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Dear readers!

We are pleased to present to you the first issue of 2026 of the journal «Psychological Science and Education» (No. 1), which features relevant research reflecting modern challenges in the fields of developmental psychology and education. The articles are grouped into two traditional sections — «Educational Psychology» and «Developmental Psychology», as well as the section titled «Discussions and Discourses».

The section «Developmental Psychology» is opened by a study dedicated to the characteristics of preschoolers' interactions with peers as a risk factor for psychological safety in kindergarten. Further, issues related to chronic stress and psychological well-being among students are examined, with particular attention given to the resourceful role of conscious self-regulation and optimism. The section also focuses on topics such as the development of social creativity among youth through project activities, the personal readiness of students with disabilities for employment, and the relationship between time perspective and professional self-determination, considering gender differences. The section concludes with studies on the development of creative thinking in ethnomatematics among schoolchildren, a systematic review on the role of working memory in solving scientific problems, and a search-based investigation that applies a classification tree method to analyze the connection between psychological well-being, internet use, and willingness to seek help.

The section «Educational Psychology» presents the results of a large-scale analysis of latent profiles that reveals the relationship between psychological well-being and academic success among students in grades 5–11. Particular interest is drawn to data from a nationwide study on the personal identity of contemporary adolescents. The section also includes research exploring motivational and volitional predictors of students' academic performance, the development of a model of pedagogical competencies within the context of teachers' understanding of students' emotions, as well as a systematic review of strategies for maintaining teachers' social and emotional competence.

The section «Discussions and Discourses» in this issue is represented by an article proposing a universal algorithm for designing educational programs based on an analysis of students' educational requests. This opens up space for professional debate on the future of educational design.

We hope that the materials of this issue will be valuable to researchers, practitioners, and all those interested in contemporary trends in developmental psychology and education.

The Editorial Board

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

Научная статья | Original paper

**Characteristics of communication between
modern preschoolers and their peers as a risk factor
for the psychological safety of the kindergarten
educational environment**

I.A. Burlakova^{1, 2} ✉, E.N. Pristupa¹, V.S. Masalova^{1, 2}, M.V. Osinenko^{1, 3}

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Abstract

Context and relevance. The problem of psychological safety has not lost its relevance and acuteness in recent years. One of the important components of a safe educational environment is to ensure the conditions for the realization of the need for communication with peers that is becoming relevant in the senior preschool age. Positive and productive interaction between children is an extremely important condition for the successful entry of each child into society, including the children's community, and the development of his personality. One of the important tasks for preschool education teachers is to create and maintain a safe educational environment conducive to the harmonious and stable development of communication between preschoolers and their peers. To create a system that will successfully solve this problem, it is extremely important to represent the current state of children's communication at preschool age, its main characteristics. **Objective.** Based on an analytical review of modern research, it is necessary to identify the features of communication between preschoolers and their peers in order to determine its main characteristics and existing risks. **Methods and materials.** Theoretical analysis of sources, analytical and synthetic methods of bibliographic search, generalization, and the method of comparative analysis. Using a bibliographic search, 572 sources were identified, of which 4 works meeting all criteria for the period from 2020 to 2025 were selected for analysis. **Results.** The analysis of the research has shown that there is a transformation of one of the most important conditions for the socialization and personal development of a child — communication with peers. The highlighted characteristics indicate a pronounced tendency towards impoverishment of means and methods, a decrease in the level of development of children's communication, and an increase in negative interaction features, which can create certain risks for socialization and personal development in the present and future. **Conclusions.** Communication

between modern preschoolers and their peers is generally dysfunctional and contains serious risks for socialization and the formation of personally important psychological qualities. The picture of the peculiarities of communication between modern preschoolers and their peers raises the question of the need to create conditions that ensure the psychological safety of preschoolers. To solve practical problems, psychological studies of children's communication with each other are becoming necessary, which will allow us to obtain more reliable and reliable information.

Keywords: modern preschooler, psychological safety, educational environment, communication with peers, risks of socialization disorders, risks of personality development

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Характеристика общения современных дошкольников со сверстниками как фактор риска для психологической безопасности образовательной среды детского сада

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Резюме

Контекст и актуальность. Проблема психологической безопасности в последние годы не утрачивает свою актуальность и остроту. Одной из важных составляющих безопасной образовательной среды является обеспечение условий реализации актуализирующейся в старшем дошкольном возрасте потребности в общении со сверстниками. Позитивное и продуктивное взаимодействие детей выступает чрезвычайно важным условием благополучного вхождения каждого ребенка в общество, включая детское сообщество, и развития его личности. Одной из важных задач перед педагогами дошкольного образования является создание и сохранение безопасной образовательной среды, способствующей гармоничному и стабильному развитию общения дошкольников с ровесниками. Для создания системы,

которая позволит успешно решать эту задачу, крайне важно представлять существующее состояние детского общения в дошкольном возрасте, его основные характеристики. **Цель.** Установить особенности общения дошкольников со сверстниками, выделенные в современных исследованиях, чтобы определить его характеристики, которые могут рассцениваться как фактор риска. **Методы и материалы.** Теоретический анализ источников, аналитико-синтетический метод библиографического поиска, обобщение, метод сравнительного анализа. С помощью библиографического поиска было выделено 572 источника, из которых отобрано для анализа 4 работы, соответствующие всем критериям, за период с 2020 по 2025 годы. **Результаты.** Проведенный анализ исследований показал, что происходит трансформация одного из важнейших условий социализации и личностного развития ребенка — общения со сверстниками. Выделенные характеристики свидетельствуют о выраженной тенденции к обеднению средств и способов, снижению уровня развития детского общения, росту негативных черт взаимодействия, что может создавать определенные риски для социализации и развития личности в настоящем и будущем. **Выводы.** Общение современных дошкольников со сверстниками представляется в целом неблагоприятным и содержит серьезные риски для социализации и формирования личностно важных психологических качеств. Картина особенностей общения современных дошкольников со своими сверстниками ставит вопрос о необходимости создания условий, обеспечивающих психологическую безопасность дошкольников. Для решения практических задач необходимыми становятся психологические исследования общения детей друг с другом, которые позволят получить более достоверную и надежную информацию.

Ключевые слова: современный дошкольник, психологическая безопасность, образовательная среда, общение со сверстниками, риски нарушения социализации, риски развития личности

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Introduction

The issue of ensuring security in modern educational institutions is extremely pressing and important in our country¹. This

is due to the “complex geopolitical situation and new social challenges” (Baeva, 2012, p. 7) and a number of factors that lead to an increase in various emergency situa-

¹ Rector of MSUPE V.V. Rubtsov (2007). On the Program "Psychology of the Safety of the Educational Environment and Psychological Support for Activities in Extreme Situations" / From the materials for the meeting of the Presidium of the Russian Academy of Education "Current State and Prospects for Developing the Problem of "Psychology of the Safety of the Educational Environment and Psychological Support for Activities in Extreme Situations", <https://mgppu.ru/news/1200?ysclid=me0avvbak7236367370>

tions, including those occurring in schools (Baeva, Rubtsov, 2008). This issue is also “actively addressed in connection with the growing influence of mass media on society and the need to protect against the impact of information factors, manipulation, and psychological pressure”².

Taking into account the possible severity of the consequences of emergency situations and other negative impacts of external factors, educational organizations are faced with the task of ensuring the physical and psychological safety of students (Federal Law “On Education...”)³, and educational psychology is updating its scientific and practical goals related to studying the conditions and possibilities for creating favorable conditions for children’s development.

Among the most important areas of research in the psychology of educational safety today, alongside the study of emergency psychological assistance for children and adolescents, are the identification of risks associated with unfavorable and dangerous situations and the provision of psychological safety within the educational environment (Baeva, 2012). The latter area is extremely important, as “it is a safe educational environment that preserves an individual’s psychological safety” (Baeva, 2012, p. 5) and serves as a favorable condition for personal development.

One of the recognized approaches to ensuring psychological safety in the educational environment is I.A. Baeva’s approach, which defines it as “a state of the educational environment free from manifestations of psychological violence in interactions, facilitating the satisfaction of needs for personal and trusting communication, creating the referential significance of the environ-

ment, and ensuring the mental health of its participants” (Baeva, Semikin, 2005, p. 12). According to this understanding and the views of other researchers (V.V. Rubtsov, V.A. Yasvin, and others), one of the main components of psychological safety in the educational environment is the safety of relationships between participants in the educational process, including interactions between children and their peers.

Psychological literature contains a substantial body of research devoted to the problems of safe communication between primary school children, adolescents, and their peers, since frequent negative manifestations in the school environment (for example, bullying) not only lead to psychological trauma but also have a detrimental effect on a child’s development when they become the object of aggressive behavior (Baeva, 2012; Baeva, Gayazova, Kondakova, Laktionova, 2021; Stepanova, 2024; Kleiberg, Deulin, 2025; Volkova, 2025, etc.). It is precisely these research results that form the basis for developing measures aimed at working with children and adolescents and ensuring the necessary conditions for their safe communication with peers (Baeva, Rubtsov, 2008; Formation and ..., 2022, etc.).

As V.V. Rubtsov noted, “a significant provision of the concept of psychological security of the individual and society is the anticipation and prevention of emerging threats, the desire to counter them at an early stage of their manifestation, that is, through a system of preventive measures.” He emphasized the need for continuous monitoring of this aspect of both the social environment and the individual. In his opinion, addressing this issue can be effective if it begins from the moment

² Ibid.

³ Federal Law of 29.12.2012 No. 273-FZ “On Education in the Russian Federation”.

a person becomes a subject of the education system⁴.

Therefore, the issue of ensuring psychological safety in the educational environment of preschool educational institutions is of particular importance. This is reflected in regulatory documents governing the activities of preschool educational organizations. For example, the Federal State Educational Standard for Preschool Education, across all requirements for implementing educational programs, specifies the need to create “conditions that ensure the protection and strengthening of children’s physical and mental health” (FSES, Art. 3.2), including “protection of children from all forms of physical and mental violence” (FSES DO, Art. 3.2.1) and the organization of a safe “subject-spatial environment ensuring that all its elements meet the requirements of reliability and safety of use” (FSES DO, Art. 3.3.4),⁵ etc.

Preschool teachers and psychologists face great responsibility in creating an effective system that not only addresses the consequences of traumatic events and emergencies but, above all, anticipates and prevents emerging dangers. This is possible if reliable data are available that provide an up-to-date picture of how modern preschoolers interact with their peers, including key characteristics of these interactions and existing risks and threats that may lead to adverse consequences. Essentially, the nature of children’s peer interactions serves as one of the indicators of the psychological safety of the preschool educational environment (Kukushkina, 2022; Seryakova, 2024; Shalaginova, Dekina, 2025, etc.).

Therefore, prior to addressing practical issues, it appears necessary and important to analyze existing empirical studies of children’s communication and, if needed, to plan new research aimed at filling knowledge gaps related to this aspect of children’s lives. Since children’s communication with peers is a crucial component of the psychological safety of the preschool educational environment, the aim of this study was to determine its characteristics in modern preschoolers based on an analysis of Russian psychological and pedagogical literature.

Methods

The primary research method was a theoretical analysis of studies devoted to the problem of communication among modern preschoolers. The theoretical review was based on an analysis of published research results using the Google Scholar search engine, the Scientific Electronic Library eLIBRARY, and the Psjournals.ru portal. Studies addressing the specifics of communication between modern preschoolers and their peers, the characteristics of this communication, as well as current challenges and risks, were selected. The search queries included the keywords “communication,” “communication with peers,” “modern preschooler,” “communication disorders risks,” “socialization,” and “preschool age.” The research covered publications from the last five years, from 2020 to 2025.

As a result, two publication arrays were formed: “Communication of preschoolers”

⁴ Rector of MSUPE V.V. Rubtsov (2007). On the Program “Psychology of the Safety of the Educational Environment and Psychological Support for Activities in Extreme Situations” / From the materials for the meeting of the Presidium of the Russian Academy of Education “Current State and Prospects for Developing the Problem of “Psychology of the Safety of the Educational Environment and Psychological Support for Activities in Extreme Situations” , [https : // mgppu.ru/news/1200?ysclid=me0avvbak7236367370](https://mgppu.ru/news/1200?ysclid=me0avvbak7236367370)

⁵ Order of the Ministry of Education and Science of the Russian Federation dated October 17, 2013 No. 1155 “On approval of the Federal State Educational Standard of Preschool Education”.

(260 publications) and “Safety and culture of behavior of preschoolers” (312 publications) for the period from 2020 to 2025.

The next stage of selection was based on the criteria of full-text availability, the presence of reliable empirical research results, and the relevance of the article's content to the characteristics of communication between modern preschoolers and their peers. Papers consisting of abstracts, descriptions of practical experience, or studies focused on conditions for the development of preschoolers' communication were excluded. As a result, only four publications meeting all the identified criteria were retained for further analysis.

Results

The studies selected for analysis on preschoolers' communication with peers involved older preschool-age children aged 5 to 7 years, with sample sizes ranging from 36 to 155 participants. The study of various aspects of communicative activity was primarily conducted using sociometric methods widely used in psychology, as well as techniques developed by M.I. Lisina, E.O. Smirnova, V.M. Kholmogorova, G.A. Zuckerman, G.R. Khuzeeva, A.M. Shchetinina, and others.

The data obtained were subjected to qualitative and quantitative analysis. The studies reviewed were conducted over the last four years, from 2021 to 2025, following the reopening of preschool institutions after the COVID-19 pandemic.

To achieve the research objectives, specific characteristics of children's communication with peers were identified by the authors either on the basis of theoretical constructs (Grebennikova, 2021; Aleksandrova, Petushkova, 2022) and/or in accordance with the focus of the methods used (Suslova, Shabatko, 2024; Suvorova, Serebryakova, Kostina, Sheshukova, 2025).

Thus, in the work of O.V. Grebennikova, which presents a study of the specific features of socialization of older preschool-age children in a peer group, socialization is defined as the child's successful integration into the community and the effectiveness of their interactions with peers. O.V. Grebennikova identified criteria for assessing children's interactions — four types of competencies (social, emotional, cognitive, and personal), the levels of which determine the content of three types of socialization: positive, diffuse, and negative. Each type is characterized by the child's mastery of social norms, the ability to navigate and take into account the emotional states of others, the ability to recognize types of interactions and identify the causes of conflicts, as well as the ability to self-regulate and control interactions. These competencies essentially determine various characteristics of a child's communication. However, each type of socialization and level of communication development is characterized by a different combination of the development levels of the identified competencies.

The work of N.S. Aleksandrova and O.A. Petushkova is based on a different theoretical construct — communicative speech skills, which determine the level of communication development in older preschoolers and are understood as “mastery of methods for navigating various communication situations based on the selection of communication content, planning, and delivery of speech when interacting with peers and adults” (Aleksandrova, Petushkova, 2021, p. 113). These skills were assessed using four criteria: motivational, cognitive, operational, and reflective. Non-participant observation revealed children's initiative, manifested in the desire “to attract a peer's attention, to encourage joint activity through speech actions,” as well as “sensitivity — the manifestation of responses to a peer's pro-

posals for interaction and the coordination of the child's actions with the peer's actions in joint play activities" (ibid.). The motivational criterion was assessed using situational testing (M.I. Lisina's method) and by identifying the predominance of a particular form of communication: situational-business, extra-situational-cognitive, or extra-situational-personal. To assess the cognitive criterion, the diagnostic situation method was used, and the level of dialogic speech development was determined (A.V. Chulkova). Indicators included "the child's ability to use the rules of speech etiquette (greeting, introduction, request, apology, conflict resolution in play, addressing an adult; the child's independence in requesting information)" (Aleksandrova, Petushkova, 2021, p. 114).

The operational criterion was assessed based on the child's ability to engage in partner dialogue (A.M. Shchetinina): "the ability to listen to the interlocutor's information and negotiate with a partner; the ability to emotionally adapt to changing conditions and the experiences of the interaction partner" (ibid.). The reflective criterion of preschoolers' communicative and speech skills was determined by the child's ability to apply social intelligence "in communicative and speech situations drawn from the everyday life of children in an educational organization" (ibid.). For each criterion, characteristic manifestations in children's behavior were described. The combination of levels across all criteria identified by the authors characterizes the level of communicative and speech skills development in older preschoolers.

In the study by O.V. Suvorova, T.A. Serebryakova, O.A. Kostina, and N.N. Sheshukova, devoted to preschoolers' communication with peers and social adaptation, a number of parameters (15 for communication and 3 for social adaptation) were identified based on theoretical analysis. These parameters were assessed using specific indicators (be-

havioral manifestations) during structured observation. In practice, these parameters reflected characteristics of children's communication with peers: interest in the peer, the purpose of communication, the variety of verbal and nonverbal means of communication, the ability to engage in prosocial behavior, emotional attitudes toward peers, etc. The observation results were supplemented with data from methods aimed at assessing the cognitive and emotional components of communication, as well as the level of social adaptation (A.I. Barkan). Ultimately, the integration of all parameters, taking into account the identified levels, allowed the authors to provide a fairly detailed description of various aspects of preschoolers' communication with peers.

The development of interpersonal skills in older preschool children in interaction with peers was examined in the study by T.F. Suslova and E.M. Shabatko. The characteristics of interpersonal relationships and communication with peers in older preschoolers were described using three indicators that enabled evaluation through selected diagnostic methods: 1) the ability to build friendly relationships; 2) the ability to interact, including the development of "children's skills of interaction and cooperation in a group when completing a certain task, the ability to listen, agree with each other, and find topics of interaction that are interesting not only to themselves but also to other children"; 3) the level of communicative competence, defined as "the ability to understand the feelings of others, take into account peers' opinions, find ways out of conflict situations, and be active in group interaction" (Suslova, Shabatko, 2024, p. 156). The authors identified qualitative characteristics for each indicator and, based on the data obtained, distinguished three levels of development of positive interpersonal relationships in older preschoolers.

The similarity of the theoretical and methodological foundations of the studies under review (M.I. Lisina, E.O. Smirnova, V.M. Kholmogorova, et al.), as well as the partial use of identical diagnostic methods, made it possible to generalize the examined parameters of communication among modern older preschoolers and to formulate a corresponding description. At the same time, the results presented in the analyzed publications were taken into account; without exception, they indicate that a fairly large proportion of older preschoolers demonstrate low and average levels of peer communication: 26% and 39% (T.F. Suslova, E.M. Shabatko), 57% and 35% in terms of communicative and speech skills (N.S. Aleksandrova, O.A. Petushkova), 30% and 50% in terms of negative socialization (O.V. Grebennikova), and in the study by O.V. Suvorova et al., only 70% of children were found to have an average level of communication and social adaptation. Thus, the description is based on characteristics demonstrated by the majority of the examined preschoolers and corresponding to an average level of peer communication development (Grebennikova, 2021; Aleksandrova, Petushkova, 2022; Suslova, Shabatko, 2024; Suvorova, Serebryakova, Kostina, Sheshukova, 2025).

First, most older preschool-age children demonstrate a need for interaction with peers; however, they often exhibit a passive position in interaction, yielding to peers while at the same time expressing a desire for a broader social circle and a positive attitude toward leadership (Grebennikova, 2021, p. 58). Quite often, a typical pattern of behavior can be observed: children approach a group of peers and observe them, waiting for an invitation, without initiating games or conversations. These children are characterized by contacts of medium duration (5–10 minutes) (Suvorova, Serebryakova, Kostina, Sheshukova, 2025).

Even when a child demonstrates initiative, it is often not persistent, and the child shows insufficient patience when listening to a partner (Aleksandrova, Petushkova, 2022). For most children, play is the leading motive, but it is not associated with a clearly expressed need to play specifically with peers; toys and didactic games that do not require a role-playing repertoire come to the fore (Grebennikova, 2021). The goals of children's communication cover a wide range: tactile contacts, self-reports about abilities and achievements, instructions, and playful cues; situational-business communication predominates (Suvorova, Serebryakova, Kostina, Sheshukova, 2025). Modern children do not always respond to peers' invitations to participate in joint activities (Aleksandrova, Petushkova, 2021).

Second, children frequently engage in interactions of moderate intensity, characterized by two to three exchanges, mostly short statements, a limited number of factual and cognitive questions, and playful remarks. Verbal communication is supplemented by nonverbal communication, both positive and negative (Suvorova, Serebryakova, Kostina, Sheshukova, 2025). Preschoolers generally possess knowledge of speech etiquette (greetings, introductions, requests, expressions of gratitude), but they use it more often when prompted by an adult. During conversation, frequent distractions from the topic are observed, and speech often lacks coherence, despite a sufficiently developed vocabulary that allows for maintaining a conversation (Aleksandrova, Petushkova, 2022).

Third, children demonstrate a limited repertoire of effective communication skills. When attempting to initiate a game or conversation, they often speak without addressing anyone in particular, which makes their attempts effective only about half of the time (Suvorova, Serebryakova, Kostina, Sheshu-

kova, 2025). In addition, many children are unable to maintain contact for a long time: they engage in play, move away after a few remarks, then return to the same child or group of children, continue the conversation for a few minutes, and then move away again (Suvorova, Serebryakova, Kostina, Sheshukova, 2025). In some cases, children show insufficient patience when listening to their partner (Aleksandrova, Petushkova, 2022). Interaction in joint activities is most often structured according to the “leader–subordinate” model, in which one child directs another (Suslova, Shabatko, 2024), or children adopt a competitive position (Suvorova, Serebryakova, Kostina, Sheshukova, 2025). Older preschoolers often choose negative strategies (such as intimidation and aggression) in interaction with peers (Grebennikova, 2021). When resolving conflict or problem situations, children tend to prefer either an aggressive response (primarily boys) or a passive one, expressed through complaints to an adult (Suvorova, Serebryakova, Kostina, Sheshukova, 2025).

Fourth, older preschoolers are characterized by positive or ambivalent attitudes toward peers; they do not demonstrate prosocial behavior or demonstrate it only in the presence of adults and at their request (Suvorova, Serebryakova, Kostina, Sheshukova, 2025; Grebennikova, 2021). When interacting with peers, children often fail to understand changes in their partner’s emotional states and feelings (Aleksandrova, 2022). At the same time, in children’s narratives about peers, alongside evaluative and practical judgments, there are “elements of perceiving the peer as an individual” (Suvorova, Serebryakova, Kostina, Sheshukova, 2025).

This description reflects the characteristics that determine the average level of communication development among modern older preschoolers in interaction with peers. However, taking into account the

results presented in the reviewed publications, a slight negative trend toward a decline in the level of interaction development among children can be observed.

Discussion of results

A review and analysis of studies (more than five hundred at the stage of publication selection) devoted to preschoolers’ interactions with peers and their behavioral safety indicate that this issue has remained relevant over the past five years and has sustained stable interest among researchers and educational practitioners. However, full-text publications presenting comprehensive empirical studies are extremely rare. Research on various aspects of children’s interactions in preschool educational institutions is presented in diverse formats, including works by students and young researchers, thematic collections, abstracts, and summaries of conference and seminar reports. Publications addressing preschoolers’ behavioral safety and the psychological safety of the preschool educational environment are either theoretical works from earlier periods, aimed at formalizing methodological approaches (Kukushkina, 2022, 2023; Mirimanova, 2013), or developments focused on enhancing preschoolers’ communication with peers (Rovnaya, 2025), where the main emphasis is placed on substantiating effectiveness. This situation may be explained by the presence of objective methodological difficulties in conducting scientific research today and certain limitations of the methods available for working with preschool-age children.

The selected publications clearly have a number of limitations (such as the predominant use of non-formalized methods and the absence of mathematical statistical analysis). Nevertheless, they contain valuable and relevant information on the characteristics of communication between modern preschool-

ers and their peers, which, given these limitations, can be interpreted as indicating a negative trend in the development of this sphere of children's lives. When compared with classic and fundamental studies on preschoolers' communication with peers (The Development of Communication in Preschoolers..., 1989), the general picture of interaction in late preschool age and its main characteristics appear, at first glance, to have remained largely unchanged. However, the depiction of communication among modern children presented in the reviewed studies is perceived as rather negative and problematic. The identified characteristics pose certain risks to socialization and personal development, primarily affecting the psychological safety of preschoolers. This is facilitated by several quantitative and qualitative indicators identified by the authors, such as the predominance of situational-business communication, which is characteristic of younger age groups; the widespread use of tactile contact, playful cues, and self-referential statements, also typical of younger and middle preschool ages; the near absence of prosocial behavior (Suvorova, Serebryakova, Kostina, Sheshukova, 2025); and a relatively high proportion of negative socialization (Grebennikova, 2021). Of particular concern is the high percentage of children classified as having low and average levels of communication development, indicating that a significant number of older preschoolers have not sufficiently mastered the means and methods necessary for building effective and productive interactions with peers.

The results of the reviewed studies suggest the presence of barriers to the full realization of communication needs for a substantial proportion of children. Difficulties in building constructive relationships with peers, accepting rules of behavior that take into account the interests and needs of others, perceiving peers primarily as friends and partners, demonstrating empathy, and a pronounced

tendency to submit to leaders may lead to future problems with prosocial behavior and the emergence of negative and destructive interaction patterns at later ages. Deficits in communicative actions and insufficient mastery of communication tools may result in children's inability to independently interact with peers, establish positive interpersonal (friendly) relationships, disrupt successful socialization, or even lead to social isolation.

Within a kindergarten group, such communication characteristics are highly likely to pose risks to the psychological safety of the educational environment, contributing to group disunity, increased conflict and aggression, and a decline in the emotional well-being of each child. A lack of productive, active interaction with peers and difficulties in organizing communication often result in frequent aggressive behavior, which, for some modern preschoolers, becomes a primary means of communication in various interactions. This increases the likelihood of recurring conflicts within the group and poses a certain danger, potentially exerting an ambiguous influence on the social development of preschoolers. Hostility toward peers, conflict, and insufficient conflict resolution skills hinder group cohesion and positive socialization.

Since peer interaction is a crucial factor not only for successful socialization but also for personal development, certain characteristics of such interaction may lead to risks in the development of personality traits and the formation of psychologically significant qualities. These risks may manifest as increased anxiety and self-doubt, reduced self-esteem, lack of independence, proactivity, and initiative, as well as dependence on the opinions and decisions of others.

Conclusion

The results of the analysis of publications on the characteristics of modern preschool-

ers' interactions with peers over the past five years indicate existing difficulties in ensuring the psychological safety of the preschool educational environment. The identified characteristics of children's interactions point to the presence of certain problems and risks in this sphere of preschoolers' lives, which may be associated with insufficient conditions for meeting their need for peer interaction. The depiction of children's interactions presented in the reviewed publications suggests the need to optimize teachers' efforts aimed at developing preschoolers' interaction within the group, which will contribute

to ensuring the psychological safety of the preschool educational environment.

At the same time, it is necessary to obtain more reliable and valid data and to comprehensively address the problem of psychological safety in preschool educational institutions. This requires the design and implementation of scientific research that will clarify the characteristics of modern preschoolers' interactions with peers, identify the causes of existing interaction patterns, and develop and test a system of pedagogical measures aimed at addressing risks and challenges in the social sphere.

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Chronic stress and its impact on psychological well-being of modern students: the resource role of conscious self-regulation and optimism

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Abstract

Context and relevance. Chronic stress experiences are still widespread among students and are the main reason for abandoning education, losing interest in a future profession, and changing educational trajectory. The theoretical basis of the study is the resource approach to studying the factors of successful achievement of life goals in stressful situations. **Objective.** The aim is to assess the severity of chronic stress in Russian students and to reveal the resource role of conscious self-regulation and optimism in overcoming stress and maintaining psychological well-being. **Hypothesis.** Conscious self-regulation and dispositional optimism act as resources for students' psychological well-being, reducing the negative impact of chronic stress on it. The level of the conscious self-regulation development is a moderator of both direct and indirect impact of stress on psychological well-being through optimism. **Methods and materials.** The study involved 2262 students from Russian colleges and universities ($M = 18,25$, $SD = 1,77$, 61% girls). The following survey methods were used: Self-Regulation Profile Questionnaire by Morosanova — SRPQ-M 2020; Well-being Manifestations Measurement Scale (WBMS), Short Questionnaire of Acute and Chronic Stress, Test of Dispositional Optimism, TDO. **Results.** Students' conscious self-regulation and dispositional optimism make a significant positive contribution to their psychological well-being, significantly reducing the negative impact of stress on it. Constructed structural models taking into account moderated and mediated effects confirmed that developing the conscious self-regulation increases the ability to cope with chronic stress and also allows maintaining psychological well-being and optimism in stressful conditions. **Conclusions.** The new scientific results obtained have practical significance in the context of the urgent task of searching for and developing psychological resources and strategies for maintaining the quality of life in modern students under the influence of various stress factors.

Keywords: chronic stress, psychological well-being, conscious self-regulation, optimism, students

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Хронический стресс и его влияние на психологическое благополучие современных студентов: ресурсная роль осознанной саморегуляции и оптимизма

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Резюме

Контекст и актуальность. Переживания хронического стресса по-прежнему широко распространены у студентов и представляют собой основную причину отказа от обучения, потери интереса к будущей профессии, смены образовательной траектории. Теоретической основой исследования является ресурсный подход к изучению факторов успешного достижения жизненных целей, в том числе в стрессовых ситуациях. **Цель.** Оценить выраженность хронического стресса у российских студентов, а также раскрыть ресурсную роль осознанной саморегуляции и оптимизма в преодолении стресса и поддержании психологического благополучия. **Гипотеза.** Осознанная саморегуляция и диспозиционный оптимизм выступают ресурсами психологического благополучия студентов, снижая негативное влияние на него хронического стресса. Уровень развития осознанной саморегуляции является модератором как прямого, так и косвенного влияния стресса на психологическое благополучие через оптимизм. **Методы и материалы.** В исследовании приняли участие 2262 студента российских вузов и колледжей ($M = 18,25$, $SD = 1,77$, 61% девушек). Использованы опросные методики: Стиль саморегуляции поведения В.И. Моросановой — ССПМ 2020, Шкала проявлений психологического благополучия — ШППБ, Краткий опросник острого и хронического стресса; тест диспозиционного оптимизма, ТДО-П. **Результаты.** Осознанная саморегуляция и диспозиционный оптимизм студентов вносят значимый положительный вклад в их психологическое благополучие, в то же время существенно снижая негативное влияние на него стресса. Структурные модели, построенные с учетом модулируемых и медируемых эффектов, подтвердили, что развитие осознанной саморегуляции увеличивает способность справляться с хроническим стрессом, а также позволяет поддерживать психологическое благополучие и оптимизм в стрессовых условиях. **Выводы.** Полученные новые научные результаты имеют практическое значение в контексте актуальной задачи поиска и развития психологических ресурсов и стратегий поддержания качества жизни современных студентов в условиях действия различных стрессовых факторов.

Ключевые слова: хронический стресс, психологическое благополучие, осознанная саморегуляция, оптимизм, студенты

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Introduction

Contemporary international and domestic empirical research unequivocally shows the serious negative consequences of stress on students' academic performance, motivation, and well-being across different levels of education, accompanied by a marked deterioration in their quality of life (Morosanova et al., 2025; Samokhvalova et al., 2022; Konrad et al., 2021; Calderon et al., 2021; Liu et al., 2019; Harahap et al., 2022). Several studies indicate an association between stress experienced during the period of study and the subsequent development of various mental disorders (Karyotaki et al., 2020; Liu et al., 2019). The negative effects of stress in the academic environment have been shown to be critical not only for individual students but also for educational practice as a whole (Pascoe et al., 2020; Slimmen et al., 2022).

In recent years, there has been a growing number of studies examining various types of stress in student populations. Among the specific learning stress, academic stress and examination stress are most frequently distinguished (Zhdanov et al., 2020; Marakshina et al., 2024; Fomina et al., 2024). Increasing attention is also being paid to the issue of perceived uncertainty stress, which is particularly pronounced in young adulthood (Morosanova et al., 2024; Odintsova et al., 2024; Glowacz, 2020). At the same time, the severity of chronic stress among students — characterized by persistent stress symptoms resulting from prolonged exposure to stressors — remains insufficiently investigated. The majority of research on chronic stress has been conducted within the frameworks of occupational and organizational psychol-

ogy (e.g., Leonova, 2016), although this type of stress has substantial implications for the quality of life and psychological well-being of young people.

The severity of chronic stress largely depends on young people's capacity to cope with it in an adaptive manner (Graves et al., 2021). Psychological resources are assumed to play a key role in effective stress management and the maintenance of psychological well-being (Samokhvalova et al., 2022). There is growing scientific interest in the study of personality characteristics that make a significant contribution to optimal functioning (Morosanova et al., 2024), as well as in the identification of psychological resources that not only mitigate the negative impact of various types of stress but also promote the personal and professional development of young people. Researchers consider a wide range of characteristics as psychological resources for coping with stress, each contributing in its own way to stress regulation. Limited evidence suggests that dispositional optimism, self-efficacy, conscious self-regulation, and hardiness contribute most substantially to stress coping and the maintenance of a high level of well-being among students (Popa-Velea et al., 2021; Korzhova et al., 2022; Morosanova, 2021; Fomina et al., 2024). These personal and regulatory characteristics function as buffers, reducing the impact of stressors and ensuring a balance between external demands and the individual's internal resources.

The present study is grounded in the resource-based approach to examining the factors underlying the successful attainment of life goals, including in stressful situations. Theoretically, conscious self-regulation has been substantiated as a meta-resource for maintaining well-being,

achieving academic success, and supporting professional self-determination (Morosanova, 2021, 2022). Empirical findings obtained from samples across different countries demonstrate that students with a high level of conscious self-regulation cope more effectively with stressful situations of various types (Morosanova et al., 2025; Fomina et al., 2024; de la Fuente et al., 2020; Harahap et al., 2022; Rodriguez et al., 2022; Travis, Bunde, 2022). During the COVID-19 pandemic, amid heightened uncertainty-related stress, students with well-developed conscious self-regulation exhibited greater stability in their academic and professional goals, a clearer vision of their career trajectories, and lower levels of depressive symptoms (Kondratyuk et al., 2021; Zinchenko et al., 2020). It was also found that optimism made a substantial contribution to students' conscious self-regulation, facilitating successful self-organization of their lives and learning activities and helping them cope with stress under lockdown conditions (Zinchenko et al., 2021).

At present, relatively few studies allow for the interpretation of the phenomenon of student stress through an understanding of the multidimensional interrelations among individual personality and regulatory characteristics (Delegach et al., 2021; Freire et al., 2018). This situation hinders the development of comprehensive explanatory models that could serve as a basis for designing effective interventions aimed at ensuring a high quality of life for contemporary students within modern higher education practice. In this regard, the search for meta-resources — both personal and regulatory — that are capable of integrating individual capacities at different levels to counteract diverse stressors in the aca-

demic environment appears highly relevant (Morosanova et al., 2025; Fomina et al., 2024). This line of inquiry is also significant for constructing a working model that would make it possible to identify and describe the psychological mechanisms underlying the integrative influence of regulatory and personal resources not only on students' stress manifestations but also on the maintenance of their well-being under stressful conditions. In particular, it may contribute to elucidating the mechanism by which stressful events are subjectively interpreted either as opportunities or as insurmountable difficulties, thereby advancing the understanding of the stress phenomenon in student populations.

