant correlation, it can be inferred that the mathematical behavior of both variables is highly similar. Consequently, variations in family social climate correspond to variations in social skills for 17% of participants in this study.

To confirm that this relationship is not moderated by other factors, a moderation study (Igartua, Hayes, 2021) was conducted with age, level of education, and sex. None of these variables were found to moderate the relationship between family social climate and social skills. It can be assumed that the family social climate significantly influences social skills in a significant portion of the sample. The possible moderations of other variables have not been analyzed, which constitutes a limitation of this study. Future studies are expected to address this limitation. No studies have been found that have examined the moderation of age, grade, or sex or other variables in the relationship between family social climate and social skills. This study represents a first step toward a better understanding of this association.

Regarding the relationships between the dimensions of the family social climate and social skills among fourth and fifth-year high school students, positive and significant correlations were found across all dimensions. The strongest correlation was with development, followed by relationships, and finally stability, with large effect sizes (TE) for all. Previous research partially supports these findings, showing direct and significant correlations, albeit with varying effect sizes (Peralta, Quispe, 2019; Quispe, 2020). Conversely, one study reported no significant correlations between social skills and family social climate dimensions (Benavides, Calle, 2021). Most research agrees that social skills are linked to development and relationships within the family social climate. The stronger relationship with development is expected, as this dimension involves actions fa-

cilitating interaction with individuals outside the family, such as individual autonomy, security, knowledge acquisition, sports, and value cultivation Moos (Moos, R., Moos, B.S., 1981; Moos, R., Moos, B.S., 1994). The second strongest correlation, with relationships, is characterized by family cohesion, expressiveness, and conflict, which allow for the open expression of both positive and negative emotions (Moos, Trickett, 1974).

Conclusions

It is concluded that there is a significant, positive correlation with a medium effect size between family social climate and social skills, accounting for approximately 17% of participants. This suggests that a higher family social climate is associated with higher levels of social skills.

Likewise, student social skills are significantly and directly related to all dimensions of the family social climate with large effect sizes (TE). These relationships account for 56%, 77%, and 48% of participants for the relationships, development, and stability dimensions, respectively.

Age, educational level and sex do not act as moderating variables of the relationship between family social climate and social skills; therefore, the family social climate predicts social skills in at least 17% of cases.

Recommendations and limitations

Further research should consider additional variables that might moderate the relationship between family social climate and social skills.

Widen the age range to encompass all adolescents.

The generalizability of the results is restricted to fourth and fifth-year students enrolled at the Heroínas Toledo State School in Callao.

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All authors participated in the discussion of the results and approved the final text of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

Ethics statement

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