Accordingly, the aim of the present study was to assess the severity of chronic stress among students and to examine the specific features of its associations with conscious self-regulation, dispositional optimism, and psychological well-being in a large Russian sample.

The study sought to evaluate the direct and indirect contributions of conscious self-regulation and optimism to coping with chronic stress, as well as to identify and describe the mediating and moderating mechanisms through which these resources influence students' psychological well-being.

Materials and methods

Methods:

1. To assess the general level of conscious self-regulation, was used Self-Regulation Profile Questionnaire by Morosanova — SRPQ-M 2020 (Morosanova, Kondratyuk, 2020).

2. Psychological well-being was measured using the “Well-being Manifestations Measurement Scale (WBMMS) (Fomina,

Bondarenko, 2024), which allows for the assessment of both the overall level of psychological well-being and its specific manifestations.

3. Chronic stress was assessed using the Short Questionnaire of Acute and Chronic Stress (Morosanova, Zinchenko, 2024).

4. The general level of dispositional optimism was measured using the screening version of the “Test of Dispositional Optimism, TDO” (Gordeeva, Sychev, Osin, 2021).

5. Statistical data processing was carried out using descriptive statistics, correlation analysis, and regression analysis (SPSS 27 package). Mediation and moderation effects were assessed using the PROCESS macro for SPSS (Version 3.2) developed by Hayes.

Participants

The study involved 2262 first- to third-year students (mean age = 18,25; SD = 1,77; 61% female). Of these, 51% were students enrolled in secondary vocational education institutions (mean age = 17,68; SD = 1,32; 56% female), and 49% were university students (mean age = 19,43; SD = 1,72; 68% female). Data collection was conducted via the “Testograph” online platform (<https://www.testograf.ru/>).

Results

Descriptive statistics and correlation analysis

The analysis of descriptive statistics, along with the assessment of the normality of distribution for the studied variables (Fig. 1), indicated that students were generally characterized by moderate to low levels of chronic stress (skewness = 0,875). A high

level of chronic stress was reported by 16% of students, whereas 72% and 12% reported moderate and low levels, respectively.

The distributions for the overall level of conscious self-regulation and dispositional optimism were close to normal (skewness = –0,035 and –0,146, respectively), whereas the distribution for psychological well-being was shifted toward higher values (skewness = –0,359). A high level of well-being was reported by 67% of respondents, a low level by 18%, and a moderate level by 15%.

A high level of conscious self-regulation was characteristic of 14% of students, a low level of 15%, and a moderate level of 71%. The percentage distribution for dispositional optimism was as follows: high level — 14%, low level — 12%, and moderate level — 74%.

In summary, across all the studied parameters, the majority of students demonstrated a moderate level of conscious self-regulation and dispositional optimism, a high level of psychological well-being, and a moderate level of chronic stress.

Subsequently, a correlation analysis was performed (Table 1), which confirmed the presence of significant relationships between the variables under study. Negative correlations were found between chronic stress, on the one hand, and psychological well-being, self-regulation, and dispositional optimism, on the other. Significant positive correlations were observed between psychological well-being, self-regulation, and dispositional optimism.

Regression analysis

To examine the characteristics that significantly influence students’ psychological well-being, a regression analysis

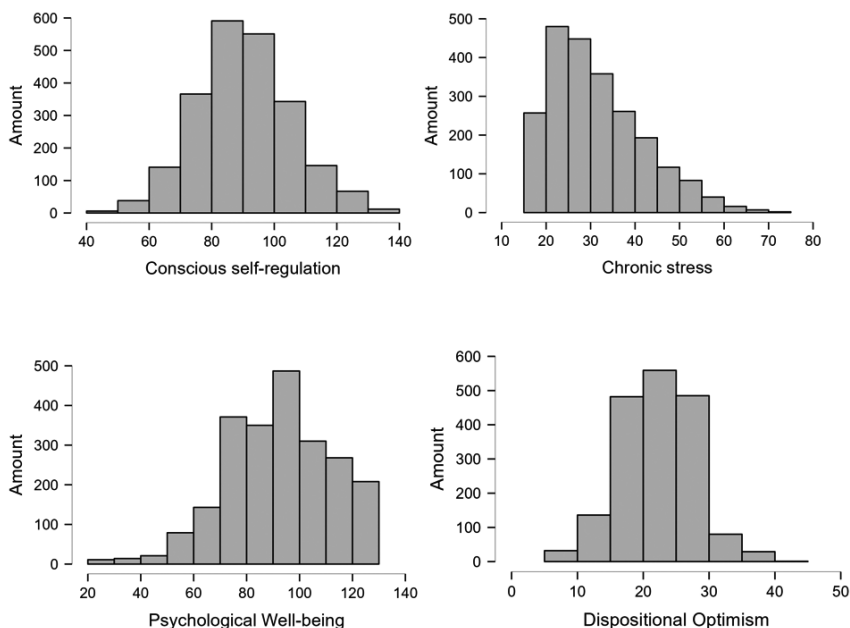


Fig. 1. Histograms of empirical distributions of the variables under study

Table 1

Descriptive statistics and correlations between the variables (N = 2262)

	Variables	M	SD	1	2	3	4
1	Chronic stress	26,29	7,38	—			
2	Self-regulation	90,90	15,11	−0,45**	—		
3	Psychological Well-Being	92,76	19,66	−0,62**	0,55**	—	
4	Dispositional Optimism	22,83	5,77	−0,32**	0,43**	0,49**	—

Note: ** — correlation is significant at the 0,01 level (two-sided).

was conducted. The dependent variable was the overall level of psychological well-being, while the predictors (independent variables) included the level of chronic stress, the overall level of conscious self-regulation, and dispositional optimism. The analysis was performed with forced-entry method (Table 2). The model demonstrated high statistical significance ($F = 635,18$, $p < 0,001$). The adjusted R^2 for the resulting model was 0,51, indicating that more than

50% of the explained variance in psychological well-being was accounted for by the variables under consideration.

A comparison of the regression coefficients suggests that the positive contributions of conscious self-regulation and optimism to the maintenance of well-being are approximately equal, whereas the negative contribution of chronic stress to psychological well-being is more substantial. On the one hand, this finding supports the hypoth-

esis regarding the significant resource role of conscious self-regulation and optimism in maintaining well-being. On the other hand, it does not yet clarify the specific nature of the relationships among these variables or their potential mechanisms of influence on psychological well-being. To examine the specificity of these relationships in greater detail, structural equation modeling was employed.

Structural equation modeling

At the initial stage, based on previously obtained findings, we proposed a theoretical model that allows for consideration not only of the direct effects of the examined characteristics (chronic stress, conscious self-regulation, and optimism) on psychological well-being, but also of indirect effects arising from the interrelations among the predictors themselves (see Fig. 2).

To address these issues, a moderated mediation analysis was employed. This method makes it possible to elucidate the mechanisms underlying the interrelationships among multiple factors within a complex system, taking into account the specific conditions under which certain effects become stronger or weaker. Models incorporating both moderating and mediating effects are more realistic, and their explanatory potential enables a more comprehensive and objective representation of the observed patterns. The proposed model allows for testing the following general hypothesis: the level of conscious self-regulation acts as a moderator of both the direct and indirect effects of stress on psychological well-being through optimism. Verification of this hypothesis involves testing several specific assumptions: (1a) self-regulation moderates the relationship between stress and

Table 2

Regression model of predictors for psychological well-being

Predictors (independent variables)	Standard regression coefficients β	T	Significance, p
General level of conscious self-regulation	0,255	13,08	< 0,001
Chronic stress	–0,415	–22,33	< 0,001
Dispositional Optimism	0,250	13,54	< 0,001

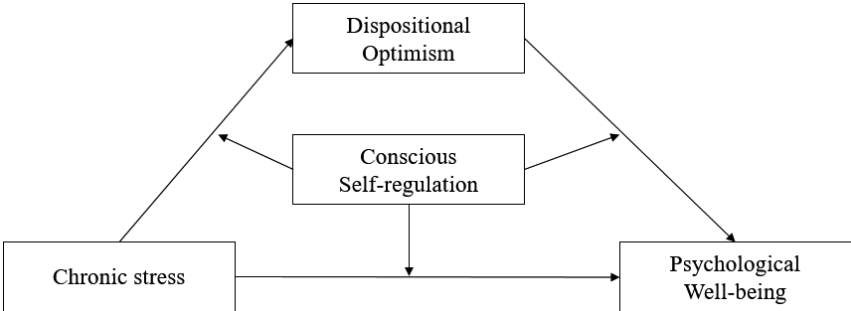


Fig. 2. Theoretical model of the influence of stress and optimism on psychological well-being by means of moderating role of conscious self-regulation

optimism; (1b) self-regulation moderates the relationship between optimism and psychological well-being; and (1c) self-regulation moderates the relationship between stress and psychological well-being. The analysis was conducted using the specialized PROCESS macros for SPSS. When interpreting the results, it is necessary to consider the specific influence of the moderator on the relationships between all potential dependent variables and the predictors. According to the conceptual model, in our case there are two dependent variables — optimism and psychological well-being. The obtained results are presented in Table 3.

After controlling for the level of self-regulation in Model 1 (dependent variable: dispositional optimism), the significant negative effect of chronic stress remained ($B = -0,257$, $p < ,001$). However, the analysis of the interaction between stress and self-regulation revealed a small but statistically significant moderating effect of self-regulation ($B = -0,02$, $p < ,01$), thereby supporting Hypothesis 1a. This finding may be interpreted to mean that a high level

of self-regulation attenuates the negative impact of stress on manifestations of optimism.

After accounting for self-regulation in Model 2 (dependent variable: psychological well-being), the negative effect of stress on psychological well-being became non-significant ($B = -0,303$, $p > ,05$). The absence of a significant effect is also indicated by the confidence interval, which includes zero. More importantly, the interaction coefficient between chronic stress and self-regulation was significant ($B = -0,006$, $p < ,05$), confirming Hypothesis 1c: self-regulation mitigates the impact of stress on psychological well-being, and this buffering effect is more pronounced among students with higher levels of self-regulation. Hypothesis 1b was not supported: conscious self-regulation did not demonstrate a moderating effect on the relationship between optimism and psychological well-being ($B = 0,002$, $p < ,05$). Most likely, the resource role of self-regulation with respect to optimism becomes particularly salient under stressful conditions. The final model is presented in Figure 2.

Statistical indicators of the moderated mediation model

Table 3

Variables	Model 1 Dispositional Optimism			Model 2 Psychological Well-Being		
	B	SE	95% CI	B	SE	95% CI
Chronic stress	-0,257***	0,063	(-0,381; -0,133)	-0,303	0,201	(-0,697; 0,090)
Conscious self-regulation	0,080**	0,024	(0,033; 0,126)	0,476**	0,146	(0,189; 0,763)
Stress x Conscious self-regulation	-0,020**	0,001	(0,001; 0,003)	-0,006*	0,002	(-0,010; -0,002)
Optimism				0,711**	0,360	(0,006; 1,417)
Optimism x Conscious self-regulation				0,002	0,004	(-0,006; 0,009)
R ²	0,21			0,52		
F	159,77***			385,23***		

Note: «*» — $p < 0,05$; «**» — $p < 0,01$; «***» — $p < 0,001$; CI — confidence interval; B — unstandardized regression coefficient.

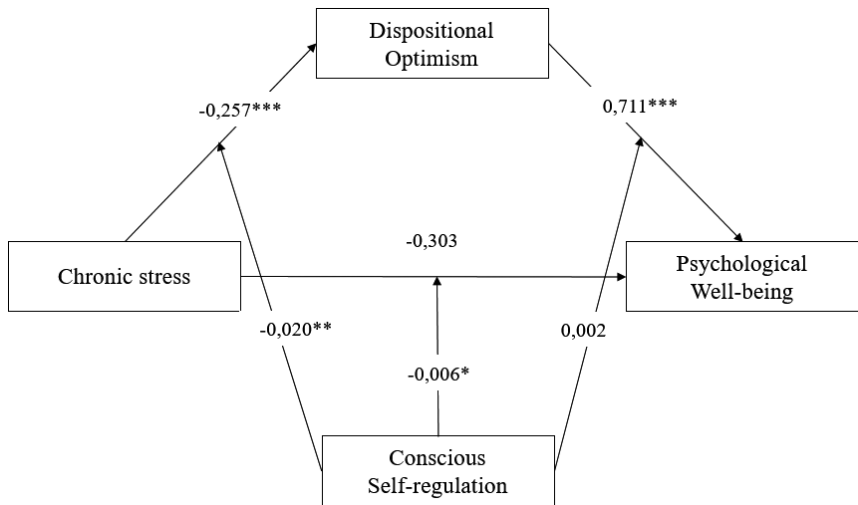


Fig. 3. The influence of conscious self-regulation on the relationship between chronic stress and psychological well-being through optimism: «*» — $p < 0,05$; «*» — $p < 0,01$; «***» — $p < 0,001$

The data presented in Table 4 demonstrate the effects of reducing the negative impact of stress on psychological well-being through optimism among students with different levels of conscious self-regulation (high, moderate, and low).

For all three groups, the indirect effect was statistically significant (the confidence interval did not include zero). This effect was observed at all levels of self-regulation. However, at higher levels of self-regulation, the indirect effects of

stress on psychological well-being through optimism were more pronounced; that is, the buffering effect was stronger among students with higher self-regulation. Thus, the obtained results support the hypothesis that self-regulation moderates the relationships among chronic stress, optimism, and psychological well-being.

Discussion

The study of psychological resources underlying students' psychological well-

Table 4

Moderating effects of self-regulation in the relationship between chronic stress and the students' psychological well-being

Moderator (Self-regulation)	B	SE	p	Bootstrapping 95% CI	
				Lower	Upper
Low level (M — 1SD)	−0,098	0,019	0,000	−0,138	−0,064
Medium level, mean	−0,076	0,016	0,000	−0,108	−0,046
High level (M + 1 SD)	−0,052	0,022	0,033	−0,099	−0,012

Note: M — mean, 1 SD — one standard deviation, B — unstandardized regression coefficient, SE — standard error, CI — confidence interval.

being represents one of the most important tasks in contemporary educational psychology. Stress remains widespread among students and constitutes a major cause of academic dropout, loss of interest in a future profession, and changes in educational trajectories (Morosanova et al., 2025; Emerson et al., 2023). These processes negatively affect professional development and entail numerous undesirable costs for both the individual and society.

The present study examined and elucidated the relationships among experiences of chronic stress, conscious self-regulation, dispositional optimism, and psychological well-being in a Russian student sample. Correlation analysis revealed significant negative associations between stress and self-regulation, optimism, and well-being, as well as positive associations among self-regulation, well-being, and optimism. It is noteworthy that previous studies have demonstrated stronger associations of psychological well-being and self-regulation with chronic stress than, for example, with perceived or acute stress (Morosanova et al., 2025).

The results of the regression analysis, as expected, confirmed in our large-scale sample that the development of conscious self-regulation and optimism makes a substantial direct contribution to the maintenance of psychological well-being and may, therefore, be considered key psychological resources.

Based on the resource approach to the comprehensive study of conscious self-regulation (V.I. Morosanova) and the empirical findings obtained in this study, a theoretical model was proposed to address the question of whether the level of conscious self-regulation functions as a moderator of

the relationship between chronic stress, optimism, and psychological well-being. This model also aimed to clarify the specific features of the impact of chronic stress on psychological well-being through optimism among students with different levels of self-regulation.

Empirical verification of the proposed theoretical model demonstrated that conscious self-regulation and dispositional optimism, while making significant positive contributions to psychological well-being, also substantially reduce the negative impact of stress on students' well-being. These findings are consistent with previous research showing that students with higher levels of optimism are more likely to employ adaptive coping strategies (Gómez-Molinero, 2018; Heinen et al., 2017). Moreover, such students tend to be more engaged in academic tasks and invest greater effort in achieving their goals (Nurttala et al., 2015; Superv a et al., 2020). At the same time, it should be noted that the nature of these relationships may vary depending on gender and regulatory characteristics (Icekson et al., 2019), factors that are not always taken into account in research models.

Our findings provide empirical evidence clarifying the specific nature of the relationship between self-regulation and optimism under conditions of chronic stress. Although a positive association between these constructs has been reported in numerous studies, their influence on one another remains unclear. Previous research has shown that optimism — as a positive orientation toward the future — contributes to conscious self-regulation, positively affecting the success of self-organization under stress (Morosanova et al., 2021; Zinchenko et al., 2021). Optimism is regarded as a significant factor in

maintaining psychological well-being and reducing the negative consequences of stress. It is associated with the capacity to cope with potentially traumatic events and with the possibility of post-traumatic growth (Puig-Perez et al., 2024; Miteva, 2023). On the other hand, self-regulation, primarily functioning as an instrumental resource, appears to “support” or reinforce optimism, particularly in difficult life situations. A significant and novel finding of the present study is that experiences of chronic stress may diminish students’ optimism; however, a high level of self-regulation mitigates this negative effect.

Thus, the present study enabled a multidimensional analysis of the relationships among chronic stress, dispositional optimism, conscious self-regulation, and psychological well-being in a Russian student sample. The resource role of self-regulation was confirmed both in attenuating the negative impact of chronic stress on students’ psychological well-being and in enhancing the influence of other personal resources.

Conclusions

Chronic stress is currently widespread among students. The present study confirmed that experiences of chronic stress are negatively associated with psychological well-being; however, well-developed conscious self-regulation skills and pronounced dispositional optimism mitigate

this adverse effect. The development of self-regulatory capacity thus represents a key resource for reducing the negative impact of stress on students’ psychological well-being.

The specific features of the relationship between self-regulation and optimism exert a complex influence on the association between stress and well-being. Conscious self-regulation not only directly contributes to the maintenance of psychological well-being but also functions as both a mediator and a moderator in the relationship between stress and optimism.

Student support programs should take into account individual differences and develop strategies for enhancing self-regulation in accordance with these differences. A promising direction for future research lies in further investigation of the system of psychological resources underlying young people’s well-being under conditions of diverse stressors and various types of stress.

Limitations.

A limitation of this study is the composition of the sample, which included undergraduate students in their early years of study at universities as well as college students. It should be noted that stress factors may differ depending on whether students are enrolled in higher education or secondary vocational education, as well as depending on the year of study. This limitation will be addressed in future research.

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Varvara I. Morosanova — ideas; annotation, writing and design of the manuscript; planning of the research; control over the research.

Tatiana G. Fomina — ideas; application of statistical methods for data analysis; conducting the experiment; data collection and analysis; visualization of research result; writing and design of the manuscript.

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The authors declare no conflict of interest.

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Development of social creativity of student youth in project activities

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Abstract

Context and relevance. The modern context of social uncertainty, growing international tensions, and destructive technologies of new hybrid wars actualize theoretical and empirical research in the field of increasing the resilience of Russian youth to social risks and threats, searching for resources for effective socialization, and developing social flexibility and individual creativity. **Objective.** The aim is to determine and verify the psychological and pedagogical conditions for the effective development of students' social creativity in the educational environment of a university by involving them in socially significant project activities using a specially developed program. **Hypothesis.** The development of social creativity will be facilitated by the implementation of a program for involving students in rich communicative and creative project activities in the reflective heuristic environment of the university. **Methods and materials.** The study involved 142 first-year students of Kostroma State University (average age $M = 18,2$; 19,7% boys, 80,3% girls). The methodological complex included A.A. Korsakova's questionnaire "The Level of Individual Social Creativity," A.G. Samokhvalova's questionnaire "Difficulties in Communicating with Peers and Adults," T.Yu. Osipova's test "Communicative Creativity," and J. Averyll's questionnaire "Emotional Creativity" adapted by E.A. Valueva. **Results.** At the ascertaining stage of the study, low indicators of social creativity were established among students in the experimental and control groups, especially in the behavioral, communicative, and reflective components. At the formative stage, a project-based activity program aimed at developing social creativity was implemented for students included in the experimental subgroups. The program proved its effectiveness at the control stage of the study, since the participating students significantly increased their level of social creativity and experienced a decrease in the number of communicative difficulties. **Conclusions.** Specially organized project-based activities in the reflective heuristic environment of the university contribute to the development of all structural components of social creativity and the overcoming of current communicative difficulties of student youth.

Keywords: student youth, educational environment of an university, social creativity, communication difficulties, project activities, psychological and pedagogical conditions, development

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Развитие социальной креативности студенческой молодежи в проектной деятельности

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Резюме

Контекст и актуальность. Современный контекст социальной неопределенности, рост международной напряженности, деструктивные технологии новых гибридных войн актуализируют теоретико-эмпирические исследования в области повышения устойчивости российской молодежи к социальным рискам и угрозам, поиска ресурсов эффективной социализации, развития социальной гибкости и креативности личности. **Цель.** Определить и верифицировать психолого-педагогические условия эффективного развития социальной креативности студентов в образовательной среде вуза через включение их в социально значимую проектную деятельность с помощью специально разработанной программы. **Гипотеза.** Развитию социальной креативности будет способствовать реализация программы включения студентов в насыщенную коммуникативно-творческую проектную деятельность в рефлексивной эвристической среде вуза. **Методы и материалы.** В исследовании приняли участие 142 студента первого курса Костромского государственного университета (среднее значение возраста $M = 18,2$; 19,7% юношей, 80,3% девушек). Методический комплекс включал анкету А.А. Корсаковой «Уровень социальной креативности личности», опросник А.Г. Самохваловой «Трудности в общении со сверстниками и взрослыми», тест Т.Ю. Осиповой «Креативность коммуникативная», опросник «Эмоциональная креативность» Дж. Эйверилла в адаптации Е.А. Валуевой. **Результаты.** На констатирующем этапе исследования установлены низкие показатели социальной креативности студентов экспериментальной и контрольной групп, особенно поведенческого, коммуникативного и рефлексивного компонентов. На формирующем этапе для студентов, включенных в экспериментальные подгруппы, была реализована программа проектной деятельности, направленная на формирование социальной креативности. Программа доказала свою эффективность на контрольном этапе исследования, поскольку у студентов-участников значимо повысился уровень социальной креативности и снизилось количество коммуникативных трудностей. **Выводы.** Специально организованная проектная деятельность в рефлексивной эвристической среде вуза способствует развитию всех структурных компонентов социальной креативности и преодолению актуальных коммуникативных трудностей студенческой молодежи.

Ключевые слова: студенческая молодежь, образовательная среда вуза, социальная креативность, коммуникативные трудности, проектная деятельность, психолого-педагогические условия, развитие

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Introduction

The modern context of an uncertain, dynamically changing social situation in the country — such as the aggravation of the military, political, and economic situations, the growth of international tensions and social isolation, cyberattacks, and information stressors — brings to the forefront theoretical and empirical studies in the field of increasing the resilience of Russian youth to variable risks and threats of "new wars," finding resources for effective socialization, identifying mechanisms for overcoming barriers to self-realization, inertia, lack of initiative, and detachment; as well as developing and implementing technologies for fostering social flexibility, adequacy, and creativity in individuals. Scientific research confirms that armed and unarmed (informational, economic, sociocultural, etc.) methods of destructive influence associated with the conduct of the special military operation (Abdrakhimov, Likso, 2024) trigger the development of negative psychological states in young people (Andreev, Andreev, Slobodenyuk, 2022), reduce the level of psychological well-being and quality of life (Samokhvalova et al., 2022). The last three years, characterized by a period of global turbulence (Kolennikova, 2023), have re-

sulted in disunity among young people and shaken their worldview and attitudes towards themselves and their entire generation (Muraschenkova, 2024 <https://stratpro.hse.ru/social-policy/news/811726959.html>)

The most important resource for overcoming social difficulties and the intrapersonal problems of young people associated with such difficulties is the *social creativity of personality* (Samokhvalova et al., 2023). In contrast to communicative creativity, which allows finding original communication scenarios, social creativity allows elaborating extraordinary solutions to social problems, interpersonal interaction problems, and behavioral responses to external community factors (Korsakova (Kovalenko), 2023). A review of existing approaches to understanding social creativity allows defining it as an integrative trait of a personality, which enables one to quickly find and apply original, effective, and socially acceptable solutions to topical problems in interpersonal interaction. In the structure of social creativity we distinguish *the motivational and value component*, which focuses on extraordinary, but socially acceptable ways of behavior; *cognitive component*, which complements creative search with planning and predicting of ac-

tivities; *communicative component*, which endows the communication form and content with creative plasticity; *emotional component*, which ensures relaxedness and congruence in the expression of feelings; *behavioral component*, which is expressed in the readiness to demonstrate creative manifestations in social interaction; *reflexive component*, enabling to make an objective assessment of social reality (Korsakova (Kovalenko), 2023).

Higher educational establishments play a crucial role in developing adaptability, enterprising, and resilience in today's youth. *Project activities* gained a new vertex of topicality in the matters of youth policy and higher education (Order of the Ministry of Education and Science of the Russian Federation, 2020). We assume that it is a project activity that offers numerous *potentials* for developing the social creativity of personality: problematization and creative search for optimal, extraordinary solutions to social issues; multiplicativity of strategies for achieving goals; communication dynamicity under the conditions of simultaneous competition and collaboration; the emotiogenicity of intense and diverse joint activities; the uncertainty of the actions of different persons and the variability of behavioral scenarios; a comprehensive examination of the cause-and-effect relations, critical analysis of the process and the results of work.

The concepts of problem-oriented learning served as the methodological basis of the study, which determined the content of the experimental work: focus on the learning process rather than on the result, students' independence in their work, facilitation and tutoring by a follow-up faculty member rather than management; interdisciplinarity, activity-based learning, collaboration, and group work. The social constructivism of problem-oriented learning

presumes students' independence in working with available information, choosing the forms and content of educational activities, and establishing meaningful contacts with the social environment for achieving self-development goals (Khamidullin, 2020).

The performed analysis allowed to formulate the **goal** of the study: to identify and verify psychological and pedagogical conditions for the effective development of students' social creativity in the educational environment of a higher educational establishment by engaging them in socially significant project activities by means of a specially developed program. In the study presented here, the following **hypothesis** was tested: implementing a program for engaging students in rich communicative and creative project activities in a reflective, heuristic environment of a higher educational establishment promotes the development of their social creativity.

Materials and methods

The study was performed using a quasi-experimental design with non-randomized groups. The sample group consisted of 142 first-year students from Kostroma State University, aged 17 to 20 years (M — mean value = 18,2; SD = 2,7), who were divided into one control group (CG; N = 86) and three experimental groups (EG; N = 56). The first experimental subgroup consisted of students engaged in project activities in the higher educational establishment environment during their school years (N = 16); the second subgroup consisted of students of the same academic group (N = 18); the third subgroup included students from different academic groups, including that of non-pedagogical fields of study (N = 22).

The study design included three stages.

The ascertaining stage included a primary assessment of the initial level of creativity in the social, communicative,

and emotional spheres using a combination of methods: A.A. Korsakova's (Kovalenko's) questionnaire aimed at determining the level of the social creativity of personality ($\alpha = 0,87$) (Korsakova, 2024), A.G. Samokhvalova's questionnaire "Difficulties in communicating with peers and adults" ($\alpha = 0,90$) (Samokhvalova, 2014); T.Yu. Osipova's test "Communicative creativity" ($\alpha = 0,82$) (Osipova, 2000); J. Averyll's questionnaire "Emotional creativity" ($\alpha = 0,85$) adapted by E.A. Valueva (Frolova, 2017).

The formative stage included the implementation of a project-based activity program in the experimental groups during an academic year. As part of the development and implementation of a socially significant project, each subgroup was engaged in active intra-group interaction, social challenges, interaction with the external environment, routine reflection, analysis, and adjustment of individual and group goals, under the follow-up of the higher educational establishment faculty members. The program included the following components: defining individual development pathways through project activities (self-determination, problematization), project development (consolidation of knowledge and development of creative thinking skills, effective communication, and fruitful heuristic collaborative work), project implementation (application of acquired competencies in the practice of socially significant activities), analysis and reflection (analysis of achieving the individual, group, and project goals).

The control stage involves repeated measurement of indicators to assess the dynamics of changes 10 months after the start of the program.

Data processing was performed using *mathematical data analysis methods*: descriptive statistics, Pearson correlation

analysis to establish correlations between the variables studied, Student's t-test for comparing two independent groups, and the Kruskal-Wallis H-test for comparing three independent groups, followed by pairwise comparisons using the Mann-Whitney test. Initially, the control and experimental groups were tested for distribution normality. The SPSS 21.0 software package was used for data processing.

The lack of randomization was compensated for by the control over the exogenous variables (age, field of study) and by comparable initial indices in the groups. The substantiation for using a quasi-experimental approach is related to the natural limitations of the educational environment, where randomization is not always possible. At that, a clearly arranged intervention allows establishing cause-and-effect relations.

Results

The results **of the ascertaining stage of the experimental work** made it possible to identify the initial development level of social, communicative, and emotional creativity in students of two groups, as well as their communication difficulties arising in the process of interpersonal interaction (Table 1).

The lowest indices of students' *social creativity* were detected in the behavioral, communicative, and reflective domains. The level of *communicative creativity* in both groups was below average, which was supported by the presence of variable *communication difficulties* among students, that were related to participants' personal traits (difficulties in empathy, aggressiveness, egocentrism, diffidence, conformism), and *instrumental difficulties* manifesting at the behavioral level (verbal and nonverbal difficulties, difficulties in establishing contact

Table 1

**The level of development of creativity and current communication difficulties
 of students (according to descriptive statistics)**

Parameters	Groups	M(SD)	M(SD)	(m)
Social creativity				
Motivational-value component	CG	2,89 (0,98)	2,89 (0,98)	2,5≤m≤3,9
	EG	2,85 (1,02)	3,13 (1,06)	2,5≤m≤3,9
Cognitive component	CG	3,36 (0,90)	2,93 (1,02)	2,5≤m≤3,9
	EG	3,33 (0,86)	3,30 (0,88)	2,5≤m≤3,9
Communicative component	CG	2,56 (0,99)	2,88 (0,95)	2,5≤m≤3,9
	EG	2,42 (1,05)	3,24 (0,93)	2,5≤m≤3,9
Emotional component	CG	3,03 (1,02)	2,95 (1,03)	2,5≤m≤3,9
	EG	3,04 (0,95)	3,36 (1,11)	2,5≤m≤3,9
Behavioral component	CG	2,31 (1,00)	2,79 (0,95)	2,5≤m≤3,9
	EG	2,32 (1,08)	3,31 (0,97)	2,5≤m≤3,9
Reflexive component	CG	2,79 (0,91)	2,79 (0,91)	2,5≤m≤3,9
	EG	2,77 (0,95)	3,38 (0,92)	2,5≤m≤3,9
General level of social creativity	CG	2,83 (0,63)	2,89 (0,60)	2,5≤m≤3,9
	EG	2,79 (0,61)	3,40 (0,62)	2,5≤m≤3,9
Communicative creativity				
Level of communicative creativity	CG	15,20 (5,03)	14,97 (4,95)	14≤m≤19
	EG	14,80 (4,97)	16,75 (5,09)	14≤m≤19
Emotional creativity				
Preparedness	CG	25,86 (7,13)	26,26 (6,75)	23≤m≤30
	EG	25,32 (7,44)	28,41 (5,72)	23≤m≤30
Novelty	CG	39,22 (13,57)	39,78 (13,76)	38≤m≤52
	EG	38,95 (14,15)	46,02 (13,29)	38≤m≤52
Efficiency	CG	18,50 (5,21)	18,57 (5,42)	14≤m≤20
	EG	18,68 (5,12)	20,39 (3,84)	14≤m≤20
Authenticity	CG	12,66 (3,56)	11,84 (3,66)	11≤m≤16
	EG	12,04 (3,16)	13,75 (3,43)	11≤m≤16
General level	CG	96,24 (25,90)	96,44 (25,78)	90≤m≤113
	EG	94,98 (25,73)	108,57 (22,71)	90≤m≤113
Communication difficulties				
Basic difficulties	CG	16,69 (8,32)	16,14 (8,13)	14≤m≤27
	EG	16,46 (8,49)	12,34 (7,39)	14≤m≤27
Content difficulties	CG	17,28 (8,66)	17,69 (9,37)	14≤m≤27
	EG	17,55 (8,86)	12,59 (7,20)	14≤m≤27
Instrumental difficulties	CG	15,55 (7,32)	15,26 (7,63)	14≤m≤27
	EG	15,46 (7,34)	11,70 (6,42)	14≤m≤27

Parameters	Groups	M(SD)	M(SD)	(m)
Reflexive difficulties	CG	16,55 (8,07)	15,87 (8,25)	14≤m≤27
	EG	16,38 (8,78)	11,82 (7,06)	14≤m≤27

Note: ЭГ — experimental group (n = 56); КГ — control group (n = 86).

and maintaining a leadership position, difficulties in listening and self-control). The emotional and cognitive components of social creativity were more developed. However, *emotional creativity*, with average indices of preparedness and novelty, has very low values in terms of effectiveness and authenticity parameters, which means that the students, having planned and elaborated original solutions to problems, experienced significant barriers in emotional self-expression, in expressing their individuality in interpersonal interactions, which influences the effectiveness of social contacts.

It had been determined that the sample group followed the law of normal distribution, and the Student's T-test was selected for statistical data analysis of independent sample groups. A comparison of the experimental and control groups at the first test revealed no significant differences between the two sample groups ($p \geq 0,05$), which confirms the randomization of the groups by age and gender, as well as by the level of creativity (social, communicative, emotional), and by communication difficulties.

Using Pearson correlation analysis, a significant direct correlation between the *overall level of the social creativity*, the *communicative creativity* ($r = 0,31$; $p = 0,003$) and the *emotional creativity* ($r = 0,43$; $p = 0,02$) of student youth has been established, as well as an inverse correlation with *communication difficulties*: the basic ones ($r = -0,37$; $p = 0,001$), the substantive ones ($r = -0,47$; $p = 0,03$) and the instrumental ones ($r = -0,53$; $p = 0,002$).

Consequently, the more communicable, empathetic, adequate, and flexible a student is in terms of communication, the more ready he is for free self-expression, for choosing creative, unconventional solutions in difficult situations of social interaction; the less often he experiences difficulties in establishing contacts, goal-setting, and planning his communications, selecting verbal and non-verbal means of influence on his partners.

At the **formative stage of the experimental work**, in the educational environment of the Institute of Pedagogy and Psychology of Kostroma State University, a project program aimed at developing the social creativity of the experimental subgroups' participants was implemented. The logic of the experiment's formation phase is shown in Figure 1.

The preparatory stage of the program was performed only for the first experimental subgroup and involved immersing schoolchildren — future students of the institute — in project activities through three intensive courses held in the university environment (practicing skills in identifying the project problem, planning solutions to overcome it, and public defense of the developed project idea). *The orientation stage* was organized at the beginning of the first year with the aim of finding strategies for developing social creativity within the framework of project activities and included incoming diagnostics of all three experimental subgroups followed by individual counseling of students. *The training stage* involved

developing projects using specially selected psychological and pedagogical tools (creative thinking techniques, business and role-playing games, case studies, training exercises, etc.) for facilitating the solving of real-world social interaction problems. *The internship stage* corresponded to the direct implementation of the developed project and allowed participants to practice and consolidate the previously acquired competencies in the sphere of creative social interaction. The psychological and pedagogical tools at this stage included social challenges, educational situations, and team self-management. The assessment stage, with the use of follow-up assessment, individual and group analysis methods, and reflection, made it possible to evaluate the dynamics of each participant's social creativity development, preferred behavioral patterns, and the degree of engagement in collaborative activities and their performance.

In order to implement the program, weekly classes were held for students outside of school hours, lasting 3–4 hours, depending on the content of the work. Furthermore, the interaction intensity was maintained through regular communication in messenger chats, the project team students and following-up faculty members were the participants, and additional meetings were arranged to address topical issues related to the project's preparation and implementation.

During the experimental work, adjustments were made to the participants' individual social creativity development pathways by way of selecting specific exercises, rotating roles within the team, redistributing project assignments, and changing the level of the students' involvement in solving various project tasks. The in-process adjustment was possible due to

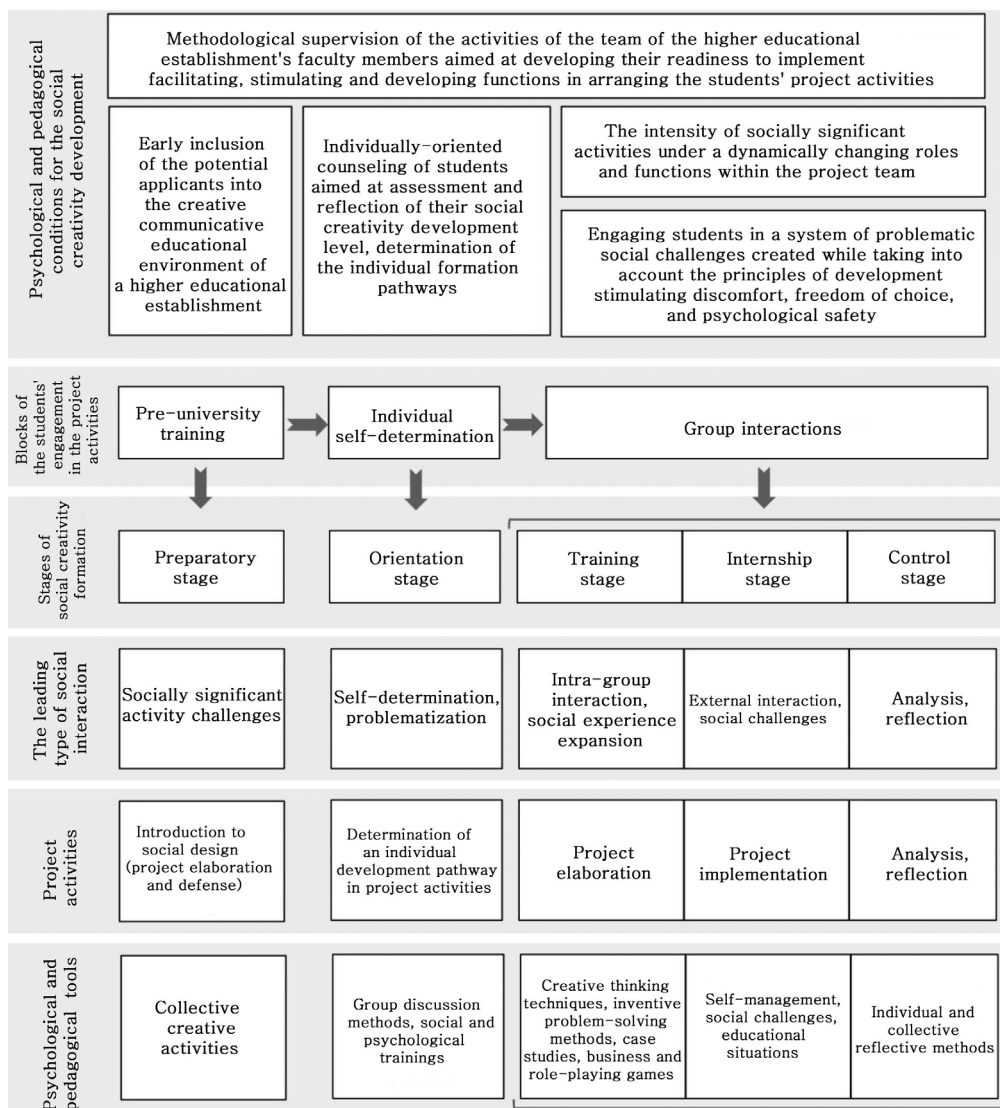
social creativity monitoring, which included individual discussions with the following-up faculty member; reflective techniques (a letter to yourself, unfinished sentences, balance wheel, etc.); collective analysis of the process and the results of joint activities; mutual assessment; self-assessment and expert assessment scales reflecting the development level of separate components of social creativity and the nature of students' interaction.

The projects implemented by the experimental groups were aimed at reorganizing extracurricular activities for university students, promoting voluntary work among the youth of the region, and establishing a creative residency to support the initiatives of the student youth.

At the control stage of the experimental work, a follow-up assessment was performed in both the experimental and control groups to check the effectiveness of the implemented program in engaging students in project activities aimed at developing their social creativity. While the initial Student's t-test revealed no significant differences between the two groups, the final stage showed significant differences in the studied indices between the groups (Table 2).

At the control stage of the experiment, no statistically significant changes were found in the *overall value of social creativity* in the control group ($p \geq 0,05$). Analysis of separate criteria reveals statistical significance of the *behavioral* and *communicative components* ($p \leq 0,01$), which is caused by the intensity of the institute's youth policy and educational activities.

The *overall value of social creativity* of the experimental group at the control stage demonstrates positive dynamics in its formation ($p \leq 0,01$). The increase in the mean values for each social creativity criterion was found to be statistically



significant, except for the *cognitive* one ($p \geq 0,05$). This displays a common trend for all students participating in the study: a lower self-assessment of the cognitive component of social interaction at the

second assessment, which is explained by the increased demands on the students' cognitive abilities in the educational environment of a higher educational establishment.

Table 2

**Differences in the expression of the studied variables in students
 at the control stage of the experimental work**

Parameters	Groups	Mean	Standard error of the mean	Value of the Student's t-test	Cohen's d value
Social creativity					
Motivational-value component	CG	2,89	0,11	1,4	0,24
	EG	3,13	0,14		
Cognitive component	CG	2,93	0,11	2,2*	0,39
	EG	3,30	0,12		
Communicative component	CG	2,88	0,1	2,2*	0,38
	EG	3,24	0,12		
Emotional component	CG	2,95	0,11	2,2*	0,38
	EG	3,36	0,15		
Behavioral component	CG	2,79	0,1	3,2**	0,54
	EG	3,31	0,13		
Reflexive component	CG	2,79	0,1	3,8***	0,65
	EG	3,38	0,12		
General level of social creativity	CG	2,89	0,06	4,9***	0,84
	EG	3,40	0,088		
Communicative creativity					
Level of communicative creativity	CG	14,97	0,53	2,1*	0,36
	EG	16,75	0,68		
Emotional creativity					
Preparedness	CG	26,26	0,73	2*	0,35
	EG	28,41	0,76		
Novelty	CG	39,78	1,48	2,7**	0,46
	EG	46,02	1,78		
Efficiency	CG	18,57	0,58	2,2*	0,39
	EG	20,39	0,51		
Authenticity	CG	11,84	0,39	3,1**	0,54
	EG	13,75	0,49		
General level	CG	96,44	2,78	2,9**	0,5
	EG	108,57	3,04		
Communication difficulties					
Basic difficulties	CG	16,14	0,88	2,8**	0,49
	EG	12,34	0,99		
Content difficulties	CG	17,69	1,01	3,5***	0,62
	EG	12,59	0,96		

Parameters	Groups	Mean	Standard error of the mean	Value of the Student's t-test	Cohen's d value
Instrumental difficulties	CG	15,26	0,82	2,9**	0,51
	EG	11,70	0,86		
Reflexive difficulties	CG	15,87	0,89	3,0**	0,53
	EG	11,82	0,94		

Note: * — significance at $p \leq 0,05$; ** — significance at $p \leq 0,01$; *** — significance at $p \leq 0,001$.

The greatest positive shift in students of the experimental group happened in the expressiveness of the *overall level of social creativity*, and also in its *behavioral* and *reflexive* components, which means that students started demonstrating unconventional, improvisational behavior patterns in interpersonal interaction situations, finding creative ways to overcome the emerging difficulties, utilizing variable social roles and functions; they have also learned to identify non-obvious cause-and-effect relations in social situations, to evaluate the impact of their own actions on outcomes comprehensively and creatively. This is also confirmed by the fact that the level of emotional and communicative creativity of students from the experimental group increased significantly; they started experiencing communication difficulties more seldom, while finding adequate solutions in interaction situations. However, no significant differences were found in the *motivational-value component*

of social creativity, although the average value of the index has increased slightly in the experimental group (from 2,85 to 3,13), which means that the developed qualities may prove to be unstable and not consolidate in the system of individual values and motives.

Kruskal-Wallis H-test was used to identify differences in the level of social creativity development in the three experimental subgroups, which showed that the highest result was achieved in the first subgroup.

By way of pairwise comparison of the subgroups of the experimental sample group at the control experiment stage using the nonparametric Mann-Whitney test, the significant differences in the *social creativity* parameter between the subgroups 1 and 2 ($U = 56$; $p = 0,002$), 1 and 3 ($U = 68$; $p = 0,001$) were confirmed, but no differences were identified between subgroups 2 and 3, which indicates the homogeneity of the experimental results received for

Table 3

The significance of the Kruskal-Wallis criterion for experimental subgroups at the control stage of the study

Experimental subgroups	Number of people	Middle rank	χ^2	Level of significance
1	16	40,75	13,159	0,001
2	18	21,78		
3	22	25,09		

these groups. In the first group, the social creativity index clearly exceeds the values of the other subgroups, which we attribute to the fact that these students had experience of participating in project activities in the educational environment of a higher educational establishment before getting enrolled in it.

Results and discussion

The research performed and the statistical data obtained confirmed the main hypothesis that the engagement of students in rich communicative and creative project activities by means of a specially designed program contributes to the development of their social creativity.

The results obtained are consistent with earlier studies, which demonstrated that *social creativity* develops in accordance with the increase in abilities in the field of self-actualization, motivation, communication and social imagination (Popel', 2005); that it is necessary to highlight and develop motivational, cognitive and pragmatist components in the structure of social creativity (Myagkova, 2013); the effective interaction, which includes objectivity, external expression of activity, subordination to situational conditions, understanding of the mutual expectations of the subjects and their impact on each other should become a criterion for the social creativity formation (Osipov, 2010). In addition to the enlisted components, the communicative, emotional, and reflexive components were identified and substantiated in our study, along with the respective criteria of their formation.

The results obtained also confirmed that *project activities* enable developing the qualities that lay the foundation for social creativity, such as the ability to interpret and design situations of interpersonal contact, predict the course of social interaction, maintain meaningful contact, assess the

feelings and emotions of the interlocutor objectively, and ecologically defend one's positions and views (Sorokumova, 2019); form value orientations and tolerance of personality (Barysheva, 2006); develop entrepreneurial competencies and intentions (Zhang et al., 2022); reduce the risk of asocial creativity emergence in a threatening social context (Meshkova, 2023). In fact, project activity in the educational environment of a higher educational establishment is a tool for *mindful learning*, which is understood as a person's conscious involvement in the learning process, whereby students notice contextual specifics, apply critical thinking, and take a creative approach. At that, the search for new knowledge, one's own conclusions, and ratiocinations must be perceived by the student as significant ones, and must be followed up with the support of a faculty member (Hassed, 2014). Project activities, in our opinion, are consistent with the basic principles of mindful learning — being open to all new things, attentiveness to differences, presence in the moment, sensitivity to context, conscious self-regulation and emotion management, conscious choice and action, awareness of the existence of more than one perspective, flexible thinking (Bordunos, Miletich, Volkova, 2024).

In addition to that, the specific feature of the suggested author's model for developing social creativity in students is that the focus is put into *social projects* built on the ideas of goodness, mutual help, and care for another Person, rather than into educational and professionally oriented projects. Such care is focused on supporting and helping another Person and arises from recognition of his value, respect for his personality, compassion in a difficult situation; and also in the manifestation of optimism in life, strong moral principles, and faith in the best (Ryaguzova, 2024).

In the process of experimental work, the effectiveness of *psychological and pedagogical conditions for the development of social creativity in students* was proven. Thus, assessment and individually oriented counseling of the participants based on a systematic analysis of the process and the result of the activity, regular evaluation of the dynamics of the social creativity level and its separate indices, contributed to motivation for development and self-realization along individual pathways. In our work, we ensured the inclusion of students in the system of problematic social challenges by taking into account the principles of development, stimulating discomfort, freedom of choice, and psychological safety. In the context of the resource approach, these two conditions form a conscious self-regulation, which is a reflexive psychological tool including a system of regulatory competencies of the operational and cognitive (planning, modeling, programming, evaluation of results), regulatory and personal (flexibility, independence, responsibility, and reliability) levels (Morosanova, Filippova, Fomina, 2023). The intensity of socially significant activities was ensured by means of dynamically changing the roles and functions of the project team students. Each time a student is plunged into a situation of uncertainty, having to undertake new roles and choose a method for interaction. In such situations, integrity and identity are developed as integral characteristics of a personality; while overcoming the complexity and uncertainty of a specific situation, students work on “identifying themselves,” “putting together” and “acquiring” themselves (Grishina, 2024).

The early engagement of potential applicants in the creative communicative educational environment of a university, in the “social-creative environment of a higher educational establishment” (Kaminska-

ya, Ertman, 2024) made it possible to ensure “adaptive readiness” of the students for project activities, which are regarded as a systemic personal education, characterized with the experience of entering educational environment at psychophysiological, psychological, socio-psychological levels, whereby the mechanisms that ensure its successful acquisition in new situations of higher educational establishment learning are launched (Shamionov, Sharov, 2025).

And, finally, the methodological support for the activities of higher educational establishment faculty members has become a necessary condition for mastering the roles of a facilitator and moderator in relation to a student project group. Faculty members must be ready to act for students as Mentors, who will become a catalyst for the process of professional and personal self-determination, who will mediate the orientation of a maturing participant in terms of building a professional career and developing certain values and worldview position (Krasilov, Repeshchuk, 2025).

Conclusion

1. The demand for developing adaptability and flexibility, forming positive life strategies, and developing social and communicative abilities among young students can be satisfied by means of targeted development of such integrative personality traits as social creativity, which includes a person’s emotional and communicative creativity, reflects the originality, activity, constructiveness, and social standardness of interpersonal interaction, enabling to overcome the emerging difficulties in communication and interpersonal relations in an effective manner.

2. The formation of each social creativity component can be ensured by project

activities that possess an entire range of potentials: problematization and creative search for optimal, extraordinary solutions for social problems; multiplicativeness of strategies for achieving a goal; dynamism of communication under the conditions of simultaneous competition and cooperation; emotiogenicity of intensive, diverse joint activities; uncertainty of the actions of various participants and the variability of behavioral scenarios; comprehensive consideration of cause-and-effect relations, and critical analysis of the process and the results of work. Within the framework of project activities, such students' social creativity development mechanisms are actualized as a focus on high social effectiveness, attribution of new social interaction scenarios, identification with creative partners, internalization of social values, empathy, and reflection.

3. The psychological and pedagogical conditions which determine the effectiveness of the students' social creativity development through their engagement in project activities include systematic diagnostics and individually focused counseling aimed at developing self-understanding and reflection, identification of individual social creativity development pathways; engaging students in a system of problematic social challenges with gradually increasing complexity of content, that are created while taking into account the principles of development stimulating discomfort, freedom of choice, and psychological safety; ensuring the intensity of socially significant activities under the dynamically shifting roles and functions

within the project team; ensuring the early engagement of potential applicants in the creative communicative educational environment of a higher educational establishment; methodological follow-up over the team's activity by faculty members in order to develop their readiness to perform facilitating, stimulating, and developing functions in arranging the students' project activities.

4. The implementation of a specially developed project-based activity program promotes the targeted, stage-by-stage development of social creativity in the student. The selection of psychological and pedagogical tools to be used in the program must be based on a subject-oriented approach. Such tools as collaborative creative work, group discussions, social and psychological training, creative thinking techniques, inventive problem-solving methods, case studies, business and role-playing games, self-management, social challenges, educational situations, individual and group reflection techniques have proven to be effective.

The perspective of the study includes identifying the resources for social creativity development at different stages of a student's life, as well as developing mechanisms for providing a socially creative environment at a higher educational establishment.

Limitations. Limitations of the study include the small sample size, non-randomization of comparison groups by gender and size, and the dominance of a nomothetic approach to data collection.

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Anna G. Samokhvalova — research ideas; annotation, writing and formatting of the manuscript; interpretation of the obtained data, formulation of conclusions; research planning, monitoring the conduct of the research.

Anastasia A. Kovalenko — conducting an experiment; collecting and analyzing data; visualizing research results; applying statistical methods to analyze data.

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

Вклад авторов

Самохвалова А.Г. — идеи исследования; аннотирование, написание и оформление рукописи; интерпретация полученных данных, формулировка выводов; планирование исследования, контроль за проведением исследования.

Коваленко А.А. — проведение эксперимента; сбор и анализ данных; визуализация результатов исследования; применение статистических методов для анализа данных.

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Personal readiness for employment among students with disabilities

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Abstract

Context and relevance. In the context of labor shortage, employment issues for people with disabilities are of particular importance. The low level of employment of people with disabilities necessitates studying the psychological factors that influence their employment. **Objective.** The aim is to identify the state and typology of personal readiness for employment in students with disabilities at the stage of study at a university. **Hypothesis.** Students with disabilities exhibit a unique state of personal readiness for employment and variability in its components. **Methods and materials.** The study involved 50 university students with disabilities. Personal readiness for employment was assessed using a set of diagnostic tools that measured its core components: university adaptation, level of subjective control, and subjective well-being. The data were analyzed using factor analysis, cluster analysis, correlation analysis, and logistic regression. **Results.** The fundamental heterogeneity of the labor potential of disabled people and three latent factors (emotional-regulatory resource, motivational-volitional potential, social-academic adaptation) determining individual differences in personal readiness for employment are revealed. Three variants of personal readiness for employment are identified: those with specific risks of reduced readiness for employment, those with potential success, and those with a combination of limiting factors. **Conclusions.** The key vulnerability factors in the structure of personal readiness for employment in disabled people are a low level of emotional stability, a weak motivational-volitional base. Each individual's cluster of personal readiness for employment requires special support measures. The variables should be taken into account when promoting employment and identifying a risk group.

Keywords: personal readiness for employment, students with disabilities, inclusive higher education, inclusive employment, variants of personal readiness for employment

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Личностная готовность к трудоустройству у студентов с инвалидностью

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Резюме

Контекст и актуальность. В условиях дефицита трудовых кадров вопросы трудоустройства инвалидов приобретают особую значимость. Низкий уровень трудовой занятости лиц с инвалидностью обуславливает необходимость изучения психологических факторов, влияющих на их трудоустройство. **Цель.** Выявить состояние и виды личностной готовности к трудоустройству у студентов с инвалидностью на этапе обучения в вузе. **Гипотеза.** Студенты с инвалидностью имеют своеобразие в состоянии личностной готовности к трудоустройству и вариативность в состоянии ее компонентов. **Методы и материалы.** В исследовании приняли участие 50 студентов с инвалидностью. Личностная готовность к трудоустройству оценивалась с помощью комплекса стандартизированных валидных тестовых методик, обеспечивающих оценку ее компонентов (эмоциональных, мотивационных, адаптационных, волевых). Для анализа применены факторный, кластерный, корреляционный анализы, логистическая регрессия. **Результаты.** Выявлены неоднородность трудового потенциала инвалидов и три латентных фактора (эмоционально-регуляторный ресурс, мотивационно-волевой потенциал, социально-академическая адаптация), определяющих индивидуальные различия в личностной готовности к трудоустройству. Выделены 3 вида личностной готовности к трудоустройству: с отдельными рисками снижения готовности к трудоустройству, потенциально успешные, с совокупностью ограничивающих факторов. **Выводы.** Ключевыми факторами уязвимости в структуре личностной готовности к трудоустройству у инвалидов являются низкий уровень эмоциональной устойчивости, слабая мотивационно-волевая база. Представитель каждого кластера личностной готовности к трудоустройству нуждается в особых мерах поддержки. Переменные следует учитывать при содействии трудоустройству и при выявлении группы риска.

Ключевые слова: личностная готовность к трудоустройству, студенты с инвалидностью, инклюзивное высшее образование, инклюзивное трудоустройство, виды личностной готовности к трудоустройству

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Introduction

According to the labor market forecast for Russia presented by the Ministry of Labor and Social Protection of the Russian Federation at the Federation Council in January 2025, the labor force deficit will reach 3,1 million people by 2030. This figure is 0,7 million higher than the December 2024 forecast. Despite government support measures, the employment rate of persons with disabilities remains extremely low at 20,7% according to 2024 Rosstat data. The importance of realizing the talents and resources of people with disabilities and the significance of work for achieving their quality of life have been emphasized in speeches by the President of the Russian Federation. Given the labor resource shortage and the demand for increased employment of persons with disabilities, there is an objective need to study the factors determining their employment and to identify personal barriers and resources that affect their professional realization.

Research in occupational psychology, including concepts of professional self-determination, psychological readiness for work, professional reliability, and stress resistance, has established that successful entry into the labor market is determined not only by professional competencies but also by personal readiness for employment. The concept of personal readiness encompasses diverse characteristics. For instance, researchers have highlighted the ability to manage emotions, acceptance of professional values and meanings, desire for professional self-realization, absence of procrastination and learned helplessness (Mitina, Mitin, 2020), acceptance of professional activity values, readiness for interaction and initiative (Denisova et al., 2023), independence in problem-solving, conscious motivation for work (Guterman,

Goryunova, 2023), and self-congruence as an internal disposition of personal autonomy (Sychev, Guryanova, 2025). Data on the interrelationship of personal readiness components for professional activity have been identified separately. For example, awareness of life perspective is directly related to the motivational, cognitive, and emotional components of readiness (Gut et al., 2021). Students' general self-efficacy is directly related to their academic performance (Mussa, 2023). Characteristics of adaptive readiness are predictors of academic adaptation (Shamionov, Sharov, 2025). Evidence suggests that intrinsic motivation for professional education and satisfaction with the profession, which determine the intention to work in one's field, are not related to academic success (Sychev, Guryanova, 2025).

Regarding persons with disabilities, the problem of work readiness is traditionally described through the place of inclusive employment in the socialization and integration of persons with disabilities (Osmuk, 2018), through identification of existing unemployment risks and ways to overcome them (Zabelina, Sergeeva, 2023; Pavlova, Salogub, 2024), and through actualization of the tasks of forming a personal foundation for continuous professionalization of persons with disabilities (Rubtsov et al., 2023). Some studies indicate lowered expectations, negative attitudes, insufficient motivation to work, and inadequate assessment by persons with disabilities of their personal and professional resources (Zhdanova, Mozheikina, 2020). The gap between physical capabilities, personal motivation to work, and labor market demand has also been noted (Bazhin et al., 2018). International studies confirm the presence of objective difficulties for persons with disabilities in employment (Lindsay et al., 2014).

Factors positively influencing the employment of persons with disabilities have been identified: previous successful experience of the employer and the applicant, the applicant's compliance with requirements, their adaptation, and the presence of economic support measures (Litwin et al., 2023); conditions of previous education, experience with remote work, and positive perceptions of the future profession (Park, Bouc, 2018; Grigal et al., 2019; Nowell et al., 2022; Enticott, Dew, 2025). Studies emphasize the need to consider cultural traditions and national context, including the role of the Chinese family in supporting employment of persons with disabilities (Wang et al., 2025), special employment options for persons with disabilities in South Korea (Hwang, Roulstone, 2015), and the connection between unstable employment and low success in labor market integration among German citizens (Stuth, Jahn, 2019). Research has also focused on overcoming discrimination against persons with disabilities in the labor market and establishing the concept of equal rights to work in society (Iwanaga et al., 2023).

Thus, predictors of successful employment include the presence of work motivation, readiness for business relationships, adaptation to the environment and activities, meaningfulness of life position, and overall satisfaction with the situation. Although the problem of employment of persons with disabilities has been partially studied, the question of the specificity and types of personal readiness for employment of students with disabilities remains insufficiently explored. The causes and ways to overcome barriers in the field of employment of persons with disabilities have not been determined, which establishes the relevance of this study.

Taking into account the identified contradictions and the stated relevance, the

purpose of the study was determined: to identify the state and types of personal readiness for employment among students with disabilities during their university studies. In the course of the study, we proceeded from the assumption that students with disabilities exhibit distinctive characteristics in the state of personal readiness for employment and variability in the state of its components.

Materials and Methods

Participants. The study was carried out in the 2023–2024 academic year, in the middle of the first semester. Fifty students with disabilities participated: 94% were undergraduate students in their 2nd–4th years and 6% were master's students; 66% studied full-time and 34% part-time. The mean age of respondents at the time of assessment was 22,6 years (range 19–46). Distribution by nosology of impairment was as follows: 6% — visual impairments; 12% — hearing impairments; 24% — musculoskeletal disorders; 58% — disability associated with general medical conditions. Acknowledging that barriers and resources may differ substantially between nosological groups, the paper presents an aggregated analysis under the umbrella «students with disabilities» because the subgroup sizes were too small for methodologically valid comparative statistics. The sample was 38% male and 62% female. The sample mean grade point average was 4,17. Overall, 89,2% of the total population of students with disabilities enrolled at Cherepovets State University at the time of the study participated; this included all students with disabilities in their 2nd year and above. The sample's nosological and age composition and the diversity of study programs generally correspond to the overall structure of students with disabilities in Russian universities.

The primary objective of the present study was to identify internal differences and the structure of readiness for employment within the group of students with disabilities; the design did not involve comparisons with non-disabled students. Given the relatively small sample size ($N = 50$), which was determined by the specific characteristics of the target population, this study should be regarded as a pilot and does not permit generalization to the entire population. Therefore, the results should be considered preliminary and hypothesis-generating. The application of multivariate methods (factor and cluster analysis) in this study is also exploratory. Although factor analysis typically requires a larger sample (commonly at least 5–10 participants per variable), the authors note that, with $N = 50$, this criterion is only minimally met. Nevertheless, measures of sampling adequacy ($KMO = 0,78$) and a significant Bartlett's test ($p < 0,001$) indicate that factorization is feasible for uncovering latent structure. We emphasize that the stability of the extracted factors and clusters requires further verification on larger samples of students with disabilities from multiple universities; however, the multivariate methods used retain heuristic value by revealing latent relationships and generating hypotheses for subsequent research. Consequently, the present findings should be interpreted as a basis for further empirical testing within larger-scale projects.

Methods. The study procedure involved administering a questionnaire. The first block comprised seven questions on gender, age, nosology of impairment, academic performance, year of study, mode of study (full-time/part-time), and field of study (UGSN). The second block comprised 84 items drawn from standardized instruments: the Subjective Well-Being Inventory (R.M. Shamionov, T.V. Beskova,

2018), the Locus of Control Questionnaire (E.F. Bazhin, E.A. Golyunkina, A.M. Etkind, 1993), and the Scale for Assessing Social and Academic Adaptation of Students (T.D. Dubovitskaya, A.V. Krylov, 2010). These instruments allowed a comprehensive assessment of characteristics that determine capacity for integration into the professional community and constitute the core of personal readiness for employment.

For analysis, we selected variables corresponding to the primary subscales of the chosen instruments, including: emotional well-being; ego well-being; existential–activity well-being; social well-being; physical well-being; general situational well-being; internality in achievements; internality in failures; internality in interpersonal relations; internality in health; internality in family; internality in work; overall internality; relationships with instructors; relationships with peers; self-organization; acceptance of university norms; satisfaction with education; acceptance of academic demands; emotional state; and engagement.

Statistical processing was performed using Python (libraries: pandas, scipy, scikit-learn, factor_analyzer) and IBM SPSS. The analysis comprised several interconnected stages: (1) assessment of data distribution using the Shapiro–Wilk test; (2) factor analysis via principal component analysis (PCA) with Varimax rotation; (3) clustering using hierarchical analysis (Ward's method) and the k-means algorithm; and (4) predictive modeling using logistic regression and decision trees (CART).

Results

The results of testing the suitability of parametric analytical methods using the Shapiro–Wilk criterion indicated that the distributions for all scales of the diagnos-

tic instruments deviated from normality ($p < 0,05$), which determined the selection of analytical methods applied at subsequent stages of the study.

To identify the latent structure of personal readiness, factor analysis was conducted using principal component analysis (PCA) with Varimax rotation. The Kaiser–Meyer–Olkin measure of sampling adequacy was $KMO = 0,81$, indicating a high level of sampling adequacy. Bartlett’s test of sphericity was statistically significant ($\chi^2 = 845,62$, $p < 0,001$), confirming the suitability of the data for factorization. The analysis yielded three factors that together explained 69,4% of the total variance. Table 1 presents the factor loadings of the variables (loadings >

0,50), reflecting the strength of the associations between the observed variables and the latent factors.

Within the framework of the study, each factor was assigned a descriptive label, and the characteristics of the key variables loading on each factor were identified and interpreted.

F1. Emotional-regulatory resource.

This factor includes the following variables: emotional well-being, existential–activity well-being, social well-being, physical well-being, general situational well-being, and ego well-being.

F2. Motivational-volitional potential.

This factor is represented by internality in the domains of achievements, failures,

Table 1

Factor structure of personal readiness for employment of students with disabilities at the stage of study at the university

Variable	F1	F2	F3
Emotional well-being	0,78		
Ego well-being	0,74		
Existential-activity well-being	0,71		
Social well-being	0,69		
Physical well-being	0,64		
General situational well-being	0,63		
Internality in achievements		0,75	
Internality in failures		0,71	
Internality in interpersonal relations		0,70	
Internality in health issues		0,68	
Internality in family		0,67	
Internality in work		0,65	
General internality		0,63	
Relations with teachers			0,73
Relations with peers			0,71
Self-organization			0,70
Acceptance of university norms			0,68
Satisfaction with studies			0,67
Acceptance of academic requirements			0,66
Emotional state			0,65
Engagement			0,63

interpersonal relationships, health, family, work, and overall locus of control.

F3. Social-academic adaptation.

This factor comprises variables related to relationships with instructors and fellow students, self-organization, acceptance of university norms, satisfaction with studies, acceptance of academic requirements, emotional well-being, and engagement.

Based on factor scores, three levels of expression were defined:

1. **Low level** (factor score $< -0,5$), indicating a pronounced resource deficit and the need for targeted support measures;

2. **Medium level** (factor score from $-0,5$ to $+0,5$), reflecting a baseline level of the resource sufficient for adaptation under standard conditions;

3. **High level** (factor score $> +0,5$), indicating a well-developed and stable resource manifested in behavioral competence and self-regulation.

Individual factor scores were calculated for each participant, which made it possible to assess the level of expression of each factor within the sample.

For **F1**, the distribution was relatively balanced but raises concern: 26% of students demonstrated a high level of this resource, 46% a medium level, and 28% a low level.

For **F2**, this factor emerged as the most vulnerable. Only 18% of students showed a high level of motivational–volitional potential, whereas 48% were at a medium level and 34% fell into the risk zone (low level).

For **F3**, this factor represented a relative strength of the sample. A high level was observed in 26% of students, a medium level in 52%, and a low level in 22%. Overall, more than half of the students demonstrated medium or high levels of social-academic adaptation.

Hierarchical cluster analysis (Ward's method with Euclidean distance) was first used to determine the optimal number of clusters. Subsequently, the k-means algorithm was applied to refine cluster boundaries and content. Based on scores for the three identified latent factors (F1–F3), k-means cluster analysis yielded three clusters, representing distinct types of personal readiness for employment among students with disabilities (Table 2).

Based on the obtained data, the distribution of students with disabilities across clusters was determined, and distinct types of personal readiness for employment were described.

Cluster 1. Students with individual risks of reduced employment readiness (32%, $n = 16$). This cluster is characterized by medium levels across all three factors.

able 2

Clusters of personal readiness for employment of students with disabilities

Cluster	Average values of factors			Interpretation of the cluster s
	F1	F2	F3	
C 1	0,38 в	−0,41 н	0,29 в	With certain risks of decreased readiness for employment: emotionally stable, adapted, with low motivation (F2↓)
C 2	0,82 вв	0,75 вв	0,79 вв	Highly motivated and socially active, emotionally stable (F1↑, F2↑, F3↑)
C 3	−0,77 н	−0,69 н	−0,81н	Set of limiting factors: vulnerable in all parameters (F1↓, F2↓, F3↓)

Note: н — below average; нн — significantly below average; в — above average; вв — significantly above average.

A noticeable gap is observed between social–academic adaptation (F3) and motivational–volitional potential (F2). Students in this cluster generally demonstrate emotional stability and adequate social adaptability; however, intrinsic motivation, persistence, and goal-directed behavior are less pronounced.

Cluster 2. Potentially successful students (28%, $n = 14$). This cluster demonstrates high levels across all identified factors. It includes students with well-developed emotional–regulatory resources and motivational–volitional potential, pronounced social activity, and a high level of adaptation to the academic environment. These characteristics indicate a well-formed personal readiness for employment.

Cluster 3. Students with a combination of limiting factors (40%, $n = 20$). This cluster is characterized by low levels of expression for most factors, with particularly low scores on motivational–volitional potential (F2) and emotional–regulatory resources (F1).

Discussion

The results of the study confirm that personal readiness for employment among students with disabilities is a multidimensional construct comprising emotional–regulatory, motivational–volitional, and adaptive components. Students with disabilities demonstrate varying levels of deficits and resources across these components of personal readiness for employment.

Factor analysis made it possible to identify three leading factors underlying personal readiness for employment among students with disabilities. The emotional–regulatory factor (F1), which includes indicators of emotional, social, physical, general situational, ego, and existential-activity well-being, was highly expressed in 26% of students with disabilities. This group is characterized by emotional stability and a

positive perception of life prospects. At the same time, 28% of students demonstrated low values on this factor, reflecting elevated anxiety and reduced life satisfaction.

The motivational–volitional factor (F2), associated with general internality as well as internality in the domains of achievements, interpersonal relationships, health, family, work, and overcoming failures, was expressed at a high level in only 18% of students. This indicates a pronounced goal orientation and a capacity for self-regulation. However, 34% of respondents showed reduced values on this factor, pointing to difficulties in goal setting and internal mobilization that limit readiness for professional self-determination.

The social and academic adaptation factor (F3), which includes indicators of relationships with instructors and fellow students, self-organization, acceptance of university norms, satisfaction with studies, acceptance of academic requirements, emotional well-being, and engagement, represented a strength for 26% of students. These individuals demonstrated a high degree of involvement in the educational process and confidence in communication. In contrast, low values on this factor were observed in 22% of respondents, indicating difficulties in social integration and academic interaction. Overall, F2 emerged as the most vulnerable factor: more than one-third of students showed insufficient development of goal-setting and self-regulation mechanisms, which may reduce career resilience. At the same time, F3 functioned as a compensatory resource, reflecting opportunities for successful integration into the academic and social environment.

Cluster analysis identified three key clusters: students with individual risks of reduced employment readiness (32%), potentially successful students (28%), and students with a combination of limiting factors (40%). Students in the first cluster, despite a relatively high level of engagement in the academic

environment and acceptable indicators on the emotional–regulatory factor (F1), demonstrated low values on the motivational–volitional factor (F2). The substantial proportion of students with a combination of limiting factors (40%) can be explained by the inclusion of a wide range of parameters in the clustering procedure, which naturally revealed a group with multiple deficits reflecting real adaptation difficulties experienced by some students with disabilities. We assume that disability is associated with increased vulnerability across several parameters of personal readiness. At the same time, high grade point average scores were found to compensate for deficiencies in F1 and F2, thereby reducing the likelihood of inclusion in the high-risk cluster (Cluster 3).

Cluster 3 can be considered a “pivotal resource” group, in which well-structured support has the potential to qualitatively change trajectories of professional development. Students in this cluster require assistance in strengthening work motivation, forming a professional identity, and mastering self-presentation skills. The potentially successful group demonstrates high adaptability to the academic and social environment, which is associated with emotional stability, a pronounced sense of meaning, and strong goal orientation. This group represents a strategic talent pool ready for integration into employment and primarily requires support in building long-term career development pathways. In contrast, students with a combination of limiting factors experience significant internal barriers, including insufficient emotional stability, low levels of internality in the work domain, and weakly developed goal-setting mechanisms. This group is at risk of social passivity and avoidance of employment and therefore requires systematic, interdisciplinary support.

Overall, only 28% of students with disabilities demonstrated pronounced personal

readiness for employment. This finding is consistent with previous studies pointing to the presence of internal vulnerability within this population. The identified intermediate group (approximately 32%) requires activation of motivational and volitional resources, which are critical for transitioning into the category of employed persons with disabilities. Accordingly, practical recommendations for supporting representatives of different clusters should be differentiated in terms of their primary strategies and tactics. For Cluster 1, the main strategy involves developing professional identity and engagement in career-oriented projects; recommended measures include participation in internships, employer-based mentoring programs, and the development of competency portfolios. For Cluster 2, the main strategy is targeted correction of weaker areas while maintaining overall resource levels; recommended measures include tutoring support for challenging subjects, soft skills training (communication and self-presentation), and psychological support programs. For Cluster 3, the primary strategy is comprehensive, long-term support with an emphasis on basic academic success and social inclusion; recommended measures include individualized educational pathways, continuous tutor or mentor support, adapted employment practices (such as sheltered workplaces and preliminary internships in inclusive organizations), and collaboration with families and academic advisors.

The discussion of the findings indicates that the identified factors expand upon existing research in the fields of inclusive education and employment of persons with disabilities. The importance of emotional stability and motivation — assessed in this study through subscales of internality in achievements and work, as well as emotional and ego well-being—corroborates the conclusions of previous national studies

(Zhdanova, Mozheikina, 2020; Zabelina, Sergeeva, 2023; Pavlova, Salogub, 2024) and confirms their key role in preventing social isolation among persons with disabilities. The present study уточняет, that these characteristics function as compensatory resources for overcoming barriers. The position of Tu, Liu, and Díaz (2024), who argue that academic motivation and perceived support in the learning environment are directly related to the well-being and professional expectations of students with disabilities, is further refined here: motivation and emotional stability among students with disabilities operate not only as internal personal resources but also as mechanisms for overcoming stigmatization, existing deficits, and risks of unemployment. Thus, the identified factor structure aligns with general research trends while simultaneously demonstrating a qualitatively distinct pattern of personal resource manifestation among students with disabilities.

The high proportion of students with a combination of limiting factors identified in this study is consistent with evidence for the existence of such groups, although it differs quantitatively from findings reported in thematically similar international studies, where comparable groups typically account for only 15-20% of samples (Lipka et al., 2020). This discrepancy may be explained by several factors, including more pronounced stigmatization of students with disabilities, processes of acceptance and inclusion (togetherness), and the impact of social identity threat on primary professionalization (Lipai, 2023), as well as the relatively early stage of development of individualized educational pathways and mentoring systems (Bazhin, Simonova, Bashmakova, 2018), alongside a labor market that remains insufficiently adapted. Identifying the leading contributors to this difference — whether internal barriers or

external factors such as labor market conditions and support systems for persons with disabilities in Russia and internationally-requires further, more detailed analysis and empirical verification.

Conclusions

The study empirically confirmed that the personal readiness of students with disabilities for employment is determined by the state of emotional-regulatory, motivational-volitional, and social-adaptive resources, which critically influence the ability to overcome barriers and build an individual trajectory of professionalization. Students with disabilities demonstrate the most deficient motivational-volitional potential, while the resource of social-academic adaptation remains the most preserved. Although emotional stability and motivation are traditionally considered key factors for successful employment, the findings of this study clarify their role specifically for students with disabilities. Unlike the general population, where these qualities are predominantly associated with individual career orientations, for students with disabilities they perform a compensatory function, enabling them to overcome external barriers such as stigmatization, limited available vacancies, and lack of an inclusive environment. Thus, the identified patterns reflect not general principles but specific mechanisms of professional development for students with disabilities, which constitutes the novelty of the research.

Cluster analysis identified three types of personal readiness for employment: those with individual risks of reduced employment readiness, potentially successful individuals, and those with a combination of limiting factors. The latter cluster is most prevalent among students with disabilities and is characterized by pronounced internal barriers to employment. The study identified predictive risks in the sphere of unem-

ployment among persons with disabilities, associated with the negative impact of deficits in each of the identified types. The resources and deficits of each type should be considered when implementing inclusive higher education practices.

The identified factors expand existing understanding of the personal characteristics of students with disabilities and the structure of their employment readiness. The findings enable the development of evidence-based, individually differentiated trajectories for professionalization and employment facilitation. Thus, the data both confirm known patterns and demonstrate new contextual features, allowing for a deeper examination of the specifics of personal employment readiness among students with disabilities and their correlation with previous research in this field. The results offer a new perspective on the employment readiness of students with disabilities and reveal both universal and specific patterns of their professional develop-

ment, enabling a transition from general statements to concrete support strategies.

Overall, the presented data confirm the relevance of developing the problem of employment readiness for persons with disabilities and demonstrate the existence of a distinct structure of personal employment readiness among students with disabilities. The study has value as a pilot and exploratory phase, which allowed for the refinement of measurement approaches and identification of directions for further analysis. At the same time, the data establish a justified agenda for the next step: expanding the sample, multi-center design and stratified analysis, as well as validation of model stability (clustering, logistic regression/CART) on independent subsamples. Such a transition will ensure methodologically rigorous, differentiated assessment of personal employment readiness and enable the formulation of practical recommendations for universities and support services.

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Alexandra V. Mikhailova — application of statistical, mathematical or other methods for data analysis; conducting the experiment; data collection and analysis; visualization of research results.

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

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The relationship between time perspective and professional self-determination in male and female adolescents: sex differences

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Abstract

Context and relevance. The study focuses on the sex differences in the structure of the connection between professional self-determination and the perception of lifetime (time perspective) in adolescence, which remains under-researched within the event-biographical framework. **Objective.** The aim is to identify the sex differences in relationships between dynamic parameters of time perspective and professional self-determination. **Hypothesis.** There are significant sex differences in the structure of relationships between time perspective parameters, measured within the event-biographical approach, and professional choice. **Methods and Materials.** The study involved 156 people aged 14 to 28 ($M = 18.69$; $Me = 18$; $SD = 4.20$), including 78 boys and 78 girls. The Life Line method (A.A. Kronik) was used to analyze the time perspective, while the Self-Determination Test (E.A. Osin) and the Subjective Quality of Educational Profile Choice Questionnaire (D.A. Leontiev) were used to analyze the parameters of professional choice. **Results.** Significant sex differences have been identified in the relationships between dynamic temporal parameters (such as expected life span and the structure of event connections) and professional choice. A key finding is the ambivalent role of expected life span in girls: it is positively associated with satisfaction with their choice and autonomy, but negatively with self-reliance. In male adolescents, this predictor is positively associated with all aspects of choice. Also, among boys, choice parameters are significantly related to age identity and negative past experience, reflected in the structure of causal connections, which is not observed in girls. **Conclusion.** The dynamic perception of time, assessed through the system of event connections, is a significant, but differently structured, factor in the professional self-determination of male and female adolescents, which requires the development of differentiated approaches to their psychological and pedagogical support.

Keywords: time perspective, future perceptions, professional self-determination, psychological choice, sex differences, adolescence

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Взаимосвязь временной перспективы и профессионального самоопределения у юношей и девушек: половые различия

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Резюме

Контекст и актуальность. Актуальность исследования обусловлена недостаточной изученностью качественных, структурных различий во взаимосвязи профессионального самоопределения и восприятия времени жизни (временной перспективы) у юношей и девушек. Преобладающий диспозиционный подход к изучению временной перспективы не позволяет выявить специфику структурных взаимосвязей между восприятием времени жизни и профессиональным самоопределением в юношеском возрасте, связанную с половыми различиями. Событийно-биографический подход позволяет преодолеть эту трудность. **Цель.** Выявить половые различия во взаимосвязях между динамическими параметрами временной перспективы и профессионального самоопределения. **Гипотеза.** Существуют значимые половые различия в структуре взаимосвязей параметров временной перспективы, измеряемых в рамках событийно-биографического подхода, и профессионального выбора. **Методы и материалы.** В исследовании участвовали 156 человек от 14 до 28 лет ($M = 18,69$; $Me = 18$; $SD = 4,20$), в том числе 78 юношей и 78 девушек. Для анализа временной перспективы использовалась методика «Life Line» (А.А. Кроник), для анализа параметров профессионального выбора — тест самодетерминации (Е.А. Осин) и опросник «Субъективное качество выбора профиля обучения» (Д.А. Леонтьев). **Результаты.** Обнаружены значимые половые различия в связях динамических временных параметров (таких как ожидаемая продолжительность жизни и структура событийных связей) с профессиональным выбором. Ключевой результат — амбивалентная роль ожидаемой продолжительности жизни у девушек, она положительно связана с удовлетворенностью выбором и автономией, но отрицательно — с самостоятельностью. У юношей этот предиктор положительно связан со всеми аспектами выбора. Также у юношей параметры выбора значимо связаны с возрастной идентичностью и негативным прошлым опытом, отраженным в структуре причинных связей, чего не наблюдается у девушек. **Выводы.** Динамическое восприятие времени, оцениваемое через систему событийных связей, является значимым, но по-разному структурированным фактором для профессионального самоопределения юношей и девушек, что требует дифференцированных подходов к психолого-педагогическому сопровождению.

Ключевые слова: временная перспектива, представления о будущем, профессиональное самоопределение, психологический выбор, половые различия, юношеский возраст

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Introduction

The time perspective of an individual is of particular interest for studying the patterns of professional self-determination in adolescence, as it acts as a cognitive filter for setting life goals and making decisions. Despite substantial research on time perspective, its specific features in male and female adolescents within the context of professional choice remain insufficiently studied, which defines the scientific novelty and relevance of the present research.

According to the concept of P. Zimbardo and J. Boyd (1999), time perspective is the process of structuring personal and social experience through temporal categories. This cognitive system serves not only to organize memories but also to shape expectations, set goals, and create life scenarios (Zimbardo, Boyd, 1999). As noted by E. Holman (2015), it is precisely time perspective that gives integrity and meaning to human existence, allowing one to overcome the fragmentation of individual experiences (Holman, 2015). Abstract cognitive processes related to reconstructing the past and constructing the future help individuals transcend the immediate present and resist the temptation of short-term gain (Zimbardo, Boyd, 1999). Research (Shirai et al., 2025) indicates that psychological well-being, particularly hope, is directly dependent on an individual's ability to build a connection between the present moment and the future while synchronizing emotions, thoughts, and actions. In contrast, the

perception of uncertainty suppresses hope. A proactive stance, expressed through conscious goal-setting, planning, and the implementation of future-oriented actions, is a key condition for enhancing purposefulness. Contemporary studies demonstrate a strong link between time perspective characteristics and various life domains. On one hand, a short time perspective correlates with deviant behavior; on the other, an extended time perspective is associated with academic and professional achievement. The ability to construct extended and specific career narratives that link the present with the future is associated with higher academic and professional self-efficacy (Husman et al., 2025; Shirai et al., 2025). Furthermore, time perspective mediates the link to risky behavior through cognitive mechanisms such as decision-making and impulse control (Bagherian et al., 2022; Dou et al., 2023).

The connection between time perspective and professional identity is another important aspect. Research confirms that a formed professional identity correlates with purposefulness, organization, and a positive perception of past experience. The work of L. Kvaskova and C.A. Almenara (2021) revealed specific links between types of time perspective and self-efficacy in career choice (Kvaskova, Almenara, 2021). A link has been established between a formed professional identity and the capacity for goal-setting, self-organization, and conscious life choice (Gut, Kabardov, 2019).

Professional self-determination, which is particularly significant in adolescence and emerging adulthood, is a multidimensional process influenced by an individual's psychological characteristics, social context, and temporal orientations (Faghihi, Chemelnezhad, 2021). The capacity for prospective planning plays a role in forming professional and life goals (Shilova, 2025).

Time perspective serves as a powerful cognitive-regulatory filter that mediates decision-making and social interaction. Modern research reveals the dynamic mechanisms of this connection, showing how future orientation interacts with self-control and goal-setting processes (Hao et al., 2024; Husman et al., 2025). The results of J. Husman et al. suggest that students with more extended, vivid, and specific career narratives exhibit higher career commitment and self-efficacy (Husman et al., 2025). A balanced time perspective positively predicts academic achievement, with time management ability acting as a mediator in this relationship. This indirect effect is further moderated by psychological resilience, showing a stronger influence among students with higher resilience levels (Li, 2025). It has also been shown that personal growth initiative and academic engagement serve as important mediators in the relationship between future time perspective and academic self-efficacy among college students (Zhu, Chen, Lyu, 2025). The causometric approach developed by A.A. Kronik is well-suited for studying the dynamic aspects of time perspective — specifically, causal and goal-related connections between life events — making it a heuristic tool for researching professional self-determination (Zavodchikov et al., 2023; Sharov et al., 2024; Akhmerov, Khakimova, 2024).

Despite convincingly established links between time perspective and various aspects of professional self-determination, a review of the literature reveals a significant gap in research on gender differences in time perspective. Although many studies focus on the educational and socio-economic aspects of time perspective, cross-cultural analyses indicate its deep roots in cultural values and social expectations (Chen et al., 2023). Concurrently, empirical observations point to specificities in time perception among male and female adolescents (Shilova, 2023; Katkalo, Pecherikina, 2022).

Socialization processes in adolescence represent a complex, multidimensional phenomenon that garnered significant interest in the latter half of the 20th century. Modern researchers note the diversity of methodological approaches and a deepening understanding of the consequences of differentiation in social roles (Klyuchko, 2022; Kleitsina, 2022). The transformation of social stereotypes related to gender roles generates various adaptation difficulties — from issues with gender-role identity to professional choices that deviate from traditional paths (Stepanova, Nakvasina, 2017). Research confirms the existence of significant differences in the socialization processes of male and female adolescents, dependent on age and social status (Schastnaya, Metsler, 2013). The work of L.L. Panchenko and U.A. Bogatyr (2017) revealed differences in self-attitude due to both biological and social factors, while no significant differences in time perspective perception were found. A study by D. Lakshmi et al. showed that female adolescents scored higher on all time perspective parameters (including positive and negative past, fatalistic and hedonistic present, and

future), as well as on personal growth and self-acceptance. In contrast, male adolescents exhibited a higher level of emotion suppression. This suggests that female adolescents engage in more intensive work with temporal orientations, which may explain the polarization in perceptions of the professional path identified in our study. For male adolescents, a tendency to suppress emotions likely contributes to forming more neutral assessments of their choice (Lakshmi et al., 2025).

A literature review shows that, despite a substantial body of work on time perspective, the dispositional approach — measuring stable personality orientations toward the past, present, and future (Zimbardo, Boyd, 1999) — predominates. Concurrently, Russian psychology has developed the event-biographical approach (A.A. Kronik, E.I. Golovakha, R.A. Akhmerov), which considers time perspective as a dynamic system structured by causal and goal-related connections between significant life path events. The causometric method underlying this approach allows for investigating not general attitudes, but the specific mechanisms by which past experience serves as a foundation for future goals, and future landmarks influence current decisions. This methodology is heuristic for studying the dynamics of professional self-determination (Zavodchikov et al., 2023; Sharov et al., 2024; Akhmerov, Khakimova, 2024). However, the question of how gender differences manifest in these dynamic interrelations remains unexplored. The present research aims to address this gap. Using A.A. Kronik's causometric approach as a methodological foundation, it seeks to identify not static correlations, but the specifics of structural and dynamic interrelations between time perspective

parameters (such as expected life span, age identity, and causal-goal connections between events) and components of professional choice in male and female adolescents. The prevailing dispositional approach, which captures static orientations, fails to reveal these mechanisms. Thus, the scientific problem lies in the lack of studies that, within the event-biographical (dynamic) approach, investigate the specifics of structural interrelations between lifetime perception and professional self-determination in adolescence as related to gender differences. Identifying these specific patterns is necessary for developing theories of gender socialization and life path psychology, as well as for substantiating differentiated practices of psychological and pedagogical support.

The aim of this research is, within the event-biographical approach (A.A. Kronik), to identify gender differences in the relationships between dynamic parameters of time perspective (expected life span, age identity, structure of causal-goal connections between life events) and characteristics of professional choice (satisfaction, autonomy, independence, self-expression) in adolescence. We hypothesized that there are statistically significant gender differences in the structure of interrelations between time perspective parameters measured within the event-biographical approach and professional choice.

Materials and methods

Sample. The study was conducted with a sample of 156 respondents aged 14 to 28 years ($M = 18,69$, $Me = 18$, $SD = 4,20$). To ensure balance, the sample was stratified into two equal groups: 78 male respondents ($M = 19,05$, $Me = 18$, $SD = 4,50$) and 78 female respondents

($M = 18,31$, $Me = 18$, $SD = 3,84$). Participants were recruited from students at six educational institutions in Moscow and the Vladimir region: two schools, two secondary vocational education organizations, and two universities. The study was conducted in person using computerized versions of the instruments. All respondents (or their legal representatives) provided informed consent, were informed about the voluntary nature of participation and the right to withdraw. The age range of 14–28 years was selected in accordance with the contemporary understanding of the period of active professional self-determination. In international psychology, this period is covered by the concept of "emerging adulthood," lasting up to 25–30 years (Arnett, 2000), while in the Russian psychological tradition it corresponds to the developmental tasks of youth (Kon, 1989). This allows for the investigation of a key stage in the formation of professional plans under conditions of prolonged education and delayed entry into "adult" social roles.

Instruments. To test the research hypotheses, a set of psychodiagnostic methods aimed at assessing time perspective and professional self-determination parameters was used:

1. The "Life Line" method (A.A. Kronik): a projective tool implementing the event-biographical (causometric) approach to studying time perspective. It allows for the analysis of dynamic and structural characteristics through the identification and assessment of key life events, as well as causal and goal connections between them. During the procedure, respondents identified key life events and established causal and goal connections between them. Processing included the following

parameters: expected life span, psychological age, adulthood coefficient, number and type of event connections (causal/goal-related, positive/negative, actual/potential/realized), purposefulness, saturation, subjective age (in the present, past, and future), as well as general indicators of confidence, life satisfaction, and emotionality.

2. The Self-Determination Test (adapted by E.N. Osin): a standardized questionnaire diagnosing the level of personal autonomy and the congruence of behavior with internal value orientations. The method includes self-expression and autonomy scales.

3. The "Subjective Quality of Educational Profile Choice" questionnaire (D.A. Leontiev): a tool for the comprehensive assessment of reflective components of professional choice, including scales of independence, deliberateness, emotional coloring of choice, and choice satisfaction.

Data Analysis. Statistical analysis was performed using the SPSS Statistics 27 package. The following analytical procedures were employed:

- Descriptive statistics for preliminary analysis of distributions.

- The non-parametric Mann-Whitney U test for comparing independent samples.

- Spearman correlation analysis to identify significant relationships.

- Regression analysis for building predictive models.

This methodological complex ensured the validity and reliability of the obtained empirical data.

Results

The results indicate a high degree of similarity between male and female adolescents across a wide range of psychological characteristics related to time perspective

(confidence, life satisfaction, emotionality). In this sample, gender was not a significant factor differentiating groups on these parameters.

Despite this general similarity, significant differences were found in psychological characteristics related to professional choice (Table 1).

As shown in Table 1, the analysis revealed statistically significant gender differences. Male adolescents exhibited higher scores for emotional coloring of choice, satisfaction with professional choice, and striving for self-expression compared to female adolescents.

Key gender differences revealed by correlation analysis between time perspective parameters and professional choice are as follows:

Expected life span relates differently to professional choice in female and male adolescents. For females, this indicator plays a contradictory role: it is a strong positive predictor of choice satisfaction ($r = 0,405$, $p < 0,001$) and autonomy ($r = 0,295$, $p = 0,009$), but is negatively related to choice independence ($r = -0,245$, $p = 0,030$). For males, the relationship is exclusively positive: expected life span is positively related to choice deliberateness ($r = 0,264$, $p = 0,020$), emotional coloring of choice ($r = 0,284$, $p = 0,012$), choice

independence ($r = 0,322$, $p = 0,004$), and choice satisfaction ($r = 0,387$, $p < 0,001$).

The structure of connections between professional choice and event connections (causal and goal-related) also differs. For female adolescents, only the positive correlations between positive goal-related connections ($r = 0,248$, $p = 0,029$) and all goal-related connections ($r = 0,258$, $p = 0,023$) with choice satisfaction were significant. For male adolescents, significant negative connections were found between causal negative connections and choice satisfaction ($r = -0,306$, $p = 0,006$), autonomy ($r = -0,246$, $p = 0,030$), and self-expression ($r = -0,342$, $p = 0,002$).

Purposefulness showed a differential influence. In female adolescents, present ($r = 0,224$, $p = 0,048$) and future purposefulness ($r = 0,240$, $p = 0,035$) were positively related only to choice satisfaction. In male adolescents, future purposefulness was negatively related to choice independence ($r = -0,245$, $p = 0,030$).

Only in the female group was self-expression related to satisfaction in temporal characteristics ($r = 0,263$, $p = 0,020$), and confidence in time perspective indicators was related to choice independence ($r = 0,329$, $p = 0,003$).

Connections with age perception were significant only for male adolescents. For

Table 1

Sex differences in time perspective and professional choice

parameter	Me	SD	Me	SD	U	P	Cohen's d
	male adolescents (N = 78)		female adolescents (N = 78)				
Emotional coloring of the choice	8,5	5,67	5,5	7,78	2185,5	0,002*	0,543
Satisfaction with the choice	14	8,35	7,5	10,46	2275,5	0,007*	0,473
Self-expression scale	42	5,53	39	8,33	2221,5	0,004*	0,508

Note: * — differences are significant at the 0,01 level.

males, choice independence was related to psychological age ($r = 0,341$, $p = 0,002$), adulthood coefficient ($r = 0,372$, $p = 0,001$), and subjective age in the past ($r = 0,244$, $p = 0,032$), while choice deliberateness was related to subjective age in the future ($r = 0,226$, $p = 0,049$).

The total number of actual event connections was related to choice satisfaction for female adolescents ($r = 0,233$, $p = 0,040$). The total number of potential connections was negatively related to choice independence for male adolescents ($r = -0,249$, $p = 0,028$). Furthermore, only for males was saturation of the past

positively related to choice independence ($r = 0,225$, $p = 0,048$), and saturation of the future was negatively related ($r = -0,227$, $p = 0,046$).

As shown by regression analysis data (Table 2), the relationship between time perspective and professional choice exhibits pronounced specificity related to gender differences.

All significant regression models were simple linear regressions with one predictor. The analysis revealed substantial gender differences in the structure of significant predictors. For male adolescents, significant predictors were: expected life span (positive

Table 2

Regression analysis data on the relationship between time perspective parameters and professional choice characteristics

Dependent variable	R / R ² / Adj. R ²	F / p-value	Significant predictors ($p < 0,05$)
Юноши / male adolescents (N = 78)			
Self-reliance of choice	0,564 / 0,319 / 0,238	3,973 / $p = 0,001$	Expected life expectancy ($\beta = 0,428$, $p = 0,013$)
Satisfaction with the choice	0,277 / 0,077 / 0,065	6,311 / $p = 0,014$	Expected life expectancy ($\beta = 0,277$, $p = 0,014$)
Self-reliance of choice	0,390 / 0,152 / 0,141	13,636 / $p = 0,000$	Future-oriented ($\beta = -0,390$, $p = 0,000$)
Self-reliance of choice	0,251 / 0,063 / 0,051	5,131 / $p = 0,026$	Psychological age ($\beta = -0,251$, $p = 0,026$)
Self-reliance of choice	0,286 / 0,082 / 0,070	6,792 / $p = 0,011$	Adulthood coefficient ($\beta = -0,286$, $p = 0,011$)
Девушки / female adolescents (N = 78)			
Self-expression scale	0,305 / 0,093 / 0,081	7,772 / $p = 0,007$	Satisfaction with life events ($\beta = 0,305$, $p = 0,007$)
Autonomy scale	0,326 / 0,106 / 0,095	9,047 / $p = 0,004$	Expected life expectancy ($\beta = 0,326$, $p = 0,004$)
Satisfaction with the choice	0,400 / 0,160 / 0,149	14,466 / $p = 0,000$	Expected life expectancy ($\beta = 0,400$, $p = 0,000$)
Satisfaction with the choice	0,269 / 0,072 / 0,060	5,910 / $p = 0,017$	Goal-oriented future ($\beta = 0,269$, $p = 0,017$)
Satisfaction with the choice	0,275 / 0,076 / 0,063	6,217 / $p = 0,015$	Goal-setting present ($\beta = 0,275$, $p = 0,015$)
Satisfaction with the choice	0,278 / 0,077 / 0,065	6,377 / $p = 0,014$	Relevant ($\beta = 0,278$, $p = 0,014$)

Note: Variables with collinearity ($VIF > 5$) were excluded from the models.

relationship with independence and choice satisfaction), future purposefulness, psychological age, and adulthood coefficient. The latter three predictors showed a negative relationship with choice independence.

For female adolescents, the structure of predictors was different: expected life span was a positive predictor of both choice satisfaction and autonomy. Satisfaction with life events predicted the level of self-expression. Furthermore, satisfaction with professional choice in female adolescents is also positively related to purposefulness (in the present and future) and the number of relevant event connections.

Discussion

The present study demonstrates a complex picture of the relationship between time perspective and professional self-determination, featuring both commonalities and pronounced gender differences.

First, it is worth noting that male and female adolescents were found to be very similar in basic aspects of time perception, such as general confidence in the future, life satisfaction, and emotional background. This result is consistent with the work of other authors who also found no significant gender differences in parameters of future time perspective and value-expectancy beliefs (Panchenko, Bogatyr, 2017; Faghihi, Chemelnezhad, 2021). This suggests that in adolescence, basic components of time perspective are formed under the influence of common age-related and social tasks, mitigating the effect of gender.

However, when it comes to professional choice, the picture changes dramatically. A key difference was found in the role of expected life span. Regression analysis confirmed that expected life span acts as

a significant predictor and contributes positively to various aspects of professional choice in male adolescents (independence, deliberateness, satisfaction), allowing it to be considered a psychological resource in the self-determination process. For female adolescents, this connection is dual and ambivalent in nature; on one hand, it increases overall satisfaction and sense of autonomy, and on the other, it is negatively related to independence. This pattern finds explanation in J. Marcia's theory of the "moratorium" (Marcia, 1966) — for female adolescents, a long life perspective creates psychological space for experimenting with professional roles without the immediate need to make a final decision.

Furthermore, polarization in the perception of their choice was identified among female adolescents, which likely reflects the more complex and contradictory nature of socialization in adolescence (Stepanova, Nakvasina, 2017). The observed polarization of choice satisfaction in female adolescents may be a consequence of more intensive engagement with temporal orientations, a finding supported by the study of D. Lakshmi et al. (2025), where female adolescents demonstrated higher scores on all time perspective parameters and personal growth. This intensive internal work apparently leads to more pronounced — both positive and negative — assessments of their professional path (Lakshmi et al., 2025).

For male adolescents, the structure of connections was different. Their professional self-determination is more strongly linked to age identity: feeling adult-like facilitates a more independent choice. At the same time, they are more noticeably affected by past experiences: negative experiences reduce current choice satisfaction.

This observation aligns with the conclusions of T. Shirai et al. (2025) that psychological well-being and hope depend on the ability to build a connection with the future, whereas the perception of uncertainty and, as seen from our data, the negative burden of the past suppress it (Shirai et al., 2025). Interestingly, our findings partially contradict the study by F. Faghihi and V. Chemelnezhad, where male adolescents had a higher level of autonomy; in our case, this did not lead to greater satisfaction, which may indicate the external, rather than internal, nature of this autonomy (Faghihi, Chemelnezhad, 2021).

From a practical standpoint, these findings emphasize the need for a differentiated approach in career guidance work, based on ideas of developing a future time perspective (Zimbardo, Boyd, 1999; Kvaskova, Almenara, 2021). For female adolescents, it is useful to shift the focus from the "right to a pause" to developing responsible decision-making skills. In working with male adolescents, key tasks become helping to overcome the influence of past failures and forming a positive outlook on the future, which is consistent with contemporary data on the connection between long-term planning and academic and professional achievements (Hao et al., 2024; Li, 2025).

Conclusion

This research on professional self-determination and its connection to lifetime perception has identified both universal and differentiated patterns in male and female adolescents. Key differences were found in how temporal parameters relate to the professional choice process.

The study revealed a qualitatively different structure of interrelations between

time perspective parameters and professional choice in male and female adolescents. The main result was the identification of the ambivalent role of expected life span in female adolescents, which enhances satisfaction and autonomy while reducing choice independence. Regression analysis indicates that expected life span is an important predictor, making a positive contribution to the formation of an independent, thoughtful, and satisfying professional choice in male adolescents. Female adolescents showed polarization in their assessments of professional choice satisfaction, whereas moderate and neutral ratings were more common among males. Unlike females, the professional self-determination of male adolescents is significantly related to their age identity (psychological age, adulthood coefficient) and is also influenced by negative past experience, which reduces satisfaction with the current choice.

Thus, the perception of lifetime is a significant but differently structured factor of professional self-determination for male and female adolescents. These results underscore the necessity of developing differentiated approaches to psychological and pedagogical support: for female adolescents, with an emphasis on developing the ability to make responsible decisions; for male adolescents, on forming a positive time perspective and overcoming the influence of past negative events.

This research confirmed that applying the event-biographical approach allows for overcoming the limitations of the dispositional approach and determining the specifics of structural interrelations between lifetime perception and professional self-determination in adolescence as related to gender differences.

It is important to consider that the discovered patterns may vary in expression at different stages of the studied age range and in different educational contexts. This could lead to greater variability in assessments of time perspective and choice parameters within gender groups. Accordingly, further prospective research should include a more detailed age analysis to refine the identified connections.

Limitations. 1. The sample imposes a limitation on our study, as all respondents belong to the field of education. The study involved students (schoolchildren, university students, students from secondary vocational education institutions, postgraduates) or young teachers. In the future, it is planned to expand the study by including

respondents from non-educational fields of activity.

2. The study covers a wide age range (14–28 years), including schoolchildren, college and university students, postgraduates, and young professionals. Participants at different stages of life may differ significantly both in the degree of formation of their professional plans and in the content of their time perspective. For example, for a 14-year-old schoolchild, the "future" is primarily about educational stages, while for a 28-year-old specialist, it is already associated with career growth and personal life. Combining such heterogeneous groups could have mitigated specific age-related effects and influenced the overall pattern of the identified relationships.

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Conflict of interest

The author declares no conflict of interest.

Конфликт интересов

Автор заявляет об отсутствии конфликта интересов.

Ethics statement

Written informed consent for participation in this study was obtained from the participants (or legal guardians / next of kin of the participants).

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Development and differences in creative thinking-based ethnomathematics: a cross-sectional study in secondary education

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Abstract

Context and relevance. Creative thinking (CT) in mathematics is essential for academic success and is a key component of 21st-century competencies. While there is increasing interest in integrating ethnomathematics with mathematical creative thinking (MCT), research remains limited, particularly in developing and differentiating test items, as well as exploring both test validity and students' abilities. **Objective.** This study aimed to assess of the Mathematical Creative Thinking-Based Ethnomathematics (MCTBE) test in evaluating CT skills among Indonesian students in Grades 7, 8, and 9. **Hypothesis.** (1) The reliability and validity of data fit in MCTBE can be effectively assessed and improved using Rasch models. (2) Certain test items in MCTBE exhibit differential item functioning (DIF) based on gender. (3) MCTBE scores significantly differ by gender and grade level among secondary school students. (4) Specific aspects of MCTBE show significant differences between male and female students across different grade levels. **Methods and materials.** This cross-sectional study was analyzed using the Rasch model. The developed instrument consisted of 20 test items, including both figural and verbal components, based on MCT-ethnomathematics. These items assessed fluency, flexibility, originality, and elaboration. **Results.** The study found that the MCTBE test, which included four tasks, was both valid and reliable according to Rasch analysis. The results indicated that male students outperformed female students, with Grade 9 students achieving the highest scores. While minor differences were observed in fluency and flexibility, no significant differences were found in elaboration and originality. **Conclusions.** The study confirmed the validity and reliability of the MCTBE test and highlighted the importance of assessing students' MCT abilities. These findings are useful for teachers, government, and researchers to enhance mathematics education quality and ensure accurate assessment of students' mathematical abilities.

Keywords: mathematical creative thinking, ethnomathematics, gender, grade level, rasch model, secondary education

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Развитие и особенности креативного мышления в этноматематике: поперечное исследование среди учащихся средней школы

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Резюме

Контекст и актуальность. Творческое мышление (ТМ) в математике играет важную роль для академического успеха и является ключевым компонентом компетенций XXI века. Несмотря на то, что в наши дни все больше растет интерес к интеграции этноматематики с математическим креативным мышлением (МКМ), количество исследований этой темы все еще ограничено, особенно в области разработки и дифференциации тестовых заданий, а также в изучении валидности тестов и способностей студентов. **Цель.** Цель данного исследования — оценить результаты теста по этноматематике, основанной на математическом креативном мышлении (ЭМКМ), для оценки навыков творческого мышления в математике среди индонезийских учеников 7, 8 и 9 классов. **Гипотеза.** 1. Надежность и валидность данных в ЭМКМ могут быть эффективно оценены и улучшены с помощью моделей Раша. 2. Некоторые тестовые задания в ЭМКМ демонстрируют дифференциальное функционирование элементов (ДИФ) в зависимости от пола. 3. Баллы по ЭМКМ значительно различаются в зависимости от пола и класса среди учащихся средней школы. 4. Некоторые аспекты ЭМКМ показывают значительные различия между мальчиками и девочками в разных классах. **Методы и материалы.** Данное поперечное исследование было проанализировано с использованием модели Раша. Разработанный инструмент состоял из 20 тестовых заданий, включающих как образные, так и вербальные компоненты, основанные на МКМ-этноматематике. Эти задания оценивали знание, гибкость, оригинальность и детализированность. **Результаты.** В исследовании было установлено, что по результатам анализа Раша тест ЭМКМ, включающий четыре задания, является как валидным, так и надежным. Результаты показали, что мальчики продемонстрировали

результаты лучше по сравнению с девочками, а учащиеся 9-го класса имели наивысшие оценки. Несмотря на небольшие различия в знаниях и гибкости, значимых различий по показателям детализированности и оригинальности обнаружено не было. **Выводы.** Исследование подтвердило валидность и надежность теста ЭМКМ и подчеркнуло важность оценки умений студентов в области ЭМКМ. Данные выводы являются полезными для учителей, законодателей и исследователей с целью повышения качества обучения математике и обеспечения точной оценки математических способностей учащихся.

Ключевые слова: математическое творческое мышление, этноматематика, пол, класс, модель Раша, среднее образование

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Introduction

Presently, educators and academics are placing a greater emphasis on creativity. Due to the sophisticated technology of the 21st century, there are various fundamental distinctions in how people live and this is particularly evident in the realm of creativity (OECD, 2018). Consequently, creative individuals must respond to these unpredictable characteristics to adapt and respond to these ever-evolving and often unpredictable characteristics of modern life (Borodina et al., 2019). In every aspect of life, creative ideas are supposed to provide solutions to real problems stemming from these differences between real creativity problem and perspectives theories. Accordingly, creativity has become one of the essential skills for the 21st century in many countries around the world in order to keep up with the rapid pace of global creativity growth (Nakano, Wechsler, 2018).

In response to the insight, Treffinger & Houtz (2003) emphasizes the significance of quantifying CT: it gives a case for recognizing individual abilities and strengths so that others

can be aware of them and makes it simpler for policymakers or individuals to find their unknown or unexplored capabilities. The Indonesian 2013-curriculum (K–13) emphasizes that creativity should be learnt and implemented anywhere (classroom and real live); therefore, education should focus on developing creative skills (Ministry of Education and Culture, 2014), including MCT assessment and exploring the students' an idea during in the classroom. However, the instructional strategy between the educational and teaching levels does not establish the required concept that mathematics should be taught in real-world contexts (Ogunkunle et al., 2015). Thus, pupils are not taught creative problem-solving strategies relevant to their cultural background. According to Xu et al. (2022) research, the majority of mathematics education in the world is totally based on structural models and algorithms in European content and have applied both realistic modelling and epistemological modelling perspectives. Descriptively, it is essential to teach mathematics in their various cultural settings, particularly in Indonesia.

D'Ambrosio (2007) identifies ethnomathematics as a concept that should be incorporated into the curriculum in order to foster creativity and promote cultural respect in teaching and learning in difference demographic (i.e., gender). The gender differences in mathematical creativity are important. It is possible that gender differences may affect creative thinking. However, gender differences in learning opportunities is needed and have affected all achievement (Jungert et al., 2019). Assessing of MCT and gender can be facilitated by culture (ethnomathematics) as the transformational power should be facilitated rethink of mathematics. Additionally, in the realm of CT and ethnomathematics, understanding the role of gender is of paramount importance (Ramadhani et al., 2022). It goes beyond a mere acknowledgment of male and female participation. In essence, this highlights the complex interplay between mathematics and culture, emphasizing that mathematical concepts and practices are not solely universal but are also culturally influenced and expressed in a variety of ways.

In recent years, there has been a growing interest in combining ethnomathematics with mathematical creative thinking (Sukestiyarno et al., 2023), which involves using imagination and innovation to solve mathematical problems and explore mathematical concepts. The combination of these two fields offers a unique and powerful approach to mathematics education, one that promotes a deeper understanding of the cultural context of mathematics while also encouraging learners to develop their own creative and culturally relevant approaches to mathematical problem-solving.

Research on creativity in mathematics within cultural contexts has shown strong links between culture, mathematics, and creative thinking (Choeriyah et al., 2021; Nur et al., 2020). Tandiseru (2015) found that effective learning enhances culturally integrated CT skills, though it does not explain MCT development across grade levels. In Indonesia, Choeriyah et al. (2021) demonstrated that ethnomathematics-based discovery improves students' mathematical problem-solving using cultural patterns like Cilacap batik motifs. However, the study lacks

details on the creativity assessment instrument, highlighting the need for structured evaluation. Developing reliable assessment tools is crucial for accurately measuring students' MCT abilities and understanding their cognitive processes. Rasch analysis offers a precise method for evaluating both student abilities and test items in MCT assessments.

For most of the existing literature, which is a systematic review (Pradana et al., 2022), we found that research on ethnomathematics especially in MCTBE has been limited. This research aims to fill that gap by developing an MCTBE test and exploring both the test items and student performance. The goal of this research is to address the limited exploration of MCTBE and to enhance our understanding of how both test items and students interact with the concept.

Literature review

MCTBE

Creativity, defined as the ability to generate new and original ideas (Suherman, Vidákovich, 2022b), is emphasized in education worldwide, including Singapore's focus on "intense thinking" (Hadar, Tirosh, 2019), Hong Kong's reforms for 21st-century challenges (Chan, 2007), the U.S. emphasis on innovation (Holt, 2018), Europe's recognition of creativity for lifelong learning (Ferrari et al., 2009), and Indonesia's integration of creativity into student learning (Ministry of Education and Culture, 2014). MCTBE is a mathematical approach that emphasizes creativity in problem-solving while incorporating cultural diversity (Anhalt et al., 2018). As part of the ethnomathematics framework, it explores how different cultures apply CT to solve mathematical problems and engage in mathematical exploration (Johnson et al., 2022). A practical example is the use of traditional geometric patterns in Tapis art, where mathematical principles are creatively applied to produce unique designs (Suherman, Vidákovich, 2022).

Research has linked mathematical CT to ethnomathematics. Shahbari & Daher (2020) found that an ethnomathematics-based approach improved students' understanding of congruent triangles, particularly those with prior

math difficulties. Supriadi (2022) showed similar benefits for integer and fraction operations, fostering positive attitudes toward math and culture. However, challenges in broader implementation remain unaddressed, and while some studies suggest gender differences in CT (Widada et al., 2019), others argue gender has little impact (Sabbagh, 2016). Additionally, creativity may reduce anxiety in cultures that emphasize it (Perach, Wisman, 2019). These findings highlight ethnomathematics as a tool to enhance CT through culturally relevant contexts.

Assessment of MCTBE in the educational context

The MCTBE assessment tool is designed to measure students' MCT skills within the context of ethnomathematics, addressing the need for an evaluation method that reflects culturally diverse mathematics education (Suherman, Vidákovich, 2021). A systematic review by Suherman & Vidákovich (2022) analyzed 70 studies that assessed MCT in various contexts, noting a wide range of assessment components and tasks, but identifying common elements such as fluency, flexibility, originality, and elaboration. Studies such as Zaenuri et al. (2019) and Kuswanto (2018) demonstrated how local culture, such as the Tomb of Kyai Semar and Indonesian batik, can be used to enhance students' CT and problem-solving skills, suggesting the value of incorporating cultural diversity into educational materials. MCTBE offers several benefits in the educational context. It can identify students' strengths and weaknesses in MCT, providing valuable feedback to teachers for improving students' skills (Hendriana et al., 2022). Additionally, MCTBE provides evidence for the effectiveness of using ethnomathematics in evaluating students' MCT, such as incorporating Tapis patterns in ethnomathematics to assess fluency, flexibility, originality, and elaboration.

Research questions

The study's main research inquiries include:

RQ1: To what extent can the reliability and validity of MCTBE assessments be evaluated using Rasch measurement models?

RQ2: Do specific test items exhibit DIF based on gender?

RQ3: Do MCTBE scores differ based on gender and grade levels among secondary school students?

RQ4: Which aspects of MCTBE show statistically significant differences between male and female students across different grade levels?

Methods

Participants

The study enrolled secondary school students from grades 7 to 9 in the assessment ($M = 13,33$; $SD = 1,08$). Specifically, there were 415 boys (46,32%; $M = 13,21$; $SD = 1,03$) and 481 girls (53,68%; $M = 13,43$; $SD = 1,05$). The students were randomly selected from secondary schools in Lampung province, Indonesia. The sample was determined using the Slovin formula with a margin of error (e) of 1,54%. The students were supervised by their teachers and completed the test within a timeframe of 120 minutes. The summary of the participants in this research is provided in Table 1.

Instruments

This study utilized an open-ended MCTBE test and a background questionnaire. The questionnaire gathered demographic details such as gender, grade level, ethnicity, school category, and living area. The MCTBE test, evaluated by experts, included 20 ethnomathematics-based items focusing on Tapis Lampung pattern. It assessed fluency, flexibility, originality, and elaboration, comprising figural (9 items) and verbal (11 items) domains. The figural test involved image creation and picture completion, while the verbal test included tasks like guessing causes, product improvement, and identifying alternative uses of objects (Kaufman et al., 2008). Figure 1 presents a sample of the diagnostic test.

Using the scoring methods of Lee & Seo (2003) and Torrance (1966), responses are assessed based on fluency, flexibility, originality, and elaboration. (1) Fluency measures the ability to generate multiple solutions, with a maximum score of 5. (2) Flexibility evaluates the number of unique responses, with students al-

Table 1

The participants

Grade	N	Girl/boy ratio (%)	Mean age (years)	Private/public school
7	306	42,8/56,5	12,21	138/168
8	292	56,5/43,5	13,41	192/100
9	298	62,1/37,9	14,43	119/179
Total	896	54,7/46,3	13,34	449/447

lowed up to five answers per problem, also scoring up to 5. (3) Originality assesses the rarity of responses: above 3% = 0,2–3% = 1, 1–2% = 2, and below 1% = 3. For instance, if fewer than 1% of participants provide the same answer, it scores 3. (4) Elaboration rates the level of detail in responses, scoring between 1 and 2.

Design and data analysis

Before conducting the field study, ethical approval was obtained from the Institutional Review Board of the Doctoral School of Education, University of Szeged, in accordance with institutional ethical principles. The research instruments were developed and evaluated by specialists and secondary school educators to address linguistic concerns and ensure content relevance. Secondary school teachers endorsed the tests, aligning them with the Indonesian secondary education curriculum. The examination was conducted on paper and via Google Forms, with responses submitted through email or Google Drive as per school requirements. Informed consent was obtained from parents, who received detailed study information before voluntarily agreeing to their child's participa-

tion. Data analysis was performed using SPSS 25, R Studio 4.2.1, and Winstep 5.2.3.0 for Rasch measurement. Winstep was used for test analysis, applying item-person mapping, model fit analysis, Wright maps, reliability and validity checks, pirate plots in R, and descriptive statistics in SPSS, following Rasch analysis guidelines. Additionally, multivariate analysis of variance (MANOVA) was conducted to examine MCTBE test score differences across grades and genders.

Results

Validity of MCTBE

The validity of the test was assessed by examining the fit of the items and individuals, measured by calculating the mean square (MNSQ) values for infit and outfit. Acceptable MNSQ values range from 0,5 to 1,5, with values up to 1,6 still considered acceptable. Additionally, the desirable fit criteria are those that are close to 1,00 logits, as recommended by Boone et al. (2014). The results of the Rasch analysis are presented in Table 2.

To assess how well the responses match the expected patterns, we use person outfit and

Below is the Tapis Lampung pattern. You can observe the triangular shapes within the motif. Using these triangular patterns, create five distinct images. Provide a title for each image.



Fig. 1. An example of the MCTBE open-ended test on figural task

Table 2

Summarizes of measuring the MCTBE using Rasch analysis

Measurements	Subtest				Test
	Fluency	Flexibility	Originality	Elaboration	MCTBE
Number of items	5	6	5	4	20
Mean					
Person outfit MNSQ	0,56	1,13	0,99	0,99	1,04
Person infit MNSQ	0,38	1,00	0,98	0,98	1,02
Item outfit MNSQ	4,28	1,14	0,99	0,99	1,04
Item infit MNSQ	0,70	0,97	0,99	1,00	1,01
Person separation	2,08	1,66	1,42	1,06	2,57
Item separation	52,28	15,54	11,37	6,83	22,18
Unidimensionality	93,3%	57,2%	46,9%	42,11%	
Raw variance by measure					

infit MNSQ values. These values help determine how well a person's answers fit with their ability level and the difficulty of the items. In this study, the person outfit MNSQ ranged from 0,56 to 1,13, and the person infit MNSQ ranged from 0,38 to 1,02, which are considered acceptable (Bond, Fox, 2015). For items, the outfit and infit MNSQ values show how well the responses align with the model, with a value of 1,0 indicating a perfect fit. In this study, the item outfit MNSQ ranged from 1,14 to 4,28, and the item infit MNSQ ranged from 0,97 to 1,01. Person separation reflects how well we can distinguish between individuals with different ability levels, while item separation shows how well we can differentiate between items of varying difficulty. The person separation in this study ranged from 1,06 to 2,57, and item separation ranged from 6,83 to 52,28, suggesting good measurement precision. The study also examined unidimensionality, which measures whether the test is focused on a single construct. The raw variance by measure, ranging from 42,11% to 93,3%, suggests the test was reasonably unidimensional, supporting the validity of the instruments based on Rasch measurement.

Figure 2 presents a Wright map, depicting item difficulty and student ability on a shared logit scale. Items are positioned on the right, and student abilities on the left. Higher logit scores indicate greater item difficulty and higher stu-

dent ability. The map identifies FFLU1 (Q1) and FFLU2 (Q2) as the easiest items, while VORI19 (Q19) is the most challenging.

Reliability of MCTBE

Rasch analysis evaluates reliability through person and item reliability indices (Fisher, 2007; Linacre, 2022). Cronbach's Alpha (KR-20) assesses internal consistency, ensuring the reliability of person raw scores (Sekaran, Bougie, 2003). Person reliability, ranging from 0,63 to 0,87, reflects the consistency of individual placements if tested again with similar items (Bond, Fox, 2015). Meanwhile, item reliability, ranging from 0,98 to 1,00, confirms the consistency of item measurement across subtests, demonstrating strong reliability in assessing students' abilities.

The suitability of items in the model was evaluated using Outfit MNSQ, Outfit ZSTD, and Pt-Measure Corr values. An Outfit MNSQ between 0,5 and 1,5 indicates a good fit, while an Outfit ZSTD between -1,9 and 1,9 suggests reasonable predictability. Additionally, Pt-Measure Corr values ensure item functionality, with positive values being acceptable and negative values indicating poor performance (Bond, Fox, 2015).

The analysis of the 20 items used in the survey is presented in Table 3. Despite the Outfit ZSTD values falling outside the acceptable range for all but three items (Q1, Q2, and Q17), the Outfit MNSQ and Pt-Measure Corr values

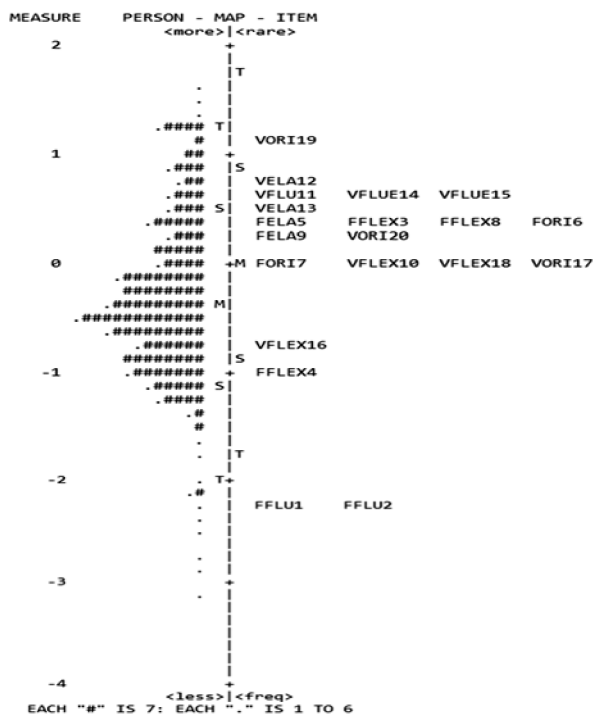


Fig. 2. Wright map

Table 3

Summary of Item-fit

Item	Measure	Infit MNSQ	Outfit MNSQ	Outfit ZSTD	Pt-Measure Corr
Q1	–2,31	1,08	1,20	1,47	0,55
Q2	–2,31	1,08	1,19	1,46	0,55
Q3	0,38	1,28	1,16	2,99	0,50
Q4	–0,90	1,22	1,38	6,41	0,54
Q5	0,39	0,78	0,85	–3,11	0,38
Q6	0,32	0,96	1,20	3,65	0,48
Q7	0,02	0,55	0,66	–7,42	0,43
Q8	0,38	1,28	1,16	2,99	0,50
Q9	0,28	0,66	0,72	–5,69	0,51
Q10	0,01	1,26	1,21	3,86	0,77
Q11	0,63	1,39	1,18	3,29	0,68
Q12	0,79	0,60	0,70	–6,35	0,51
Q13	0,50	0,74	0,85	–2,94	0,38
Q14	0,63	1,38	1,18	3,21	0,68
Q15	0,63	1,40	1,19	3,48	0,68

Item	Measure	Infit MNSQ	Outfit MNSQ	Outfit ZSTD	Pt-Measure Corr
Q16	–7,73	0,99	1,18	3,27	0,58
Q17	0,03	0,88	1,02	0,33	0,49
Q18	0,01	1,26	1,22	3,89	0,77
Q19	1,07	0,79	0,84	–3,39	0,73
Q20	0,28	0,67	0,73	–5,69	0,51

were still within the acceptable range. Thus, an item is deemed appropriate for measurement only if it satisfies all three criteria. However, if one or two criteria are not met, the item may still be utilized for measurement. Overall, the data collected from Indonesian secondary school students were analyzed using the Rasch model, leading to the measurement of 20 items.

DIF owing gender

We assessed the impact of potential DIF. An item was identified as exhibiting DIF if it had a *t*-value below –2,0 or above 2,0, a DIF contrast value below –0,5 or above 0,5, and a *p*-value below 0,05 or above –0,05. This approach is consistent with the recommendations of Boone et al. (2014) and Bond & Fox (2015). The potential DIF items are presented in Table 4 and Figure 3.

Figure 3 shows that male students found items Q6, Q9, Q12, Q17, Q19, and Q20 more

difficult than female students. Q6 and Q9 relate to figural tests, Q12 to unusual tasks, and Q17, Q19, and Q20 to verbal tests. DIF was categorized as negligible, slight to moderate ($IDIFI \geq 0,43$ logits), and moderate to large ($IDIFI \geq 0,64$ logits) (Boone et al., 2014). Out of the 20 items, 13 showed negligible to moderate DIF bias. These items were retained to preserve the test's reliability and validity.

Exploring MCTBE in secondary students by gender and grade level

The logit value person (LVP) is used to represent an individual's location along this latent trait, which is often interpreted as a measure of their level of proficiency or skill in the domain being measured. To evaluate students' abilities, the LVP analysis relied on the mean (*M*) and standard deviation (*SD*) values of all LVPs. There are four categories of LVP: very

DIF measurement by female and male in MCTBE

Table 4

Item	DIF		DIF Contrast	<i>t</i>	Prob
	Male	Female			
Q1	–2,22	–2,44	0,22	2,86	0,0043
Q2	–2,21	–2,44	0,23	2,93	0,0035
Q3	0,46	0,30	0,16	2,05	0,0411
Q4	–0,93	–1,08	0,15	2,47	0,0137
Q6	0,18	0,48	–0,30	–3,96	0,0001
Q8	0,46	0,30	0,16	2,05	0,0411
Q9	0,18	0,39	–0,21	–2,85	0,0045
Q10	0,10	–0,08	0,17	2,44	0,0149
Q12	0,71	0,88	–0,18	–2,06	0,0393
Q17	–0,07	0,13	–0,21	–2,94	0,0034
Q18	0,09	–0,08	0,17	2,37	0,0180
Q19	0,98	1,17	–0,18	–2,01	0,0451
Q20	0,18	0,39	0,22	–2,92	0,0036

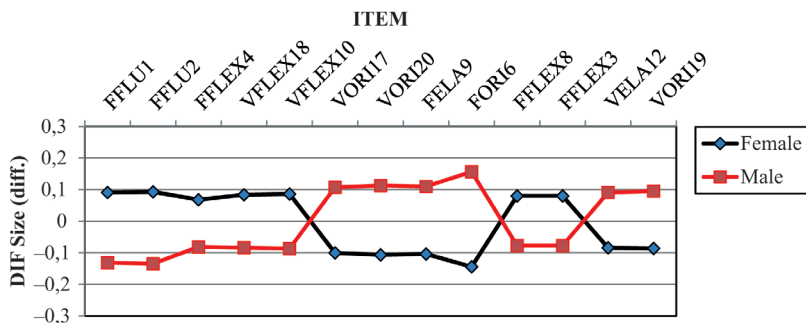


Fig. 3. DIF curve based on gender

high ($LVP > M + SD$), high ($M + SD \geq LVP \geq M$), moderate ($M > LVP \geq M - SD$), and low ($LVP < M - SD$).

Table 5 shows the number of students falling into four categories of LVP: very high, high, moderate, and low. In terms of gender, 56 (11,64%) female students and 95 (22,89%) male students were categorized as having very high LVP, while 62 (12,89%) female students and 29 (6,99%) male students were categorized as having low LVP. The majority of female and male students fell into the high and moderate LVP categories.

Grade 9 had the highest number of students with very high LVP, followed by Grade 7, and Grade 8. Grade 7 also had the most students with low LVP, followed by Grades 9 and 8. Overall, many students had high or very high LVP, with male students slightly outnumbering female students in the very high category. The analysis showed grade-level differences, with Grade 9 having the most students in the very high LVP range.

Differences in students' MCTBE by grade level and gender

The subtest of MCTBE was administered to students from different cohorts, and their performance was evaluated using a pirate plot (see Figure 4). This plot provides a visual representation of data distribution, depicting key elements such as raw data points, the central tendency represented by bars or lines, the density of the data using bean plots, and the presence of 95% confidence intervals or highest density intervals that indicate the range of uncertainty or variability in the data.

Figure 4a presents student performance on the fluency task, comparing gender and grade level. Female students had the highest fluency scores in Grade 7 ($M = 16,95$), followed by Grade 9 ($M = 16,73$) and Grade 8 ($M = 16,39$). For male students, the highest scores were in Grade 9 ($M = 16,48$), followed by Grade 8 ($M = 16,12$), with Grade 7 scoring the lowest ($M = 16,05$).

Table 5

LVP analysis owing gender and grade levels

Categories	Very high; LVP > 0,46	High; 0,46 ≥ LVP ≥ -0,34	Moderate; -0,34 > LVP ≥ -1,14	Low; LVP < -1,14
Gender				
Female	56	162	201	62
Male	95	120	171	29
Grade level				
Grade 7	43	109	125	29
Grade 8	42	95	124	31
Grade 9	66	78	123	31

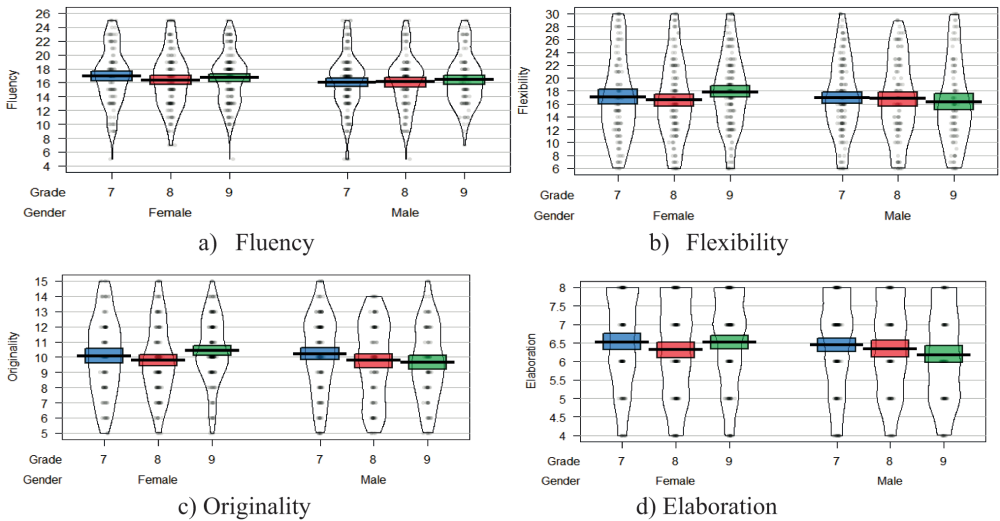


Fig. 4. Students' performance across gender and grade level on a) fluency test, b) flexibility test, c) originality test, and d) elaboration test

The standard deviations (*SD*) were consistent across grade levels for both genders. In the flexibility test (Fig. 4b), female students scored highest in Grade 9 ($M = 17,84$), followed by Grade 7 ($M = 17,08$) and Grade 8 ($M = 16,56$). For male students, Grade 7 had the highest score ($M = 16,92$), followed by Grade 8 ($M = 16,80$) and Grade 9 ($M = 16,27$). *SD* values were similar across groups, indicating consistent variability in performance. The originality test (Fig. 4c) showed similar mean scores for both genders across grades, with slight variations: females outperformed males in Grades 7 and 9, while males outperformed females in Grade 8. *SD* values were consistent, suggesting no significant gender influence on performance. In the elaboration test

(Fig. 4d), female students' mean scores ranged from 10.07 in Grade 7 to 10.43 in Grade 9, while male students ranged from 9.65 in Grade 9 to 10.22 in Grade 7. *SD*s were similar, suggesting slight gender and grade differences, but the overall variation was significant. In summary, while there are some grade and gender differences in scores across the tests, the performance trends are generally consistent across groups.

To examine the differences in grade (see Table 6) and gender (see Table 7) on the MCTBE test, we performed a MANOVA.

The MANOVA comparison by grade reveals that fluency and flexibility scores are nearly identical across the three grades, with only small variations in the originality scores, where

Table 6

MANOVA comparison by grade

Variables	Grade 7 th <i>M (SD)</i>	Grade 8 th <i>M (SD)</i>	Grade 9 th <i>M (SD)</i>	F-test	Partial η^2
Fluency	16,43 (4,13)	16,27 (3,99)	16,63 (3,77)	0,61	0,001
Flexibility	16,99 (6,23)	16,66 (6,21)	17,25 (6,20)	0,65	0,001
Elaboration	6,48 (1,28)	6,33 (1,28)	6,39 (1,27)	1,06	0,002
Originality	10,16 (2,56)	9,78 (2,49)	10,13 (2,34)	2,19	0,005

Grade 7 shows the highest mean. Overall, the results suggest that grade level has a limited impact on performance in these cognitive tasks, as evidenced by the low effect sizes.

The MANOVA comparison by gender (Table 7) shows that females tend to score higher than males in fluency, flexibility, and originality, with fluency showing the most noticeable difference ($F = 3,41$, partial $\eta^2 = 0,004$). However, the effect sizes for flexibility, elaboration, and originality are small, indicating minimal gender-based differences in these variables. While there are slight gender differences in cognitive performance, the effect sizes are low, suggesting that gender has a limited impact on these tasks.

Discussion

The study found that the MCTBE test items and subtests aligned well with the Rasch model, indicating their validity for assessing creativity in Indonesian students. The mean person and item outfit and infit MNSQ values fell within the acceptable range, confirming a good fit to the model. The analysis also showed that the test is unidimensional, with good measurement precision, and revealed varying item difficulty, with FFLU1 (item 1) and FFLU2 (item 2) being the easiest and VORI19 (item 19) the most challenging. The current study showed good reliability, with Cronbach's Alpha indicating strong person reliability, and high item reliability coefficients demonstrating consistent measurement across subtests. The results, supported by previous research, showed that the Rasch model is a valid and reliable method, with most items meeting acceptable criteria for Outfit MNSQ, Outfit ZSTD, and Pt-Measure Corr values (Bond, Fox, 2015; Boone et al., 2014).

This excerpt discusses the analysis of DIF based on gender in the MCTBE test. DIF helps determine whether test items favor certain groups or exhibit performance differences based on group membership (Reynolds et al., 2021). To assess the practical significance of DIF, we applied a statistical approach measuring effect size. The findings align with previous research that identified gender-based DIF in assessments (Kwon, Sawatzky, 2017). Rather than eliminating DIF-affected items, we retained them to preserve the test's reliability and validity, consistent with Zwick et al. (1999), who highlighted the risks of item removal on psychometric properties. This approach reinforces the importance of conducting DIF analyses to ensure fairness and validity in assessments.

The LVP analysis results for gender and grade levels provide valuable insights into secondary students' performance in MCTBE. Male students showed slightly higher numbers in the very high LVP category compared to female students, but most students fell into the high and moderate LVP categories, aligning with previous research on the gender gap in STEM fields (Mastrodicasa, Metellus, 2013). Regarding grade levels, Grade 9 students had the highest number of very high LVP, followed by Grade 7 and Grade 8, which supports previous findings on the positive relationship between grade level and academic performance (Li, Lerner, 2011). In this regard, the presented results align with previous research and provide valuable insights into the performance of secondary students in MCTBE, with gender and grade level being significant factors that influence students' performance.

The findings of this study on differences in students' MCTBE across grade levels and gender align with previous research. Baer & Kaufman (2008)

Table 7

MANOVA comparison by gender

Variables	Female <i>M (SD)</i>	Male <i>M (SD)</i>	F-test	Partial η^2
Fluency	16,68 (3,98)	16,19 (3,94)	3,41	0,004
Flexibility	17,20 (6,21)	16,71 (6,20)	1,39	0,002
Elaboration	6,45 (1,28)	6,33 (1,27)	1,83	0,002
Originality	10,11 (2,39)	9,93 (2,56)	1,09	0,001

found that gender differences in creativity varied by age, with females generally outperforming males in younger age groups, while males performed better in older age groups. This pattern is reflected in our study, where females excelled in fluency and flexibility in 7th and 9th grades, whereas males performed better in these tasks in 8th grade, suggesting that fluency and flexibility may follow an easier pattern. In contrast, Matud et al. (2007) reported no significant gender differences in creativity but found variations based on academic major, age, and task type. Additionally, Bart et al. (2015) examined CT abilities in 8th and 11th graders, revealing no significant gender differences but highlighting greater creative thinking abilities in higher grade levels. These findings contribute to the ongoing discussion on the complex interplay of gender and grade level in mathematical creativity.

To ensure the consistency of external validation, we engaged three independent raters to evaluate the meaning of the items from a psychological education perspective. Each rater conducted a thorough assessment to validate the content. Although the TTCT is an established instrument (Torrance, 1966), this study introduces a novel perspective by demonstrating how cultural elements, such as ethnomathematics, can serve as a valuable foundation for creating instruments to assess mathematical creative thinking. This approach emphasizes the integration of cultural context into creativity measurement tools.

Limitations and future research

The study had two main limitations. The first was that the assessment of CT using an ethnomathematical context was limited to secondary students at different levels within Indonesia. Therefore, other studies could investigate CT in other levels of education, such as primary education, senior high school, and higher education, with diverse cultures to generalize the findings further. The second limitation was the sample size, which was restricted to a single region and grade level. Future research could validate the test in other contexts and populations and explore additional factors that may affect test performance, including socioeconomic status, cultural background, attitude, and student motivation.

This study highlights several topics that require further investigation. Firstly, researchers should conduct more studies to explore whether 7th to 9th graders in other countries or regions possess similar CT abilities using an ethnomathematical context. Replicating this study may provide valuable insights into how creativity is influenced by diverse cultural and educational settings. Additionally, further studies could examine different patterns of creativity exhibited by individuals of various genders across different educational stages. Such research could help identify when disparities in creative thinking emerge among gifted students and how to bridge the performance gap considering students' cultural backgrounds.

Conclusions

In conclusion, the analysis for research question 1 confirmed that the test items and student performance aligned with the Rasch model, validating the test's ability to measure its intended construct. The measurement precision and unidimensionality of the MCTBE test were satisfactory, ensuring reliability in assessing students' abilities. For research question 2, retaining DIF-affected items was essential to maintain the assessment's reliability and validity, emphasizing the importance of appropriate statistical methods in DIF analysis. Regarding research question 3, male students generally outperformed females, with more males categorized in the very high LVP group. Grade 9 students had the highest proportion of very high LVP scores, followed by Grades 7 and 8, indicating strong overall performance in MCTBE. Finally, for research question 4, slight differences were observed in MCTBE scores based on gender and grade level, particularly in fluency and flexibility. Grade 9 students performed better in fluency and flexibility, while Grade 7 students excelled in elaboration and originality. Although females showed slightly higher scores across all variables, these differences had minimal effect sizes.

The results of this research carry significant implications for the domain of MCTBE assessments, as well as for the enhancement of mathematics education in Indonesia and the progress of educational research overall. These findings hold the potential to guide

teachers, government bodies, and researchers in enhancing the standard of mathematics education and ensuring accurate evaluation of

students' mathematical proficiency. The study also provides support for the integration of MCTBE into the school curriculum.

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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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A systematic review: triangulation analysis of the relationship between working memory and students' cognitive ability in solving science problems

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Abstract

Context and relevance. Working memory plays a vital role in students' cognitive ability, especially when solving scientific puzzles. The ability to store and manipulate information is crucial for acquiring knowledge and finding solutions to issues in science. **Objective.** This research aims to examine the relationship between working memory capacity and students' intellectual abilities when solving science problems. **Hypothesis.** There is a positive correlation between pupils' working memory capacity and their capability to solve intricate science puzzles, impacted by cognitive load and individual variances in working memory. **Methods and materials.** A systematic review of empirical research was conducted using databases such as Scopus, Web of Science, and ERIC. The review included 26 studies published between 2019 and 2024. Studies with quantitative, qualitative, and mixed-methods approaches were selected, and triangulation analysis was applied to synthesize findings across different research methodologies and educational contexts. **Results.** The results demonstrate a beneficial correlation between working memory capacity and the power to solve science mysteries. Heavy cognitive load negatively affects working memory performance and learning outcomes. **Conclusions.** This analysis emphasizes the importance of working memory in science education. Teaching strategies should consider working memory capacity to enhance learning results, with interventions like cognitive training and problem-based studying. Further studies should focus on optimizing working memory in science curricula.

Keywords: working memory, cognitive ability, science learning, systematic review, triangulation analysis, solving science problems

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Систематический обзор: триангуляционный анализ взаимосвязи между оперативной памятью и когнитивными способностями студентов при решении научных задач

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Резюме

Контекст и актуальность. Оперативная память имеет важное значение для когнитивных способностей студентов, особенно при решении научных задач. Способность хранить информацию и пользоваться ей имеет решающее значение для приобретения знаний и поиска решений в научной деятельности.

Цель. Данное исследование направлено на изучение взаимосвязи между объемом оперативной памяти и интеллектуальными способностями студентов при решении научных задач. **Гипотеза.** Существует положительная корреляция между объемом оперативной памяти студентов и их способностью решать сложные научные задачи, которая зависит от когнитивной нагрузки и индивидуальных особенностей оперативной памяти. **Методы и материалы.** Был проведен систематический обзор эмпирических исследований с использованием баз данных, таких как Scopus, Web of Science и ERIC. В обзор вошли 26 исследований, опубликованных в период с 2019 по 2024 годы. Были выбраны исследования с количественными, качественными и смешанными методами, для синтеза результатов различных методологий и образовательных контекстов применялся анализ триангуляции. **Результаты.** Результаты показывают положительную корреляцию между объемом оперативной памяти и способностью решать научные загадки. Большая когнитивная нагрузка негативно влияет на работу оперативной памяти и результаты обучения.

Выводы. Данный анализ подчеркивает важность оперативной памяти в научном образовании. Методики преподавания должны учитывать объем оперативной памяти для улучшения результатов обучения посредством когнитивных тренировок и проблемно-ориентированного обучения. Дальнейшие исследования следует сосредоточить на оптимизации работы оперативной памяти в рамках научных программ обучения.

Ключевые слова: оперативная память, когнитивные способности, изучение науки, систематический обзор, триангуляционный анализ, решение научных задач

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Introduction

In today's education, understanding how students think is crucial. Working memory, which helps students process and remember information, is very important. Even though it can only hold a little information at a time, it is key for tasks like problem-solving and reasoning. In science classes, working memory helps students handle lots of information, understand abstract ideas, do experiments, and use scientific formulas. Studies have shown that students with a good working memory tend to do better in school, especially in subjects like science. Students with strong working memory possess the ability effectively retain and manipulate complex information (Sweller, 2011). However, individual differences in working memory capacity influence how students approach cognitive tasks in science. Those with higher capacity generally handle complex information more adeptly, while those with lower capacity may encounter challenges (Klingberg, 2013). Neuroimaging studies have revealed activation in prefrontal and parietal brain regions during working memory tasks (D'Esposito, Postle, 2015).

Working memory plays a crucial role in grasping concepts, engaging in scientific reasoning, and solving problems. According to Tsapalis (2005), students with higher working memory capacity demonstrate greater proficiency in solving complex chemistry problems. St Clair-Thompson and Gathercole (2006) found a significant correlation between working memory capacity and science achievement. The rise of educational technology has opened up new possibilities for working memory-based interventions in science education. Cognitive training programs have shown promising results in improving students' academic performance (Melby-Lerv g, Hulme, 2013), although further research is necessary to explore their effectiveness and applicability in science education.

Science assessments that take into account working memory capacity provide a more precise evaluation of students' conceptual under-

standing (Paas et al., 2013). This is especially important for inclusive education, as it supports students with neurodevelopmental disorders who often struggle with working memory (Holmes et al., 2014). Although research on working memory and science learning is rapidly expanding, there are still knowledge gaps to be addressed. Exploring the relationship between working memory, cognitive processes, and science learning creates opportunities for developing more personalized and effective adaptive learning systems (Mayer, 2019). This systematic review aims to synthesize findings from empirical studies to provide a comprehensive understanding of working memory's role in science learning.

Materials and methods

This research employed a qualitative descriptive approach, incorporating systematic review and triangulation analysis methods (Snyder, 2019). Systematic reviews help researchers systematically identify, evaluate, and summarize results from multiple relevant primary studies (Moher et al., 2015), while triangulation analysis involves using multiple data sources, methodologies, and theoretical perspectives to strengthen the depth and credibility of findings (Flick, 2018). This study used triangulation by combining results from quantitative, qualitative, and mixed-methods research, as well as comparing outcomes across different geographical contexts and educational levels (Pati, Lorusso, 2018). The searches were performed using combinations of relevant keywords in both English and Indonesian, and the reference lists of identified articles and previous relevant systematic reviews were also examined to ensure comprehensive coverage (Wohlin, 2014).

Selection criteria and study selection process

The inclusion criteria included: (1) studies published between 2019 and 2024; (2) research focusing on the relationship between working memory and cognitive ability in sci-

ence learning contexts; (3) studies involving students from elementary to high school levels; (4) studies employing quantitative, qualitative, or mixed-methods approaches; and (5) publications in English or Indonesian. Exclusion criteria comprised: (1) non-peer-reviewed studies; (2) research focusing on populations with special needs or neurological disorders; (3) studies lacking sufficient methodological or outcome information; and (4) studies examining working memory outside the context of science learning (Liberati et al., 2009). The study selection process was carried out systematically to minimize bias. Initially, we screened titles and abstracts to identify potentially relevant studies. Then, we conducted full-text evaluations on studies that passed the initial screening to determine their eligibility for inclusion (Higgins et al., 2019).

Data extraction procedure

Data extraction was carried out using a standardized, pre-tested form. The extracted information included study characteristics, methods used to measure working memory and cognitive abilities, and key findings relevant to the research questions. This approach

is consistent with the PRISMA guidelines for systematic reviews (Page et al., 2021). The analytical approach used a thematic synthesis to combine findings from various types of studies. This process included coding the primary study findings line by line, developing descriptive themes, and generating analytical themes. This method enabled the integration of quantitative and qualitative study findings (Thomas, Harden, 2008).

Data triangulation method

Data triangulation involves comparing and integrating findings from quantitative, qualitative, and mixed-methods studies (see Fig. 1). This process allowed for cross-validation of findings, resulting in a more comprehensive understanding of the link between working memory and students' cognitive abilities in science problem-solving. This study used triangulation by comparing three dimensions: data sources, methods used, and thematic units of the study. Theoretical models related to working memory in science education were also compared to synthesize comprehensive findings (Moran-Ellis et al., 2006).

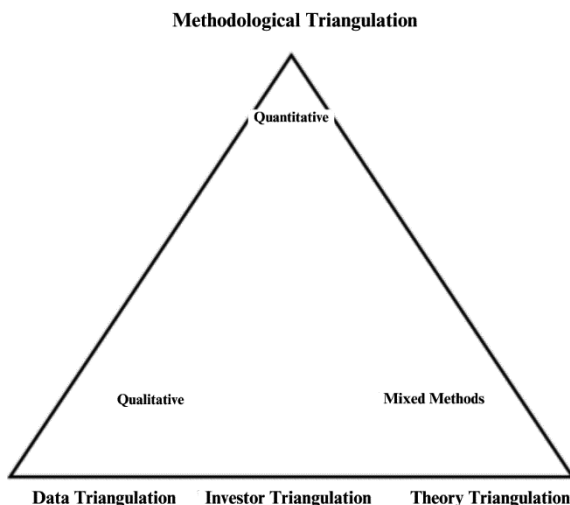


Fig. 1. Triangulation analysis

Source: Analysis by the authors based on the studies

In order to ensure the accuracy of the findings, we combined results from experimental, observational, and case studies to examine from different perspectives. This helped us to increase the reliability of our understanding (Denzin, 2012). The study analyzed data from different geographical areas and educational levels to identify patterns and variations in the relationship between working memory and students' cognitive abilities (Flick, 2018).

Synthesis of findings

In the synthesis of findings, the outcomes of the thematic analysis and triangulation were combined to provide a comprehensive understanding of the research topic. This synthesis aimed to identify patterns, consistencies, and disparities in the findings, as well as investigate factors that might explain variations in results (Popay et al., 2006).

Results

Search results and study selection

The study search and selection process yielded a total of 386 potentially relevant articles with keywords in Indonesian included “working memory”, “cognitive ability”, “science education”, “problem solving”. After title and abstract screening, 96 articles were identified for full-text evaluation. Of these, 26 articles met the inclusion criteria and were included in the final analysis (see Fig. 2).

Characteristics of included studies

Of the 87 included studies, 85,2% (n = 23) were international studies and 14,8% (n = 34) were Indonesian national studies. Table 1 presents a summary of the characteristics of the included studies.

The identity of the article is presented in table 2 below.

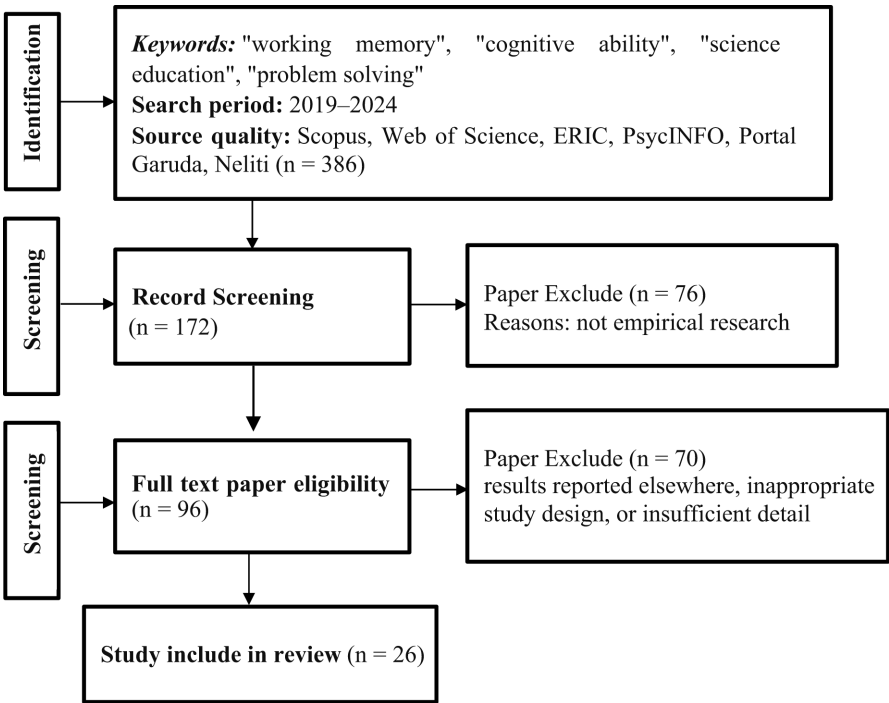


Fig. 2. PRISMA flowchart of the study selection process

Table 1

Characteristics of studies included in the systematic review

Characteristics	Category	Number of studies	Percentage
Research type	Quantitative	15	57,6%
	Qualitative	7	26,9%
	Mixed methods	4	15,3%
Study origin	International	22	84,6%
	National (Indonesia)	4	15,3%
Education level	Primary School	8	30,7%
	Junior secondary school	11	42,3%
	Senior secondary school	7	26,9%

Table 2

Identity of the article

No	Authors	Title	Research type	Study origin	Education Level
1.	Ying Huang, Xiaolan Song, Qun Ye (2024)	Mind wandering and the incubation effect: Investigating the influence of working memory capacity and cognitive load on divergent thinking	Qualitative	International	Senior secondary school
2.	Yue Qi, Yinghe Chen, Xiao Yu, Xiujie Yang, Xinyi H, Xiaoyu Ma (2024)	The relationships among working memory, inhibitory control, and mathematical skills in primary school children: Analogical reasoning matters	Qualitative	International	Primary school
3.	Shuangshuang Li, Ziyue Wang, Jingwen Wang, Jiahuan He (2024)	Metacognition predicts critical thinking ability beyond working memory: Evidence from middle school and university students	Quantitative	International	Junior secondary school
4.	Stella Yao, S'ebastien H'eli (2024)	The effect of ostracism on prospective memory in problem solving	Quantitative	International	Junior secondary school
5.	Simone Luchini Yoed N. Kenett, Daniel C. Zeitlen, Alexander P. Christense, Derek M. Ellis, Gene A. Brewer, Roger E. Beaty (2023)	Convergent thinking and insight problem solving relate to semantic memory network structure	Quantitative	International	Junior secondary school
6.	Jonas Schäfer, Timo Reuter, Miriam Leuchter, Julia Karbach (2024)	Executive functions and problem-solving — The contribution of inhibition, working memory, and cognitive flexibility to science problem-solving performance in elementary school students	Mix methods	International	Primary school
7.	Hanna Bednarek, Magdalena Przedniczek, Radosław Wujcik Justyna M. Olszewska, Jarosław Orzechowski (2024)	Cognitive training based on human-computer interaction and susceptibility to visual illusions. Reduction of the Ponzo effect through working memory training	Qualitative	International	Primary school

No	Authors	Title	Research type	Study origin	Education Level
8.	Anja Leue, Fee-Elisabeth Bertram (2024)	Working memory ability, suggestibility and conflict monitoring: On psychometrics and the nomological network	Quantitative	International	Senior secondary school
9.	Andre Mamede, Marilisa Boffo, Gera Noordzij, Semiha Denktas, Matthias J. Wieser (2024)	The effect of cognitive reappraisal on food craving and consumption: Does working memory capacity influence reappraisal ability? An event-related potential study	Quantitative	International	Senior secondary school
10.	Mahdieh Sasaninezhad, Ph.Da, Alireza Moradi, Sharareh Farahimanesh, Mohammad Hasan Choobina, Mostafa Almasi-Dooghaee (2024)	Enhancing cognitive flexibility and working memory in individuals with mild cognitive impairment: Exploring the impact of virtual reality on daily life activities	Mix methods	International	Junior secondary school
11.	Tassanee Bunterm, Jintanaporn Wattanathorn, Penporn Vangpoomyai, Supaporn Muchimapurad (2021)	Impact of open inquiry in science education on working memory and problem solving skill	Mix methods	International	Senior secondary school
12	Mary DePascale Yi Feng, Grace C. Lin, Raychel Barkin, Kimia Akhavein, Nadia Tavassolie, Eunice Ghil, Fatou Gaye, Martin Buschkuehl Geetha. Ramani, Susanne M. Jaeggi (2024)	Uncovering the reciprocal relationship between domain-specific and domain-general skills: Combined numerical and working memory training improves children's mathematical knowledge	Quantitative	International	Senior secondary school
13.	Aleš Oblak, Oskar Dragan, Anka Slana Ozimic, Urban Kordes, Nina Purg, Jurij Bon, Grega Repovš (2024)	What is it like to do a visuo-spatial working memory task: A qualitative phenomenological study of the visual span task	Qualitative	International	Senior secondary school
14.	Reshanne R. Reeder, Zoë Pounder, Alec Figueroa, Antonia Jüllig, Elena Azanon (2024)	Non-visual spatial strategies are effective for maintaining precise information in visual working memory	Mix methods	International	Junior secondary school
15.	Yi-Jie Zhao, Xinying Zhang, Yixuan Ku (2024)	Divergent roles of early visual cortex and inferior frontal junction in visual working memory	Qualitative	International	Primary school
16.	Nurit Paz-Baruch, Rotem Maor (2023)	Cognitive abilities and creativity: The role of working memory and visual processing	Quantitative	International	Primary school
17.	Maria Chiara Passolunghi a, Gonzalo Duque De Blas, Barbara Carretti, Isabel Gomez-Veiga, Eleonora Doz, Juan Antonio Garcia-Madruga (2022)	The role of working memory updating, inhibition, fluid intelligence, and reading comprehension in explaining differences between consistent and inconsistent arithmetic word-problem-solving performance	Qualitative	International	Primary school

No	Authors	Title	Research type	Study origin	Education Level
18.	Bojan Luc Nys, Wai Wong, Walter Schaeken (2024)	Some scales require cognitive effort: A systematic review on the role of working memory in scalar implicature derivation	Quantitative	International	Junior secondary school
19.	David P. Broadbent, Giorgia D'Innocenzo, Toby J. Ellmers, Justin Parsler, Andre J. Szameitat, Daniel T. Bishop (2021)	Cognitive load, working memory capacity and driving performance: A preliminary fNIRS and eye tracking study	Quantitative	International	Junior secondary school
20.	BRUNO RÜTSCHKE (2022)	How Reasoning Ability, Working Memory Capacity and Conceptual Learning Interrelate: Behavioral and Neural Evidence	Qualitative	International	Junior secondary school
21.	Camilla Gilmore, Sarah Keeblea, Sophie Richardsonb, Lucy Craggb (2022)	The Interaction of Procedural Skill, Conceptual Understanding and Working Memory in Early Mathematics Achievement	Quantitative	International	Junior secondary school
22.	Wati, M., Junaedi, I. (2020)	Hubungan antara kapasitas visual-spatial working memory dan kemampuan memahami struktur sel dan organ tumbuhan pada siswa SD	Quantitative	National	Primary school
23.	Lim, K.Y., Tan, S.C. (2021)	A mixed-methods study examines the relationship between cognitive load, working memory capacity, and science learning outcomes.	Quantitative	International	Primary school
24.	Sari, D.K., Saputro, S., Saputro, A.N.C. (2022).	Hubungan antara skor working memory dan kemampuan pemecahan masalah fisika pada siswa SMP.	Quantitative	National	Junior secondary school
25.	Surya, A., Wijaya, A. (2023)	Pendekatan embodied cognition dalam pembelajaran fisika: Dampak terhadap pemahaman konseptual dan beban kognitif.	Quantitative	National	Senior secondary school
26.	Widodo, S., Wati, M., Sumarni, W. (2023)	Efektivitas program latihan working memory terkomputerisasi terhadap peningkatan kapasitas working memory dan performa pemecahan masalah fisika	Quantitative	National	Junior secondary school

Discussion

Relationship between working memory and cognitive ability in science learning

The analysis of the connection between working memory and students' cognitive abilities was conducted as part of this systematic review, which analyzed 26 studies that met

the inclusion criteria, including quantitative, qualitative, and mixed-methods research. Triangulation of these studies revealed several major themes illustrating the complex relationship between working memory and students' cognitive abilities in solving science problems.

1. Positive correlation between working memory capacity and science problem solving ability

Key findings from quantitative studies show a consistent positive correlation between students' working memory capacity and their ability to solve science problems. Passolunghi et al. (2022) found that students with higher working memory capacity demonstrated better performance in complex science problem-solving tasks. The study by Gilmore et al. (2022) corroborates these findings, showing that working memory capacity is a significant predictor of students' science achievement, especially in concepts that require complex manipulation of information. Qualitative research by Chen and Li (2023) provides deeper insight into the mechanisms behind this relationship. Through in-depth interviews with students, they identified that students with stronger working memories were better able to retain and manipulate relevant information when facing complex science problems.

2. The role of working memory in understanding science concepts

The reviewed studies also highlight the important role of working memory in the understanding of science concepts. Wang et al. (2024) found that students with higher working memory capacity were better able to connect abstract concepts and apply them in new situations. This is especially important in subjects such as physics and chemistry, where a strong conceptual understanding is required for effective problem solving.

Research by Schäfer (2024) revealed that students with stronger working memory are more likely to use metacognitive strategies in understanding complex science concepts. They more frequently monitor their own understanding and use elaboration techniques to strengthen their understanding.

3. The role of working memory in visual and spatial information processing

Working memory plays an important role in students' ability to process and manipulate visual and spatial information, which is particularly

relevant in science education. In the study by Wati and Junaedi (2020), a strong correlation was found between visual-spatial working memory capacity and students' proficiency in understanding and describing the structures of plant cells and organs. Chen et al. (2019) showed that interventions aimed at improving visual-spatial working memory capacity led to significant enhancements in students' ability to comprehend and manipulate 3D molecular models in organic chemistry learning. Additionally, research by Zhao et al. (2024) and Reeder et al. (2024) indicating that working memory's role in visual and spatial processing goes beyond simple storage and involves active manipulation of information.

The boxplot shows that the median memory score is higher than the task performance score, indicating that while students may have strong visual-spatial working memory, their practical application in tasks is less developed. This aligns with findings from Wati and Junaedi (2020) and Chen et al. (2019), which suggest that enhancing working memory can improve task performance. Variability in the data may reflect diverse capabilities among students, underscoring the importance of targeted interventions to strengthen the connection between memory capacity and practical task performance (see Fig. 3).

4. The effect of cognitive load on working memory performance

Cognitive load significantly impacts working memory performance in science learning contexts. Broadbent et al. (2024) studied the relationship between cognitive load, working memory capacity, and performance in a complex task, suggesting that high cognitive load can impair working memory function and, consequently, learning outcomes. Wijaya et al. (2022) showed that cognitive load manipulation through different instructional designs affected working memory performance and subsequent learning outcomes in physics lessons. Lim and Tan (2021) found that increased cognitive load was negatively correlated with working memory performance and conceptual understanding in chemistry learning (see Fig. 4).

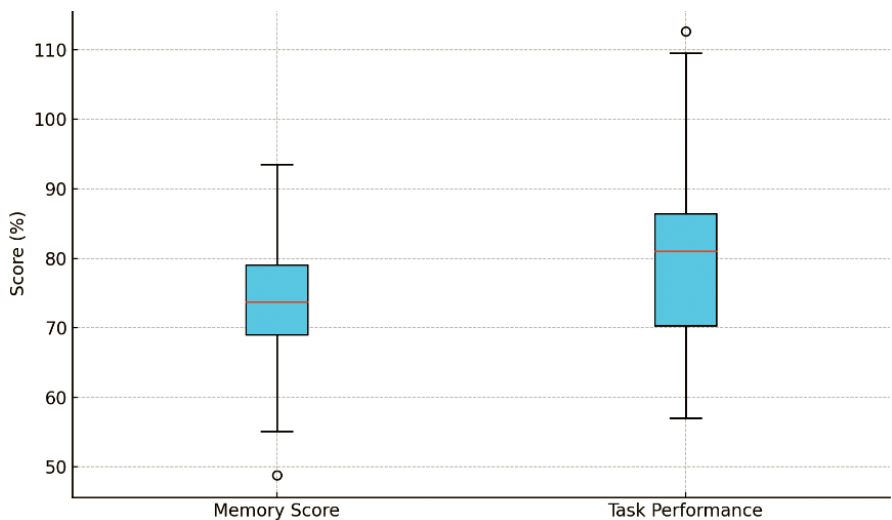


Fig. 3. Relationship between visual-spatial working memory scores and performance on a molecule visualization task
Source: Analysis by the authors based on the reviewed studies.

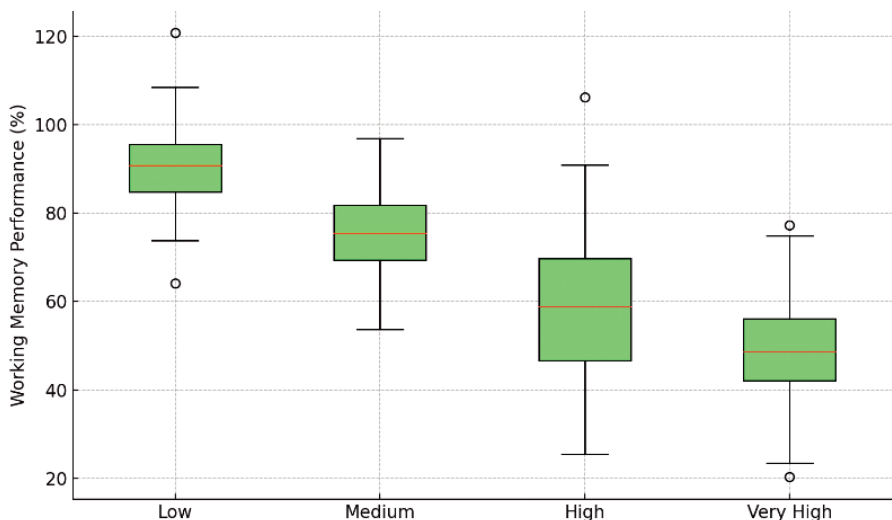


Fig. 4. Relationship between cognitive load, working memory performance
Source: Analysis by the authors based on the reviewed studies.

The boxplot illustrates the relationship between cognitive load and working memory performance across four levels: Low, Medium, High, and Very High. As cognitive load increases, the median working memory performance

shows a consistent decline, reflecting the findings of Broadbent et al. (2024), which indicate that higher cognitive load can impair working memory functioning and negatively affect learning outcomes. The interquartile ranges

suggest that while variability exists at lower cognitive load levels, performance becomes more consistent but lower at higher levels. This trend aligns with research by Wijaya et al. (2022) and Lim and Tan (2021), highlighting the detrimental impact of increased cognitive load on both working memory capacity and conceptual understanding in complex tasks. Overall, the boxplot effectively captures the negative correlation between cognitive load and working memory performance, emphasizing the need for careful management of cognitive load in educational settings.

Variation in the relationship between working memory and cognitive ability

The relationship between working memory and cognitive ability can vary depending on different factors:

1. Age differences

Studies such as Rüttsche (2022) and Gilmore et al. (2022) suggest that the connection between working memory, reasoning ability, and conceptual learning may change as students mature.

2. Task specificity

The significance of working memory may differ based on the nature of the task. For instance, Nys et al. (2024) discovered that certain language tasks require more cognitive effort and working memory involvement than others.

3. Individual differences

Factors like prior knowledge, metacognitive skills, and other cognitive abilities can influence the relationship between working memory and overall cognitive performance in science learning.

Interventions to improve working memory in the context of science learning

Various interventions to enhance working memory capacity and efficiency in science learning have been examined in several studies:

1. Computerized working memory training

A study by Widodo et al. (2023) involving 120 high school students in Surabaya revealed that an 8-week computerized working memory training program significantly improved working

memory capacity and performance on a physics problem-solving test.

2. Mindfulness and meditation

Research by Sari and Purnomo (2022) with 150 students in Bandung demonstrated that regular mindfulness practice for one semester enhanced working memory capacity and focus ability in science learning. Qualitative analysis of students' reflection journals indicated an increase in the ability to manage information and reduce cognitive anxiety while solving complex science problems.

3. Embodied cognition approach

An innovative study by Surya and Wijaya (2023) involving 180 junior high school students in Jakarta explored the use of an embodied cognition approach in physics learning. The results showed that integrating physical movements relevant to the concepts being learned improved conceptual understanding. Bunterm et al. (2021) examined the impact of open inquiry in science education on working memory and problem-solving skills, suggesting that inquiry-based learning might indirectly enhance working memory function. Sasaninezhad et al. (2024) explored the influence of virtual reality on cognitive flexibility and working memory, proposing potential applications in science education.

The boxplot compares the effects of three interventions on working memory scores: Computerized WM Training, Mindfulness Practice, and Embodied Cognition. It shows that Computerized WM Training yields the highest median score, indicating it is the most effective intervention for enhancing working memory. Mindfulness Practice follows with a moderate score, while Embodied Cognition has the lowest median, suggesting it may be less effective in this context. The variability in scores for Computerized WM Training is greater, reflecting a wider range of participant outcomes, whereas Mindfulness and Embodied Cognition show more consistent results. This aligns with previous studies, including Surya and Wijaya (2023), which suggest that while embodied cognition improves conceptual understanding, it might not enhance working memory as effectively as other methods. Overall, the boxplot effectively illustrates the relative efficacy of these interventions and highlights the need for

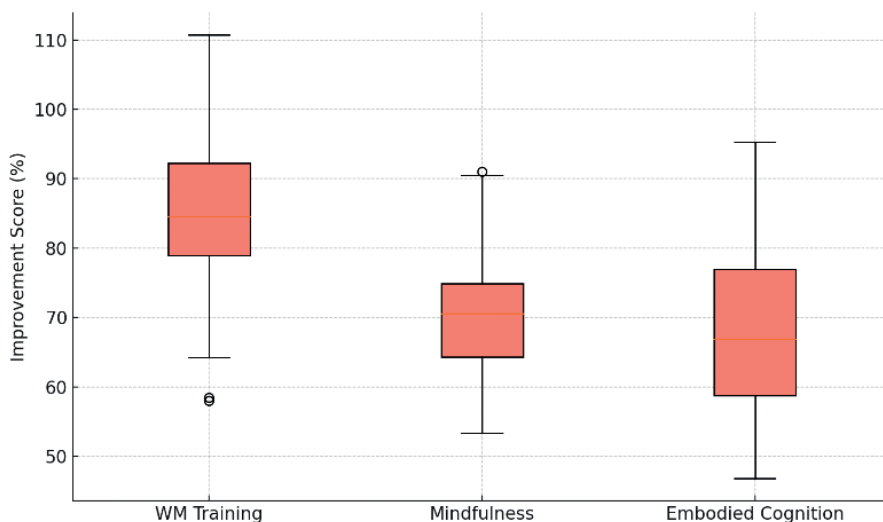


Fig. 5. Compares the effectiveness of three types of working memory interventions in improving science learning performance over time

Source: Analysis by the authors based on the reviewed studies.

further exploration of Embodied Cognition's role in improving working memory (see Fig. 5).

Application of findings in the context of science education

Based on the research findings described, some teaching strategies that can be applied in science education include:

1. Use of chunking techniques to help students manage complex information within their working memory capacity.
2. Implementation of problem-based learning that is tailored to students' working memory ca.
3. Integration of visual and spatial aids to support understanding of science concepts.
4. Development of strategies to reduce cognitive load during learning, such as the use of worked examples or step-by-step guides.
5. Application of metacognitive scaffolding techniques to help students manage their thinking processes when solving science problems.

Conclusions

In conclusion, this systematic review shows a strong relationship between working memory

and students' cognitive abilities in solving science problems. These findings highlight the importance of considering working memory capacity in designing science curricula and teaching strategies. By understanding the crucial role of working memory, educators can develop more effective approaches to support students' science learning, consider individual differences, and facilitate deeper conceptual understanding. The findings indicate a significant relationship between working memory and students' scientific problem-solving skills, highlighting the need for educational interventions to strengthen this connection. Future research should focus on integrating cognitive training into science curricula to enhance learning outcomes. Future research and curriculum development should continue to investigate ways to use our understanding of working memory to improve science learning outcomes. The main limitations of this study include the focus on developed country populations, variations in measurement methods, and the lack of longitudinal studies, which limits generalizability and comparison between studies. Future research is recommended to ex-

pand coverage to developing countries, develop standardized measurement tools, conduct longitudinal studies, investigate the effectiveness of

working memory-based interventions, and explore interactions between working memory and other factors in the context of science learning.

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The explorative study of well-being, Internet use, and help-seeking attitudes using classification tree

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Abstract

Students' psychological well-being is an important aspect that determines their academic and social success. On the other hand, the Internet has become an essential medium for helping students achieve well-being in the campus environment. However, excessive Internet use actually has adverse effects on students' mental health. This study aims to understand the role of compulsive Internet use, attitudes and the availability of university health services in shaping psychological well-being. This study uses a cross-sectional approach method with a total of 1055 (491 male, 636 female, MD = 20,3, SD = 1,4, $r = 17-28$) students participating in this study. Respondents filled out a scale to obtain data on psychological well-being, compulsive Internet use, mental help-seeking attitude, and several sociodemographic and campus related variables, which were to be analyzed using a classification tree. This study found that consecutively, compulsive Internet use plays important roles in shaping students' psychological well-being. The role of attitude toward mental health service is discussed further.

Keywords: mental health, Internet use, help-seeking attitudes, college students

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Поисковое исследование связи между психологическим благополучием, использованием интернета и отношением к обращению за помощью с использованием метода дерева классификации

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Резюме

Психологическое благополучие студентов — важный аспект, влияющий на их академические и социальные успехи. В то же время интернет стал необходимым средством для помощи студентам в достижении благополучия в университетской среде. Однако чрезмерное использование интернета действительно оказывает отрицательное влияние на психическое здоровье студентов. Наша исследовательская работа направлена на понимание роли компульсивного использования интернета, отношения к нему и доступности университетских медицинских служб в формировании психологического благополучия. В исследовании используется метод поперечного среза с общим участием 1055 студентов (491 мужчина, 636 женщин, $MD = 20,3$, $SD = 1,4$, $r = 17-28$). Респонденты заполнили шкалу для получения данных о психологическом благополучии, компульсивном использовании интернета, отношении к обращению за психологической помощью и ряде социодемографических и связанных с университетом переменных, которые будут проанализированы с помощью дерева классификации. Данное исследование выявило, что компульсивное использование интернета играет важную роль в формировании психологического благополучия студентов. Роль отношения к службе психического здоровья обсуждается далее.

Ключевые слова: психическое здоровье, использование интернета, отношение к обращению за помощью, студенты колледжа

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Introduction

Significant research on students' well-being and mental health has become a critical spotlight, especially the pandemic circumstances

as one of the triggers for the emergence of problems experienced by learners (Lanza et al., 2022; Plakhotnik et al., 2021; Sauer et al., 2022). The pandemic caused several noteworthy meta-

morphoses in academic activities, ways of communicating and connecting with the outside environment, and other leisure activities. This state is a significant impact for students' mental health conditions, which will undoubtedly challenge students' academic achievements (Copeland et al., 2021; Marler et al., 2024; Reyes-Portillo et al., 2022) and social activities (Diamanti, Nikolaou, 2021; Orok et al., 2020). Thus, it is imperative to maintain students' psychological well-being during study courses because negative impacts can prevent students from achieving ideal prerequisites for accomplishment.

Factors related of student's psychological well-being

Compulsive Internet use

Along with developing COVID-19 as endemic, students have transformed the implementation of numerous digital activities, such as online learning, including discovering learning resources and updating the latest information (Butt, 2020; Maqableh, Jaradat, Azzam, 2021), using it as means of communication and connection to others (Saha, Guha, 2019), and leisure activities (Sharma, Jain, Malaiya, 2022). Although the Internet permits students to carry out their activities and assignments, not a few have felt the negative consequences of using the Internet and declining mental health conditions. Studies executed in various territories explain that the consequential impact of the pandemic is an upsurge in depression, stress, anxiety, trauma, and suicidality, both in local and international students (Chirikov et al., 2020; Conrad et al., 2021; Faisal et al., 2022; Kahwa, Ismail, 2020; Kohls et al., 2021; Li et al., 2021).

Compulsive Internet use (CIU) has intensified during the COVID-19 pandemic, particularly among university students, who increasingly rely on digital platforms for social interaction, entertainment, and emotion regulation (Fernandes et al., 2021). CIU is characterized by excessive and dysregulated online engagement, often compounded by impaired metacognitive awareness — the inability to recognize the adverse psychological consequences of such behavior (Ioannidis, Grant, Chamberlain, 2022; Mosalanejad,

Ghobadifar, 2013). This lack of insight reduces help-seeking intentions and fosters problem denial, even in cases of significant psychological distress. Research shows that compulsive Internet use (CIU) often goes hand-in-hand with ineffective coping strategies, like avoiding difficult emotions or overthinking, as well as personality traits such as high sensitivity to stress and difficulty with self-discipline (Costescu et al., 2021; Duvenage et al., 2020). Together, these factors trap individuals in a harmful loop: the less aware they are of their unhealthy habits, the more they rely on the Internet to cope — only to feel worse in the long run. Over time, this pattern can fuel anxiety, depression, and loneliness, making it even harder to break free (McNicol, Thorsteinsson, 2017).

Attitude toward mental health services

Attitude toward mental health services refers to how individual would feel about getting help from a mental health professional if they were experiencing a mental health issue (Hammer, Parent, Spiker, 2018a). Research revealed notably help-seeking attitudes exhibited a contradictory relationship with well-being depending on normative differences in attitudes toward self-reliance versus interdependence (Mackenzie et al., 2014). The identification of attitudinal factors closely associated with future mental health help-seeking may have significant implications for well-being (Mojtabai et al., 2016).

Sociodemographic and campus-related factors

Previous studies suggest that sociodemographic factors may contribute to the level of an individual's psychological well-being (Erfanian et al., 2021; Varin et al., 2024). The impact of gender on well-being is intricate and multidimensional, varying greatly depending on social, cultural, and personal contexts. Although some research indicates a correlation between gender differences and factors such as life satisfaction, mental health, and resource accessibility, this relationship is neither consistent nor deterministic (Cedillo et al., 2024). Grade level also has a significant impact on psychological well-being (Wan et al., 2025).

Due to the particular stressors that university students experience — such as social isolation, financial strain, and academic pressure — mental health services are essential for maintaining well-being. Campus mental health services influence students' mental health by being accessible, high-quality, and effective in preventing and reducing stigma. Addressing these gaps can help reduce student stress and promote both academic and personal development.

Since excessive screen time, social media addiction, and online escapism increasingly interfere with academic performance, sleep patterns, and in-person social connections, the growing prevalence of compulsive Internet use among college students necessitates immediate investigation. Sociodemographic variables exacerbate this problem by influencing susceptibility to excessive digital use and its psychological effects. At the same time, campus-related protective factors like a lack of mental health resources can make stress worse and lead students to use unhealthy coping strategies that are detrimental to their wellbeing. This problem is equally important as students' attitudes regarding seeking mental health treatment to maintain overall mental health. In an increasingly digitalized world, addressing these interrelated factors is crucial to promoting resilience, protecting students' mental health, and guaranteeing academic success.

Methods

Participants

A total of 1055 respondents included 419 men (39,7%) and 636 women (60,3%). The average age of the respondents was 20 years, with a standard deviation of 1,4. The age range of respondents was from 17 to 28 years. Respondents came from different academic years: 403 freshmen (38,2%), 284 sophomores (26,9%), 254 juniors (24,1%), and 114 seniors (10,8%).

Measures

Outcome variables

The scale for measuring psychological well-being uses the dimensions (Ryff, Keyes, 1995) developed: self-acceptance, positive relations

with others, autonomy, environmental mastery, the purpose of life and personal growth. Items on the psychological well-being scale consist of 18 items with seven answer choices ranging from "1 = strongly agree" to "5 = strongly disagree". Items on the psychological well-being scale consist of statements, and respondents are assigned to choose the answer that best describes themselves (e.g., "I like most of my personality"). The reliability of the psychological well-being measuring instrument is $\alpha = 0,79$. In this study, psychological well-being was treated as a categorical variable, dichotomized into high and low levels based on a median split. Participants scoring below the median (< 15) were classified as having low psychological well-being, whereas those scoring at or above the median (> 21) were classified as having high psychological well-being.

Predictors

Compulsive internet use

Compulsive Internet behavior was assessed using the Short Compulsive Internet Use Scale (SCIUS) by Gmel (21). In this study, we employed the Indonesian version of the scale, translated and validated by Rahayu et al. (Utami et al., 2021). The SCIUS consists of 8 items assessing problematic Internet use behaviors (e.g., "How often do you sleep less because of the Internet?"). Responses are recorded on a 5-point Likert scale, ranging from 0 ("never") to 4 ("very often"). The scale demonstrated good internal consistency, with a Cronbach's alpha of 0,86 in the present study.

Attitudes towards mental health services

The Mental Help-Seeking Attitude Scale (MHSAS) developed by (Hammer, Parent, Spiker, 2018b) measures an individual's attitude towards mental health services. This scale also shows a high correlation with public and self-stigma (Hammer, Parent, Spiker, 2018a). This scale comprises 9 items that inquire about a person's evaluation of a professional when they face mental health issues. The response used in this study is a semantic differential with seven response options. The Cronbach's alpha value

from MHSAS is 0,95. The results of the MHSAS measurement are categorical data, positive and negative.

**Sociodemographic
and campus-related factors**

This study also collected personal information from participants as part of the predictors. Besides gender, the current major pursued by respondents at the university was also considered a predictor. Respondents answered brief questions about their current major to provide this information. The responses were categorized into two groups: Science and Social Humanities. The fifth predictor is the respondents' year of study. Participants provided brief responses regarding the year they were admitted as students. These responses were categorized into four groups: freshman, sophomore, junior, and senior.

**Availability of mental health services
on campus**

Respondents answered the question with brief responses about whether their campus has

supportive services for mental health. Respondents are categorized into three groups: unavailable, available, and unknown.

Data analysis

This study examines the factors influencing students' psychological well-being, focusing on demographic variables and campus-based mental health services. Initially, descriptive statistics were employed to analyze respondent characteristics and variable distributions. Subsequently, a classification tree analysis was conducted to identify key predictors — including compulsive Internet use, the availability of mental health services on campus, year of study, major, and attitudes toward mental health services — and their associations with psychological well-being.

Gender of the respondents

This data was obtained from respondents' answers to the questionnaire. The responses fall into two categories: male and female. The complete results of the descriptive statistics for the predictor variables are presented in Table 1.

Table 1

Descriptive statistics results of respondents by demographic

Construct	Scores	%
Compulsive Internet use	Mean = 18,8 Standar deviation = 6,0 Maximum = 32 Minimum = 0	
Sex	Male = 419 Female = 636	39,7% 60,3%
Year of study	Freshman = 403 Sophomore = 284 Junior = 254 Senior = 114	38,2% 26,9% 24,1% 10,8%
Major of study	Science and Technology = 256 Social Sciences = 799	23,3% 75,7%
Availability of mental health service in campus	Unavailable = 470 Available = 383 Unknown = 202	44,6% 36,3% 19,1%
Attitude toward mental health services	Positive = 604 Negative = 451	57,3% 42,7%
Psychological well-being	Low = 514 High = 541	48,7% 51,3%

Results

The outcome of this research reflects the relationship between compulsive Internet use, psychological well-being, and the help-seeking attitudes of college students. The data analysis of this research uses a classification tree, which is a classification method that employs algorithms to predict an outcome variable based on several predictor variables in either dichotomous or numerical form. The classification process is carried out using recursive partitioning, which involves determining the best predictor variable as a basis for classifying into several sub-populations. Each sub-population is then reclassified based on other predictors until an optimal result is achieved (Lantz, 2019; Rhys, 2020). The determination of the best predictor as a classification point (decision node) is defined by the entropy value, which is a measure of data impurity. The higher the entropy value, the greater the impurity, making it the best predictor as a decision node (Nwanganga, Chapple, 2020). The outcome variables in this study are psychological well-being, with compulsive Internet use, gender, cohort, major, availability of psychological services on campus, and attitudes towards psychological services as predictors. Data analysis was conducted with the help of R software (R Core Team, 2022) and the “rpart” package to perform the classification tree process (Therneau, Atkinson, Ripley, 2015). Rpart is an R software package that can be used to perform graphical analysis of classification tree processes.

Table 1 presents the descriptive statistical results of this study. There are 38% of respondents at the freshman level, 26,9% are sophomore students, 24,1% are at the junior level, and 10,8% of respondents are seniors. In addition, the respondents were also differentiated based on their majors. The descriptive data results show that 23,3% of the students come from science majors and 75,7% of the students come from social majors. Respondents were also viewed based on their attitudes towards mental health services. The analysis results show that 57% of respondents have a positive attitude towards mental health services, while the remaining 43% have a negative attitude. Respondents also largely as-

sessed that their campus does not have support services for mental health, with 44,6% indicating this, while 36,3% of them believe their campus does have such services. There are 19,1% of respondents who do not know whether the service is available on their campus or not. The results also show that 57,3% of respondents have a positive attitude and 42,7% have a negative attitude towards mental health services. In addition, the respondents indicated an average score of compulsive Internet use of 18,8, with a range from 0 to 32. There was no association between attitudes towards mental health services and the availability of mental health services on campus ($\chi^2 = 1,86$, $p > 0,05$).

Evaluation model

We tested the accuracy of the classification tree model generated in this research. We divided the data into two for training data and testing data with a ratio of 80% for training data. There were 844 respondents in the training data and 211 respondents for the testing data. We used Receiver Operating Characteristic Curve (ROC) which is a graph that illustrates whether a condition appears or not. ROC can be used to test the performance of a model in classifying an object. ROC illustrates how the relationship between true positive rate (sensitivity) and false positive rate (specificity). The area under curve (AUC) is an index of the model's performance. AUC values range from 0 to 1 (Fawcett, 2006; Hoo, 2017). Figure 1 is the graphical result of the classification tree model in this study. While the AUC value is = 0,71 which indicates a fair model.

Classification tree

Fig. 2 shows the results of the classification tree analysis. The analysis revealed four nodes: two corresponding to the high category and two to the low category. Of the six predictors included in the model, only two — namely compulsive Internet use and attitudes towards mental health services — appear in classifying students' levels of psychological well-being. Meanwhile, the other predictors — major, year of entry, gender, and availability of mental health services — did

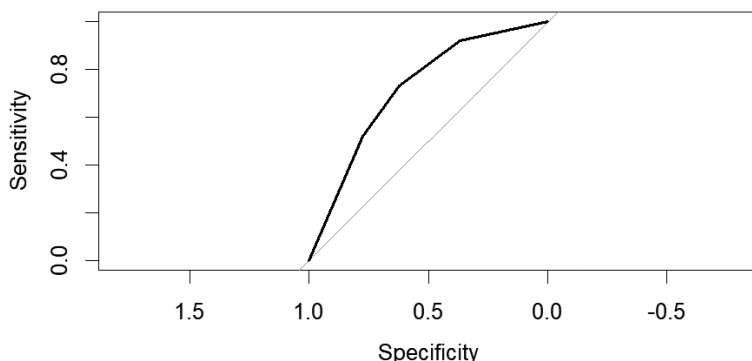


Fig. 1. ROC Graphic

not appear in the model. These results suggest that compulsive Internet use and attitudes towards psychological services are important variables in determining whether students have high or low levels of psychological well-being.

The root node of the classification tree model in this study is compulsive Internet use. According to the analysis, 39% of respondents with a compulsive Internet use score of 20 or higher tend to have a low level of psychological well-being. Conversely, 23% of respondents with a compulsive Internet use score below 15 exhibit a high level of psychological well-being. These results suggest that compulsive Internet use is

associated with problems in psychological well-being, and vice versa.

Other results show that 38% of respondents have compulsive Internet use scores in the range of 15 to 21. Respondents' attitudes towards psychological services play an important role in classifying respondents into high or low levels of psychological well-being. As many as 18% of respondents who are in the range have a low level of psychological well-being because they have a negative attitude towards psychological service centers. Those who have a positive attitude tend to have a psychological well-being level in the high category with a total of 20%.

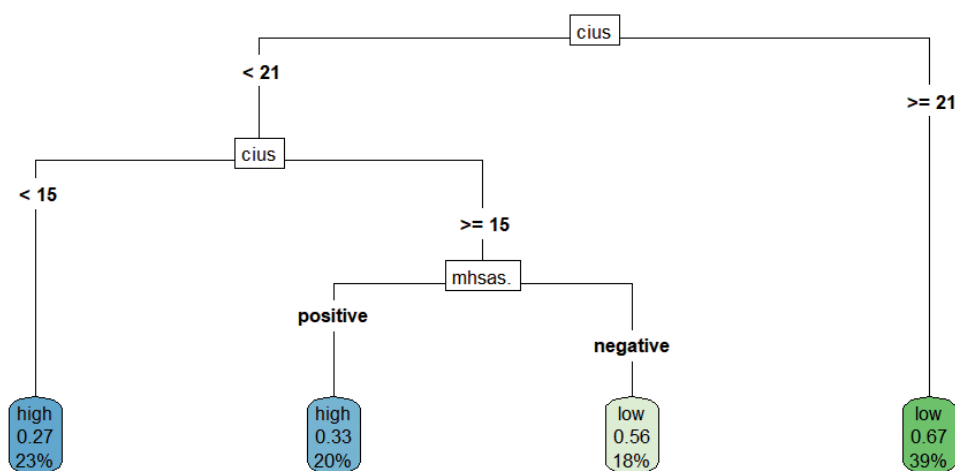


Fig. 2. Classification tree analysis

Discussion

This study indicates two distinctive results regarding compulsive Internet use, psychological wellbeing, and attitudes towards mental health services. Notably, students with a higher level of compulsive Internet use ($CIUS \geq 21$) exhibited significantly lower psychological well-being compared to those with moderate or lower usage. This finding suggests a potential dose-response relationship, wherein excessive Internet use may exacerbate psychological distress or reflect maladaptive coping mechanisms (Scott et al., 2024). The self-reinforcing loop of reinforcement, escape, and cognitive depletion that characterizes compulsive Internet use (CIU) compromises psychological health (Melodia, Canale, Griffiths, 2022). Heavy Internet use encourages recurrent use despite drawbacks and results in withdrawal symptoms (such as anxiety or irritation when offline) and tolerance (needing more screen time for satisfaction) (Freire et al., 2016). Conversely, a lower level of compulsive Internet use ($CIUS < 15$) was associated with significantly higher psychological well-being. This explanation is supported by earlier studies showing that improved emotional regulation and life satisfaction are associated with controlled Internet use (Maschia, Agus, Penna, 2020; Weidi, JeeChing, 2023).

The analysis revealed an intriguing pattern among participants with moderate compulsive Internet use ($CIUS$ scores 15–20) whereas their psychological well-being outcomes varied significantly depending on their attitudes toward mental health services. Specifically, those who held more positive attitudes toward mental health services exhibited better psychological well-being compared to their counterparts with less favorable views. This finding highlights the potential protective role of mental health service engagement — or openness to it — in mitigating the negative psychological effects associated with moderate compulsive Internet use.

Many students struggling with compulsive Internet use face two major hurdles in getting help: access and stigma. In underserved areas, treatment options are often scarce or unaffordable, leaving students without support. Even

when services exist, misconceptions and societal shame surrounding compulsive Internet use can discourage individuals from admitting they have a problem or seeking care. One form of stigma is self-stigma, which refers to a person's negative beliefs about themselves. Self-stigma is correlated with both actual experiences and perceived stigma and tends to be stronger in collectivist cultures (Crowe, Averett, Glass, 2016; Yu et al., 2021). It is also associated with attitudes and intentions regarding help-seeking among individuals experiencing mental health issues. Studies indicate that, compared to external stigma, self-stigma plays a stronger role in shaping negative attitudes towards seeking mental health assistance. This form of stigma — rooted in beliefs that excessive Internet use is a personal failing rather than a psychological issue (Odaci, Değerli, Cikrikci, 2021)— creates a barrier as significant as the lack of clinics or therapists. Without affordable, culturally sensitive solutions, many remain trapped in cycles of dependency, unable to take the first step toward recovery (Kuss, Lopez-Fernandez, 2016).

Strengths and limitations of the research

The strength of this research lies in its use of a diverse sample, covering a wide region that includes many provinces in Indonesia, involving numerous predictors, and employing a new, more exploratory machine learning approach to examine the dynamics of predictor variables against the criterion variable. The limitation of this research is that, although it considers the variable of compulsive Internet use, it does not further explore the purposes of Internet use. Using the Internet for different reasons may indicate varying levels of dependence.

Implication

The results obtained from this research indicate that the main issue for students with moderate psychological well-being tend to have either negative or positive attitudes towards psychological mental health services. For this, a formal and valid program is needed through promotion to enhance students' literacy regarding their under-

standing of mental health, to provide information to raise students' awareness of adverse impact of compulsive Internet use and overall mental health, and to offer services and facilities for student mental health with varied strategies such as animated videos (Curran et al., 2023). In addition, to combat public and self stigma and bring about positive transformation behavior that will then stimulate help-seeking behavior among students. This can be initiated by the campus health service by applying a community psychology approach. Simultaneously, this process also helps maintain social cohesion in the campus environment, as well as enhance the perception of positive relationships with others in achieving psychological well-being among students (Buggle, 2020; Chiu, 2024; Ong, Ponting, Chavira, 2024; Tarmo, Issa, 2022).

Future direction

As technology continues to evolve, future research should adopt a more precise approach in examining the advancements in Internet use and their psychological impact on well-being. Additionally, studies must identify key factors influencing attitudes toward mental health services, as well as the driving forces

that strengthen help-seeking behaviors. Such investigations will provide deeper insights into how digital engagement shapes mental health and how to effectively promote proactive support-seeking among students.

Conclusion

The aim of this research is to explore the psychological well-being of students in relation to compulsive Internet use, attitudes towards university psychological services, and several demographic variables such as major, gender, year of study, and the availability of campus psychological services. The analysis results using a classification tree show that the strong variable for determining the level of psychological well-being among students is compulsive Internet use, while major, year of entry, gender and availability of mental health services did not appear in the model do not contribute. Students who use the Internet compulsively tend to have lower well-being, and vice versa. Students with a moderate level of Internet use compulsivity and a positive attitude towards campus psychological services tend to have high psychological well-being, and conversely.

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Фара Аулия — концептуализация; методология; валидация; написание оригинального черновика; руководство исследованием.

Рахаю Хардианти Утами — помощь в концептуализации; написание оригинального черновика; рецензирование и редактирование; помощь в визуализации.

Эльрисфа Магистарина — исследование; написание оригинального черновика; помощь в рецензировании и редактировании рукописи.

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Conflict of interest

All authors declare that they have no conflicts of interest.

Конфликт интересов

Все авторы заявляют, что не имеют конфликта интересов.

Ethics statement

The protocol for this study was created in compliance with the ethical guidelines to the Faculty of Psychology and Health, Universitas Negeri Padang, Indonesia. In accordance with the Declaration of Helsinki pertaining to ethical behavior in scientific research, technical development, and innovation, each subject willingly took part in the study and provided written informed consent.

Заявление об этике

Протокол этого исследования был разработан в соответствии с этическими руководящими принципами факультета психологии и здравоохранения государственного университета Паданг, Индонезия. В соответствии с Хельсинкской декларацией, касающейся этического поведения в научных исследованиях, техническом развитии и инновациях, каждый участник добровольно участвовал в исследовании и дал письменное информированное согласие.

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Psychological well-being and success of students in grades 5–11: analysis of latent profiles

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Abstract

Context and relevance. The problems that the individual faces in adolescence can have long-term consequences not only for his school life, but also to influence later events: the choice of profession, family and well-being in adulthood. Therefore, many researchers seek to highlight the factors associated with the emergence of difficulties and problems in the school life of the child in order to develop suitable prevention or correction strategies. **Objective.** The aim is to allocate and analyze the latent profiles of students in grades 5–11, from the point of view of academic performance, psychological well-being, cognitive abilities and physical condition of the child and evaluate a change of latent profiles from 5 to 11 class. **Methods and materials.** The study was attended by 1387 students from grades 5–11 aged 11 to 18 years (51% of girls, average age 13,68 years). The indicators were investigated: the body mass index, day-time drunkenness index, cognitive indicators, academic success, psychological well-being. Data analysis was carried out in the MCLUS software environment. **Results.** According to the analysis results, the best model contains 4 latent profiles: Latent Profile 1 — “Satisfactory students without difficulties” (11%, 159 observations); Latent Profile 2 — “Successful and prosperous” (28%, 389 observations); Latent Profile 3 — “Overloaded students” (38%, 525 observations); and Latent Profile 4 — “Underachieving but socially adapted” (23%, 313 observations). The proportion of students in each latent profile varies from grade 5 to grade 11. **Conclusions.** The allocated latent profiles of students allow us to examine the dynamics of psychological and emotional well-being from grades 5 to 11, considering a large number of parameters.

Keywords: adolescence, psychological well-being, academic performance, cognitive abilities, latent profiles

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Психологическое благополучие и успешность обучения обучающихся 5–11 классов: анализ латентных профилей

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Резюме

Контекст и актуальность. Проблемы, с которыми индивид сталкивается в подростковом возрасте, могут иметь долговременные последствия не только для его школьной жизни, но и оказывать влияние на более поздние события: выбор профессии, семьи и благополучие во взрослом возрасте. Поэтому многие исследователи стремятся выделить факторы, связанные с возникновением трудностей и проблем в школьной жизни ребенка, чтобы выработать подходящие стратегии профилактики или коррекции. **Цель.** Выделить и проанализировать латентные профили обучающихся 5–11 классов с точки зрения академической успеваемости, психологического благополучия, когнитивных особенностей и физического состояния ребенка, оценить изменение латентных профилей от 5 к 11 классу. **Методы и материалы.** В исследовании участвовали 1387 обучающихся 5–11 классов в возрасте от 11 до 18 лет (51% девочек, средний возраст — 13,68 лет). Исследованы показатели: индекс массы тела, индекс дневной сонливости, когнитивные показатели, академическая успешность, психологическое благополучие. Анализ данных проведен в программной среде R с использованием пакета mclust. **Результаты.** По итогам анализа наилучшими показателями обладает модель с 4 латентными профилями: латентный профиль 1 «Удовлетворительные ученики без трудностей» составил 11% (159 наблюдений), латентный профиль 2 «Успешные и довольные» — 28% (389 наблюдений), латентный профиль 3 «Перегруженные ученики» — 38% (525 наблюдений) и латентный профиль 4 «Слабоуспевающие, но социально адаптированные» составляет 23% (313 наблюдений). Соотношение количества обучающихся каждого латентного профиля варьируется от 5 к 11 классу. **Выводы.** Выделенные латентные профили позволяют взглянуть на динамику психологического благополучия обучающихся от 5 к 11 классу с учетом большого количества параметров.

Ключевые слова: подростковый возраст, психологическое благополучие, успеваемость, когнитивные способности, латентные профили

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Introduction

Adolescence is one of the most critically important periods of development, during which a multitude of cognitive, psychological, physiological, and social changes converge, creating a unique social situation of development. Many psychologists and educators note a decline in interest in the educational process, the emergence of a new system of relations with adults and peers, and the development of a new "self-image" (Vygotsky, 1931; El'konin, 1971). This period is also often characterized by emotional instability, the onset of anxiety disorders, and a surge in behavioral problems (Lin, Guo, 2024; Briggs, 2009; Podolskii et al., 2011). The problems an individual encounters in adolescence can have long-term consequences not only for their school life but also influence later life events: career choice, family, and well-being in adulthood (Sigurdson et al., 2015; Jonsson et al., 2011; Schlack et al., 2021). This is precisely why many researchers strive to identify factors associated with the emergence of difficulties and problems in a child's school life, in order to develop appropriate strategies for prevention or intervention.

Research on child mental development reveals complex interrelationships between cognitive, emotional, behavioral, and social factors. To account for the multifaceted nature of the relationships between these characteristics and academic achievement, researchers increasingly turn to a person-centered approach, as opposed to a variable-centered approach. While the variable-centered approach assumes that a sample or population can be described by average parameters, the person-centered approach treats the individual as the unit of analysis, not seeking to focus on a single

aspect or characteristic, thereby providing researchers and practitioners with a deeper understanding of the social and psychological situation of development (Watt, Parker, 2020). The person-centered approach posits that the sample and/or population are heterogeneous and may consist of several subgroups, each with a unique set of parameters differently related to each other (Howard, Hoffman, 2017; Morin, Gagne, Bujacz, 2016).

Various methods can be used to identify such groups, with the most popular being Latent Profile Analysis (LPA) or Latent Class Analysis (Obersky, 2016). LPA is based on probabilistic modeling, making it a flexible tool for identifying latent homogeneous groups based on a set of characteristics of interest to the researcher (Howard & Hoffman, 2017). Furthermore, this approach allows for assessing the uncertainty in classifying each group. The algorithm finds the optimal number of groups and assigns each observation a probability of belonging to one of them. The result is a set of latent profiles (classes), each with a unique pattern of characteristics.

Previous research on psychological characteristics of schoolchildren using latent profile analysis has revealed heterogeneity within populations in terms of the severity of various characteristics and their interrelationships. For example, a study of sixth-grade students in Brazil identified seven latent profiles based on academic skills, assessment of behavioral problems, and social skills, which differed in levels of adaptation, social skills, and academic performance (Orpinas et al., 2014). Belonging to a specific profile (poorly adapted with low achievement) was a strong predictor of school exclusion. Another study in the USA also showed heterogeneity among stu-

dents in terms of social and psychological school adaptation, identifying three latent profiles ("Well Adapted," "Low Adapted," "Moderately Adapted") (Mindrila, 2016). Interestingly, these groups were replicated across several age cohorts and were relatively stable over time, although the proportion of students in each latent class changed. Understanding the specifics of a latent group of learners allows for more targeted interventions for each group.

Research on Russian samples of schoolchildren has also demonstrated the promise of this approach for a deeper understanding of processes in middle and high school. In particular, a study of students in grades 6–8 regarding the severity of various types of engagement (behavioral, cognitive, emotional, and social) revealed several latent profiles of students that were consistently replicated across different grades (Morosanova & Potanina, 2024). It was shown that the general decline in engagement during the transition from 6th to 7th grade was related to a decrease in cognitive engagement, which may be explained by a decline in overall cognitive activity.

At the same time, it should be noted that we found a limited number of studies on Russian data that analyze latent student profiles, taking into account both academic performance and a broad set of psychological characteristics. Typically, analyses of psychological well-being or school performance are conducted within a variable-centered approach (e.g., analysis of predictors of school performance) (Tikhomirova et al., 2015). However, the person-centered approach allows for a broader picture of ongoing processes, considering the possible heterogeneity of the sample.

In light of the above, this study has two objectives:

1. To identify and analyze latent profiles of students in grades 5–11 based on their academic performance, psychological well-being, cognitive characteristics, and physical condition.
2. To assess changes in the distribution of latent profiles from grades 5 to 11.

Materials and methods

The study involved 1387 students in grades 5–11 from general education institutions in the Irkutsk region, aged 11 to 18 years (51% girls, mean age = 13,68 years, SD = 1,91). Digital psychodiagnostic tools were used for data collection. Students completed tasks in computer labs according to uniform protocols under the supervision of a member of the research team. The distribution by grade is presented in Table 1.

The following indicators were used to identify student groups:

1. **Body Mass Index (BMI).** BMI was calculated based on weight and height (kg/m^2).
2. **Daytime Sleepiness Index.** The Pediatric Daytime Sleepiness Scale (Zakharov et al., 2023) was used. Higher scores indicate greater daytime sleepiness; participants scoring 16 points or more belong to the group with significant daytime sleepiness. In the total sample, 39% of students had scores above the norm.
3. **Cognitive Indicators:** a. **Non-verbal intelligence.** Raven's Progressive Matrices test was used. The test is divided into five blocks of 12 tasks each. One point is assigned for each correctly solved task, with a maximum possible total of 60. b. **Spatial reasoning.** A test of spatial abilities and assessment of technical rea-

Table 1

Distribution by classes

Class	Quantity (%)	Averageage (st. deviation)
5	279 (20%)	11,28 (0,46)
6	232 (17%)	12,24 (0,47)
7	267 (19%)	13,32 (0,47)
8	201 (14%)	14,61 (0,71)
9	216 (16%)	15,27 (0,56)
10	125 (9%)	16,4 (0,49)
11	67 (5%)	17,33 (0,47)

soning (Mechanical Reasoning, Ecipenko et al., 2018) was used. The test includes 16 items; 1 point is assigned for each correct answer (maximum = 16). c. **Vocabulary** (Golovin, 2015). The test measures vocabulary size and is used for an express assessment of verbal intelligence (Maslennikova et al., 2017). The test consists of several blocks. In this case, scores from the first block were used. In this block, respondents are presented with words sequentially and must indicate whether they know the meaning. Fake words are included to check for guessing. The maximum score is 95.

4. **Psychological Well-being:** For assessing emotional and behavioral problems in children and adolescents, the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001) was used. The instrument has five 5-item scales: "Emotional Symptoms," "Conduct Problems," "Hyperactivity/Inattention," "Peer Relationship Problems," and "Prosocial Behavior." Validation and assessment of psychometric properties of the SDQ on a Russian sample were conducted by V. Ruchkin et al. (Ruchkin et al., 2007). The Russian version of the questionnaire was used (Ruchkin et al., 2007). The following SDQ scales were used in the analysis: a. **Emotional problems score.** SDQ Emotional Prob-

lems scale, assessing emotional problems and heightened anxiety (max = 10). b. **Peer problems score.** SDQ Peer Problems scale, assessing problems in peer relationships (max = 10). For assessing life satisfaction, the Multidimensional Students' Life Satisfaction Scale (MSLSS) (Huebner, 1994) was used. The Russian version includes five subscales: family satisfaction, school satisfaction, teacher satisfaction, self-satisfaction, friend satisfaction (Sychev et al., 2018; Tabueva et al., 2024). The following scales were used in the analysis: c. **Family Satisfaction.** MSLSS Family Satisfaction scale shows the degree of satisfaction with relationships with family members (max = 30). d. **School Satisfaction.** MSLSS School Satisfaction scale assesses children's satisfaction with school life regarding support for their interests and general attitude towards school and learning (max = 30). e. **Self-Satisfaction.** MSLSS "Self" scale is aimed at assessing the level of satisfaction with oneself and a positive self-attitude (max = 30).

Academic Performance: f. **Average grades** (over 4 quarters) in Mathematics (grades 5–6) or *Algebra and Geometry* (grades 7–11). g. **Average grades** (over 4 quarters) in *Russian Language and Literature*.

Data analysis

To identify groups of students based on their academic performance, psychological well-being, and cognitive characteristics, Latent Profile Analysis (LPA) (Muthén, 2001) was used. LPA is an exploratory technique, a type of latent variable modeling where the latent variables are discrete. An advantage of discrete latent models is that their distribution is estimated from the data rather than assuming a normal distribution. LPA implies the existence of "hidden" subgroups within the general sample, leading to a mixture of distributions across these latent groups.

LPA uses probabilistic mathematical modeling based on correlations between variables to identify probable groups and assign individuals to them. In the first stage, the algorithm tests different models with varying numbers of latent classes. Models differ not only in the number of latent classes but also in the type of covariance structures. Specifically, models can vary in whether variance of variables within classes is allowed to differ, whether correlations between variables are allowed, and whether cluster sizes can vary.

Based on the comparison of several statistical criteria, the model with the best fit indices was selected. These indices include: maximum log-likelihood, Bayesian Information Criterion (BIC), Integrated Complete-data Likelihood (ICL), and a measure of model uncertainty. ICL is calculated based on BIC but penalizes models with high uncertainty.

Before inclusion in the model, all variables except cognitive indicators were standardized relative to the sample mean (z-scores: $[\text{raw value} - \text{sample mean}] / \text{sample SD}$). To account for changes in cognitive scores from grade 5 to 11, they

were standardized relative to the mean for the corresponding grade ($[\text{raw value} - \text{grade mean}] / \text{grade SD}$).

After selecting the best-fitting model, the obtained latent profiles were compared based on the mean values of the included variables. Then, the proportion of each latent profile was calculated for students in grades 5–11 separately for each grade.

The analysis was conducted in the R environment using the *mclust* package.

Results

The distribution of the variables included in the analysis is shown in Table 2.

Spearman correlations between the selected indicators were examined (Fig. 1).

Analysis of correlations shows that BMI has no significant correlations with other indicators except a weak positive correlation with vocabulary. The daytime sleepiness index is negatively related to satisfaction indicators and positively related to the emotional problems scale. Satisfaction indicators are strongly positively correlated with each other and moderately negatively correlated with problem indicators. Grades in mathematics and Russian language are positively related to nonverbal intelligence and school satisfaction.

Results of latent profile analysis of students

The model with 4 latent classes showed the best fit indices, where variables within each latent class are considered uncorrelated, and variables can have different variances (diagonal, varying volume and shape). The model indices are presented in Table 3.

The main characteristics of each latent profile can be described as follows:

Table 2

Indicators of variables included in the analysis

Indicators	Average	St. deviation	25th percentile	75th percentile
IMT	20,47	4,11	17,66	22,13
Daytime drowsiness index	13,75	6,40	9	18
Non-verbal intelligence	39,8	8,6	34	46
Spatialabilities	8,4	2,6	7	10
Vocabulary	52,9	18,2	40	65
Emotional problems	3,15	2,63	1	5
Problems with peers	2,95	1,92	1	4
Satisfaction with the family	18,8	4,98	20	28
Satisfaction with the school	23,9	5,02	15	23
Satisfaction with oneself	22,4	5,25	19	27
Average mathematics points	3,81	0,58	3,25	4,13
Average points in the Russian language and literature	3,97	0,58	3,5	4,38

Latent Profile 1 (159 observations, 11%):

1. **"Adequate Students without Difficulties"**

- Cognitive indicator values are close to zero, indicating average cognitive abilities (relative to age norms).

- Average family satisfaction and below-average school satisfaction (the lowest among all profiles).

- No pronounced emotional or peer relationship problems.

- Grades in mathematics and language are also close to or slightly below average.

This is a group of adequately performing students without pronounced psychological difficulties, who are not very satisfied with school.

Latent Profile 2 (389 observations, 28%):

2. **"Successful and Content"**

- High academic performance and high levels of cognitive abilities.

- Low levels of emotional problems and peer relationship problems.

- Low level of daytime sleepiness.

- High levels of family, school, and self-satisfaction.

This group of students is generally content with their lives, well-rested, and the most academically successful.

Latent Profile 3 (525 observations, 38%):

3. **"Overloaded Students"**

- Slightly above-average BMI, high level of sleepiness, which may be a consequence of overload, stress, or lack of sleep.

- Very low indicators of school, family, and self-satisfaction.

- High indicators of emotional problems and peer relationship problems.

- Average grades in mathematics and language.

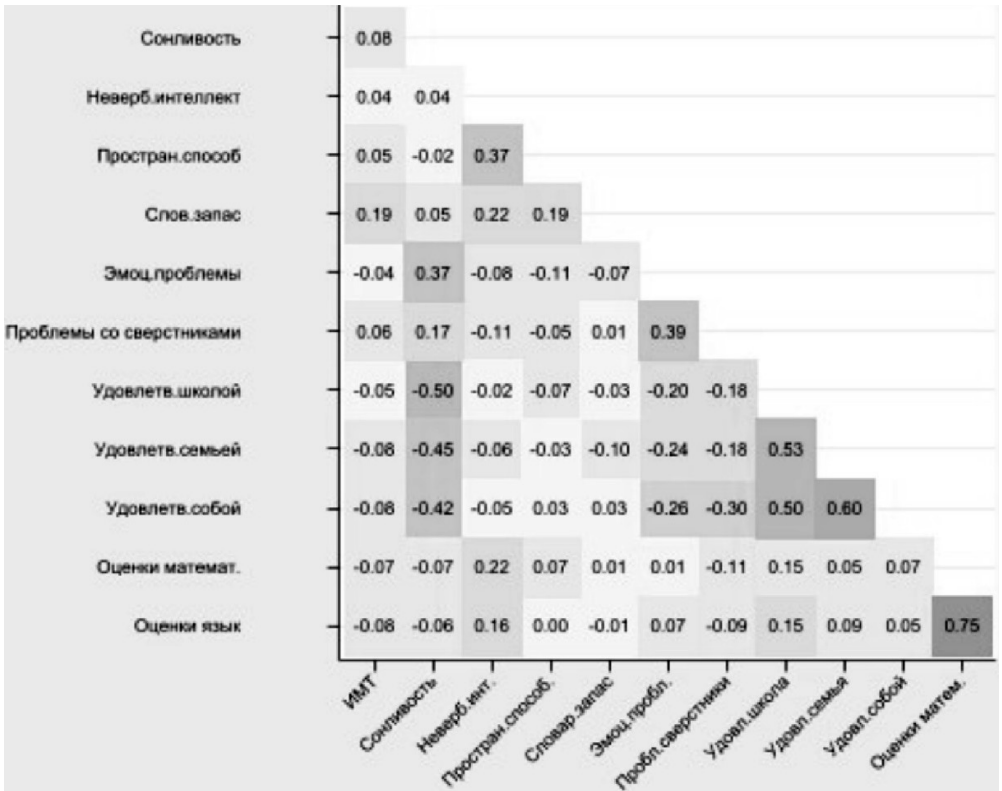


Fig. 1. Correlations between variables

Table 3

Model indicators based on the results of the analysis of latent profiles

log-likelihood	BIC	df	ICL	The degree of uncertainty
3625,9	6535,6	99	6422,97	0,03

• Scores on cognitive tests are slightly below average for their age.

A group of students who manage academically but experience high levels of stress, fatigue, and dissatisfaction with their social environment.

Latent Profile 4 (313 observations, 23%):

4. **"Low-Achieving but Socially Adapted"**

- Levels of family, school, and self-satisfaction are slightly above average.
- The lowest academic results.
- Levels of emotional problems and peer relationship problems are below average.
- The level of cognitive abilities is close to average.

A group of low-achieving students without significant adaptation or communication problems.

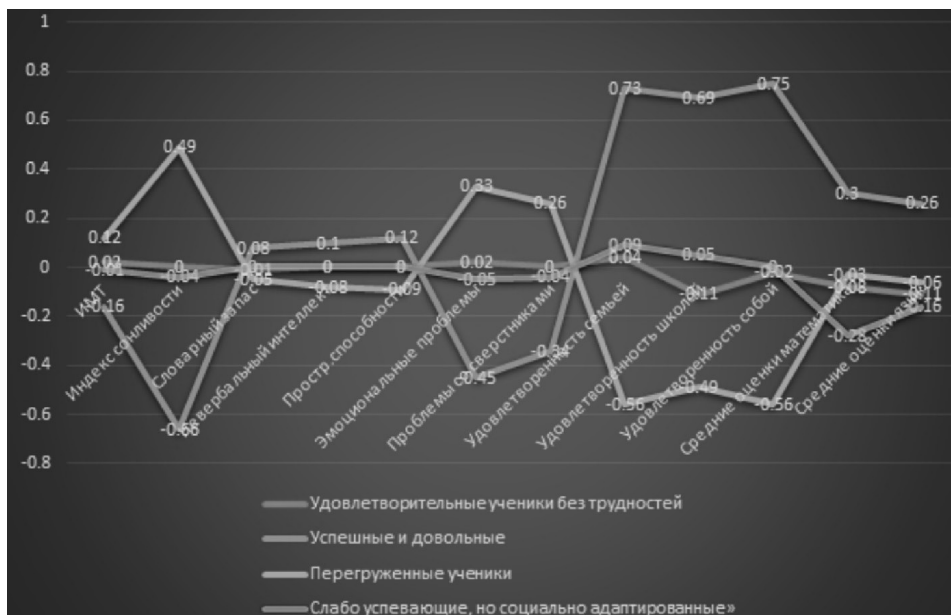


Fig. 2. Indicators of the average values of variables for four latent profiles

Figure 2 presents the indicators (z-scores) for the variables across the four latent profiles.

Next, we analyzed how the described latent profiles are distributed across grades (see Fig. 3).

Thus, it can be seen that the proportion of students from each latent profile varies from grade to grade. In particular, the proportion of "Overloaded Students" (with average grades but low satisfaction and high problem levels) is highest in grade 7 (53%), and also in grades 10–11 (51% and 49%, respectively). Conversely, the proportion of "Successful and Content" students is highest in grade 11 (43%) and lowest in grade 9 (15%). Low-achieving but adapted students are more common in grade 6 (37%) and grade 9 (34%). It should also be noted that in grade 7, students with this latent profile were not identified.

Discussion of results

Based on indicators of psychological well-being, cognitive characteristics, as well as sleepiness index and BMI, four latent profiles of students in grades 5–11 were identified. The most numerous (38% of the sample) is the latent profile of "Overloaded Students," who generally have satisfactory average grades in mathematics and Russian language but report emotional and social problems, low satisfaction with school, family, and self, and have high daytime sleepiness. Half of the students in grades 7, 10, and 11 have this profile. The share of "overloaded students" is especially high in grade 7. The second most represented latent profile is "Successful and Content" (28% of observations). These are students with high grades, high scores on cognitive tests, high satisfaction indicators, and low levels of problems. The highest proportion

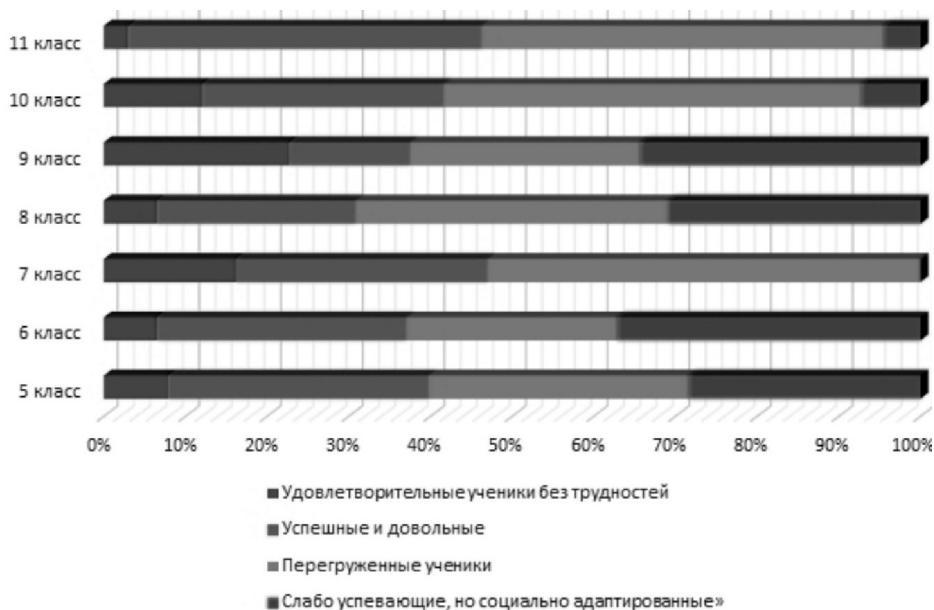


Fig. 3. The proportion of students of each latent profile in classes

of such students is in grade 11 — 43%. The lowest proportion of such students (only 15%) is in grade 9. Attention should also be paid to students with the profile "Low-Achieving but Socially Adapted" (23% of observations). Such students have the lowest average grades compared to other profiles but do not experience significant psychological problems. The share of such students is particularly large in grade 6 (37%) and grade 9 (34%). Interestingly, in grade 7, students with this profile were not found. The least represented (only 11% of the sample) was the latent profile "Adequate Students without Difficulties." Students with this profile generally have satisfactory academic performance indicators and no particularly pronounced problems but have quite low indicators of school satisfaction. It should be noted that the analysis did not identify a separate group of students with

low academic performance and low psychological well-being indicators. Possibly, the proportion of such schoolchildren is too small to form a separate latent profile. On the other hand, it is possible that these children did not participate in the study for various reasons.

The identified latent profiles allow us to look at the dynamics of psychological and emotional well-being from grades 5 to 11, considering a large number of parameters. It can be stated that grades 5–6 are relatively favorable, with a fairly high proportion of successful and adapted students. In grade 6, the share of low-achieving students without pronounced psychological problems increases. In all likelihood, the decline in academic performance does not yet affect psychological well-being at this age. In grade 7, the picture changes; in many respects, grade 7 appears to be

the most problematic. On the one hand, the proportion of "overloaded" students increases significantly. These students may demonstrate satisfactory academic performance but experience problems in both peer relationships and emotional state. It is in this grade that students show the lowest level of satisfaction with school, family, and self (Fig. 4).

On the other hand, students with the "Low-Achieving but Adapted" profile were not found in grade 7. Given the sharp increase in the proportion of "overloaded" schoolchildren, it is possible that those students who were in this profile in grade 6 may "move" to a less favorable profile in terms of psychological state in grade 7. Of course, the available data do not allow us to speak about dynamics in terms of individual trajectories of transition from one latent class to another; we can only

hypothesize based on data on differences between grades. In grade 8, the situation stabilizes, and the ratio of students of different profiles becomes approximately the same as in grade 6. In grade 9, the situation changes again, as compared to previous grades, the proportion of "average students" increases, but the share of "successful students" decreases. This may be related to the increasing complexity of the school curriculum and the need to prepare for the State Final Attestation. Grades 10 and 11 show a similar picture in terms of the representation of "overloaded students." Among students in these grades, the proportion of such "overloaded" students is very high and comparable to the situation in grade 7, although the reasons for this situation may be different. For example, analysis of changes in daytime sleepiness indicators revealed that it is in

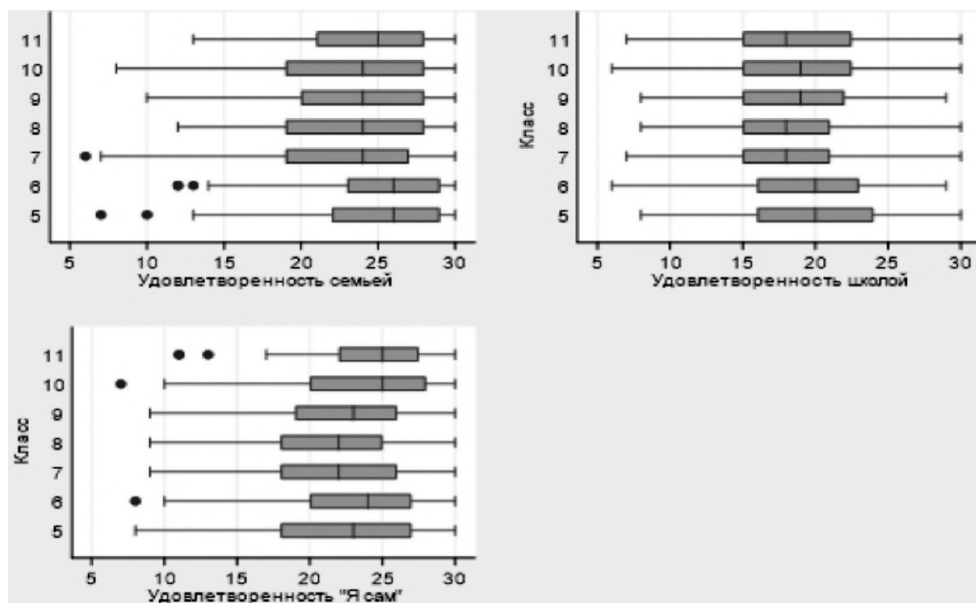


Fig. 4. Distribution of a subscale on the scale of satisfaction with life

grade 10 that students have the highest average scores for daytime sleepiness (Fig. 5).

On the other hand, it can be seen that grades 10 and 11 differ in the representation of the "successful" profile, as in grade 11 the share of "successful" students is significantly higher than in grade 10. However, it should be noted that the sample of grade 11 students is small, and the situation may change with a larger sample.

Conclusion

Based on the analysis, the model with 4 latent profiles showed the best fit: Latent Profile 1 "Adequate Students without Difficulties" accounted for 11% (159 observations), Latent Profile 2 "Successful and Content" — 28% (389 observations), Latent Profile 3 "Overloaded Students" — 38% (525 observations), and Latent Profile 4 "Low-Achieving but Socially Adapted" —

23% (313 observations). The proportion of students in each latent profile varies from grade 5 to 11.

Regarding the choice of possible corrective or preventive measures, it can be noted that students in different latent profiles require different approaches. From the teachers' perspective, students from the "Low-Achieving but Adapted" profile may seem the most problematic. However, from the perspective of long-term consequences, the profile of "overloaded" students appears more "risky." Furthermore, it is worth noting that the cognitive indicators of students in this profile are slightly lower than those of schoolchildren in the "low-achieving" profile, despite their higher academic performance. It can be assumed that maintaining relatively high academic performance may be quite costly for many students in terms of psychological and physical well-being. It is also possible that

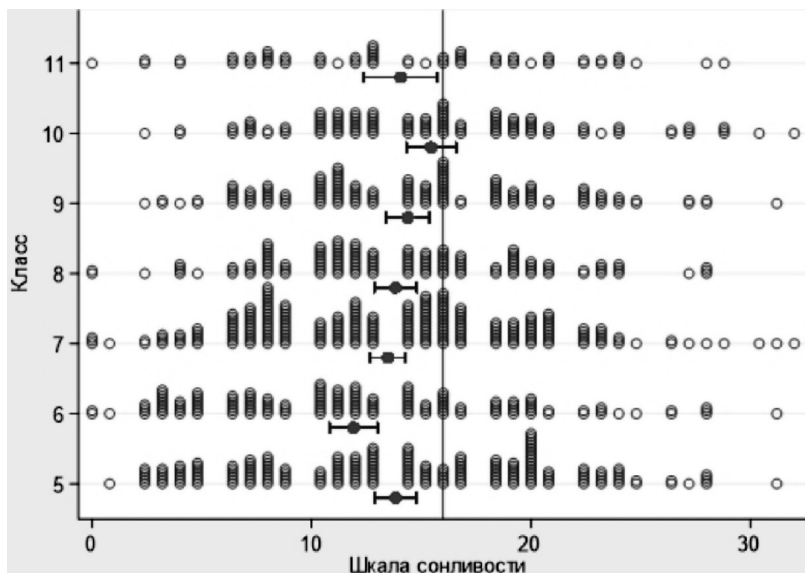


Fig. 5. Distribution of indicators of the scale of daily drowsiness by classes

a slight decrease in cognitive indicators may be associated with increased stress and fatigue, as indicated by high daytime sleepiness scores.

The obtained results also indicate that the relationships between indicators of psychological well-being, cognitive, and

physical characteristics are complex and may differ across subgroups. For a better understanding, both detailed analysis (e.g., structural equation modeling) within the separately identified latent profiles and longitudinal and qualitative studies are necessary.

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Personal identity of modern adolescents: results of an all-Russian study

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Abstract

Context and relevance. The theoretical significance of the work is related to the need to correlate the cultural-historical approach to understanding adolescence, as well as theories of identity and modern ideas about the dynamics of Self-concept development. The practical and social value of the research is determined by the need to actualize developmental educational influences in relation to adolescents. **Objective.** The purpose of the study is to analyze the features of personal identity (namely, the profile of self-perception and clarity of self-concept) of modern Russian adolescents. **Hypotheses.** There are differences in the profile of self-perception and the clarity of self-concept among adolescents, taking into account factors such as gender, age, academic achievement, and territory of residence. Additionally, there are significant links between the profile of self-perception and the clarity of self-concept in adolescents. **Methods and materials.** The survey was conducted using the following methods: 1) "Self-perception profile for adolescents," adapted by N.K. Radina and E.Y. Tereshenkova; 2) the scale "Clarity of Self-concept," adapted by V.V. Vdovenko, S.A. Shchebetenko, and E.B. Starovoitenko. The participants number more than 62000 teenagers from 85 regions of Russia, aged 11 to 17 years. **Results.** Gender, age, academic performance, and life in difficult conditions have virtually no effect on adolescents' self-perception and the formation of their self-concept. The turning point in the development of self-clarity has been empirically identified at ages 11–12. Significant positive relationships between self-clarity and various aspects of adolescents' self-esteem have been established. **Conclusions.** The characteristics of adolescents' personal identity are practically not associated with demographic and situational variables. The picture of the direction and content of the development of adolescents' personal identity obtained in the study confirms the relevance of the patterns formulated in the classical theories of E. Erikson and D.B. Elkonin.

Keywords: adolescence, personal identity, self-perception, self-concept, self-clarity, self-esteem, reflection, digital socialization

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Личностная идентичность современных подростков: результаты общероссийского исследования

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Резюме

Контекст и актуальность. Теоретическая значимость данной работы связана с осуществлением эмпирической верификации классических теорий подросткового возраста Э. Эриксона и Д.Б. Эльконина на уникальной по масштабу российской выборке и с уточнением роли традиционных факторов развития личности подростка. Практическая и социальная ценность исследования обусловлена необходимостью актуализации развивающих воспитательных воздействий по отношению к подросткам. **Цель.** Определить особенности личностной идентичности (а именно — профиля самовосприятия и ясности Я-концепции) современных российских подростков с учетом ряда факторов: пола, возраста, академической успеваемости, территории проживания. **Гипотезы.** Существуют различия в профиле самовосприятия и ясности Я-концепции у подростков с учетом факторов: пол, возраст, уровень академической успеваемости, территория проживания; существуют значимые связи профиля самовосприятия и ясности Я у подростков. **Методы и материалы.** Опрос с помощью методик: 1) «Профиль самовосприятия для подростков» в адаптации Н.К. Радиной, Е.Ю. Терешенковой и 2) Шкала «Ясность Я-концепции» в адаптации В.В. Вдовенко, С.А. Щебетенко, Е.Б. Старовойтенко. Участники — более 62000 подростков из 85 регионов России в возрасте от 11 до 17 лет. **Результаты.** Пол, возраст, успеваемость, жизнь в трудных условиях практически не влияют на самовосприятие и сформированность Я-концепции подростков. Эмпирически выявлен переломный момент 11-12 лет в развитии ясности Я. Установлены значимые положительные связи ясности Я и ряда аспектов самооценки подростков. **Выводы.** Особенности личностной идентичности подростков практически не связаны с демографическими и ситуационными переменными. Полученная в исследовании картина направления и содержания развития личностной идентичности подростков подтверждает актуальность закономерностей, сформулированных в классических теориях Э. Эриксона и Д.Б. Эльконина.

Ключевые слова: подростковый возраст, личностная идентичность, самовосприятие, Я-концепция, ясность Я, самооценка, рефлексия, цифровая социализация

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Introduction

Adolescence is viewed as a transitional period to adulthood, during which adolescents learn to understand themselves, evaluate their abilities and limitations, a period of choosing a future life path. Personal identity is increasingly seen as a key construct for understanding both optimal and pathological functioning in society among people of different ages (Luyckx et al., 2023).

One of the most critical issues in modern adolescent psychology is recognized to be the problem of personal identity formation under conditions of sociocultural change. Firstly, the era of globalization and digitalization creates conditions for intensive interaction of adolescents with the most diverse cultural phenomena, while the probability of value conflicts is very high (Vanhoffelen et al., 2023). Secondly, the current political tension in the world, the complex socio-economic situation, and the diversity of cultural behavioral models cause stress and adaptation problems even in adults, and are even more challenging for adolescents.

According to E. Erikson, ego-identity is understood as a subjective feeling of the integrity of one's own personality, reflecting the degree to which a person accepts clear and consistent goals, beliefs, and values (Erikson, 1996). These ideas are conceptually close to the understanding of key developmental achievements of the

adolescent era in Russian psychology. In E. Erikson's concept, successful resolution of the crisis is associated with the emergence of personal and social identity, while in the cultural-historical approach, in the works of L.S. Vygotsky and D.B. Elkonin, the most important developmental achievements of adolescence are a qualitatively new level of self-awareness, personal reflection, a system of value orientations, and finally, professional and personal self-determination (Vygotsky, Elkonin, 2005). These psychological achievements of the coming-of-age period become the foundation for determining educational and professional trajectories, building personal relationships, progressing toward adulthood, and personal maturity.

One of the important directions in the development of identity is considered to be self-perception as a process of self-knowledge and the development of personal attitudes, including the self-concept (Meshcheryakov, Zinchenko, 2003). Self-perception is defined as a person's orientation in their own inner world by comparing themselves with others, by observing and analyzing their own behavior and activities through the prism of the same concepts that are realized when analyzing the observed behavior of other people (Meshcheryakov, Zinchenko, 2003; Baeva et al., 2022).

Modern American psychologist Susan Harter, in her monograph «The Construc-

tion of the Self: A Developmental Perspective» (1999), described the main normative stages in the formation of many self-knowledge processes, cross-cultural approaches to the development of self-esteem, the contribution of educational institutions to personality development, and individual variability in self-perception. She identified various types of self-representations, ranging from markedly negative to unrealistically positive (Harter, 2012). S. Harter developed methodological tools for diagnosing children's and adolescents' representations of themselves, of their success in the most important spheres of interaction. In her developed method, the «Self-Perception Profile for Adolescents», 9 aspects of assessing one's own competence in significant domains are identified (Harter, 2012; Prikhodzhan, Tolstykh, 2018).

The self-concept is considered a generalized product of self-perception. English psychologist Robert Burns, known for developing the «Self-Concept», stated: «The self-concept is formed under the influence of various external influences that the individual experiences. Contacts with significant others are particularly important for him, which, in essence, determine the individual's ideas about himself» (Burns, 2006, p. 39).

One of the key parameters of the self-concept structure is Self-Concept Clarity as the «degree of distinctness, confidence, internal consistency, and chronological stability with which the content of the self-concept is represented (e.g., the individual's beliefs about their attributes)» (Vdovenko, Shchebetenko, Starovoitenko, 2021).

Numerous empirical studies conducted on samples of varying sizes (from several dozen to several thousand adolescents) examine positive and negative factors in the formation of self-perception and self-concept, the age dynamics of these psychological constructs, gender differ-

ences (Portillo, Fernandez-Baena, 2019); the connections of self-perception and self-esteem with personal, emotional, and communicative characteristics, with the success of personal integration into society (Palenzuela-Luis et al., 2022), destructive influences on self-perception (Bogatyreva, Bostanova, 2022; Bobchenko, Nefedova, 2025), and the influence of social networks (Smith, Johnson, 2025; Grajek et al., 2025).

The theoretical significance of this work lies in the empirical verification of classical theories of adolescence by E. Erikson and D.B. Elkonin on a uniquely large-scale Russian sample and in clarifying the role of traditional factors in adolescent personality development. The practical value of the study is due to the opportunity to present current data on the characteristics of self-perception and self-concept clarity of modern Russian adolescents in the new technological era of digitalization.

The diagnostics of the features of self-perception and self-concept clarity of Russian adolescents were included in the context of the All-Russian scientific research «Creating a psychological portrait of modern children and adolescents and determining the conditions for their well-being», conducted in September–October 2025. In this study, we considered the adolescent era (according to D.B. Elkonin), encompassing the actual adolescent period and the period of early adolescence.

Objective of the study: To determine the features of personal identity (namely, the self-perception profile and self-concept clarity) of modern Russian adolescents, taking into account several factors: gender, age, academic performance, and territory of residence.

A number of hypotheses were tested, including assumptions about the existence of differences in the self-perception profile and level of self-concept clarity 1) in adolescents of different genders, 2) of different

ages, 3) with different levels of academic performance, 4) residing in different territorial zones of Russia (e.g., in the zone of «Ordinary territories» and «Ecologically disadvantaged territories»), as well as hypothesis 5) about the presence of significant relationships between the self-perception profile and self-concept clarity in adolescents.

Materials and methods

To create a psychological portrait of modern Russian adolescents, a battery of 8 standardized methods was selected, aimed at assessing different aspects of personal development, with special attention to their subjective well-being. Empirical data collection was carried out using electronic forms of the «Anketolog» service in educational institutions of various regions of Russia. In this article, we will present the results obtained using only two methods designed to diagnose aspects of personal identity:

1) The questionnaire «Self-Perception Profile for Adolescents» by S. Harter (Harter's Self-Perception Profile for Adolescents, SPPA), adapted by N.K. Radina, E.Yu. Tereshenkova, for adolescents to assess their own competence in the most significant life domains (Prikhozhan, Tolstykh, 2018). The method was implemented in our modification: the wording of questions with a choice between two alternative options was replaced by us with one direct statement (with maximum preservation of content) — for the convenience of electronic presentation. Here is an example of such a modification: a question with a dichotomy and choice "Some teenagers think that they are just as smart as their peers, while other teenagers are not sure that they are just as smart as their peers" was replaced by us with the following statement «I think that I am just as smart as my peers». Cronbach's α coefficient values for

all scales ranged from 0,74 to 0,90, indicating high internal consistency of items within the scales. Cronbach's α values «if item deleted» were in all cases lower than the final indicator, justifying the retention of items in the respective scales.

2) The questionnaire «Self-Concept Clarity Scale (SCCS)» by J. Campbell, adapted by V.V. Vdovenko, S.A. Shchebetenko, E.B. Starovoitenko (Vdovenko, Shchebetenko, Starovoitenko, 2021).

Sample. The study of adolescents involved 62312 people from 85 regions of the Russian Federation. The average age of participants was 14,1±1,8 years (minimum — 11 years, maximum — 17 years). Girls constituted slightly more than half of the sample (54,1%).

Statistical methods. To test the research hypotheses, the statistical packages IBM SPSS Statistics 21 and Statistica 12.0 were used. Considering the large sample size, classical criteria for testing the normality of distribution showed deviation of all indicators from normal. Relying on the authors of the textbook (George, Mallery, 2016), we assessed the skewness of the indicators and, since it did not exceed the value of 2, we can consider the distribution of all indicators to correspond to a normal distribution. To test differences in qualitative indicators, Pearson's chi-square test was used; for quantitative indicators, multivariate analysis of variance was used. Effect size was assessed using η^2 .

Results

Table 1 presents descriptive statistics for the scales of the «Self-Concept Clarity Scale» and «Self-Perception Profile for Adolescents» methods.

On the Self-Concept Clarity Scale (SCCS), the average score (3,44 out of 5 possible) indicates a moderately high level of internal consistency and stability of the content of self-representations in the stud-

Table 1

**Descriptive statistics of the scales of the “Self-Concept Clarity Scale
and “Self-Perception Profile for Adolescents” methods**

Scale	Mean ± Standard Deviation	Median [Lower Quartile; Upper Quartile]
Self-Concept Clarity Scale		
Self-Concept Clarity Scale	3,44 ± 0,66	3,50 [3,00;3,92]
Self-Perception Profile for Adolescents		
Scholastic Competence	14,45 ± 3,29	15,00 [13,00;16,00]
Social Competence	13,86 ± 3,39	14,00 [12,00;16,00]
Athletic Competence	13,03 ± 3,85	13,00 [10,00;16,00]
Physical Appearance	14,27 ± 3,85	15,00 [12,00;17,00]
Job Competence	13,23 ± 3,24	13,00 [11,00;15,00]
Romantic Appeal	12,35 ± 3,66	13,00 [10,00;15,00]
Behavioral Conduct	14,07 ± 3,06	14,00 [12,00;16,00]
Close Friendship	15,04 ± 3,71	15,00 [13,00;18,00]
Global Self-Worth	15,37 ± 3,74	15,00 [13,00;19,00]

ied sample of adolescents. Respondents' answers on this scale are quite homogeneous, without sharp variations; most values are concentrated around the mean.

According to the SPPA method for diagnosing self-perception — different aspects of self-esteem in adolescents from this sample are expressed unevenly, mean values on the subscales range from 12,35 (romantic appeal) to 15,37 (global self-worth). The highest mean scores are observed for global self-worth (15,37) and close friendship (15,04). The lowest domains are romantic appeal (12,35) and athletic competence (13,03). There is large variability within the sample: there are adolescents who rate themselves very highly in these domains, and those who rate themselves low.

Gender factor. When comparing adolescents of different genders, statistically significant differences were found on the SCCS method ($F(1, 62310) = 1260,1$; $p < 0,0001$; $\eta^2 = 0,02$), (see Fig. 1). In this very large sample, it was found that, on average, male adolescents and young men have statistically significantly higher

self-concept clarity than females. This coincides with the conclusions of many works that indicate such a difference (Rosenberg, 1965; Twenge, Campbell, 2001). However, in our case, the effect size is negligibly small; gender explains only 2% of the variability in self-concept formation.

When comparing adolescents of different genders on the SPPA, significant differences were also found ($F(8, 498480) = 389,5$; $p < 0,0001$; $\eta^2 = 0,01$). The scales of the method with the greatest differences are presented in Fig. 2. As can be seen from the figure, adolescent girls have higher self-esteem regarding the ability to establish close friendships, but lower self-esteem regarding their achievements in sports and active games, as well as lower self-esteem regarding readiness for professional (work) activity. However, the effect size is again negligibly small and has no practical significance.

Nevertheless, let us comment on these differences in content as a trend:

— The proposition «Girls have higher self-esteem regarding the ability to establish

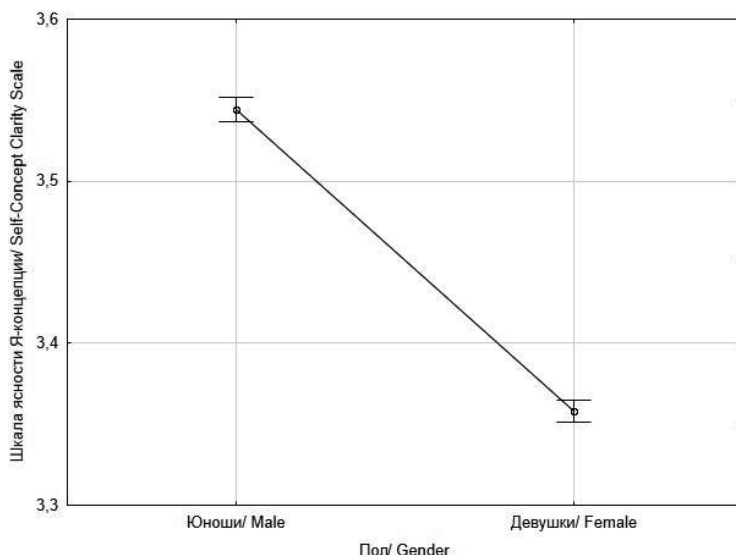


Fig. 1. Average values of the “Self-Concept Clarity Scale” for adolescents of different genders (vertical bars denote 0,95 confidence intervals)

close relationships with friends than boys» is a classic and most replicable finding in cross-cultural studies, consistent with theories of gender socialization (Harter, 2012).

— The proposition «Girls have lower self-esteem regarding their achievements in sports and active games (athletic competence)» is quite consistent with stereotypes and previous research (Kling et al., 1999; Rose, Rudolph, 2006). However, considering the effect size of 1%, within-group differences (differences between individual adolescents) are much more important than between-group differences (between the average boy and the average girl).

— The same applies to the statement that adolescent girls have lower self-esteem regarding readiness for work (job competence) than male adolescents.

Age factor. To assess age-related differences in self-perception and self-concept clarity, a comparison of adolescents of different ages (from 11 to 17 years) was conducted.

Significant differences with a weak effect size were found on the SCCS method ($F(6, 62305) = 77,6; p < 0,0001; \eta^2 = 0,01$). The results of mean values on the clarity scale are presented in Fig. 3. We see a certain decrease in indicators from 11 to 12 years and then a subsequent increase as the adolescent grows older — from 12 to 17 years. Despite the effect size being formally also small, here we find a statistically significant non-linear age trend in the change of self-concept clarity with a turning point around 12 years.

The described dynamics — a decrease in indicators between 11 and 12 years, followed by an increase from 12 to 17 years — corresponds to modern understanding of the course of identity formation. The peak of maximum uncertainty, occurring at the age of 11–12 years, is the period of the beginning of the active phase of puberty and the transition to middle school. The previous, childhood self-concept is being broken down, while a new one has not yet

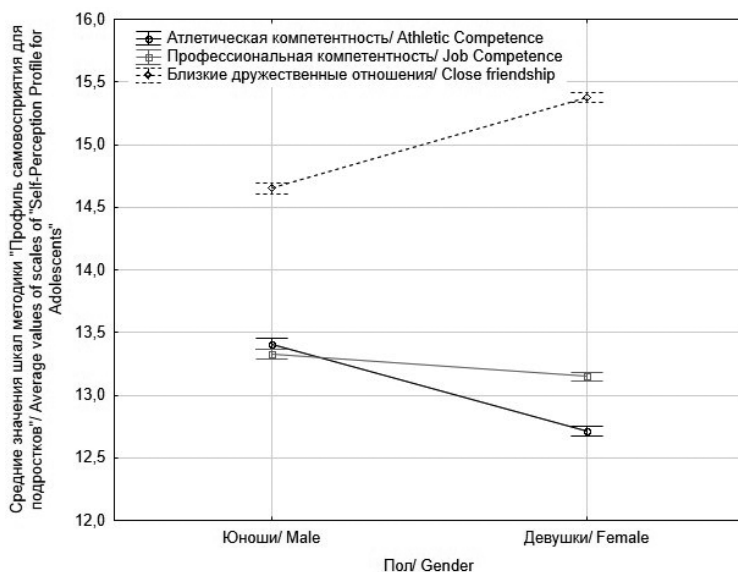


Fig. 2. Average values of 3 scales of the “Self-Perception Profile” method for adolescents of different genders (vertical bars denote 0,95 confidence intervals)

been formed. Later, the adolescent actively experiments with roles, tries themselves in different spheres (studies, hobbies, relationships). Through this experience, communication with peers, and cognitive development, a more holistic, complex, and stable system of self-representations is gradually constructed. This is reflected in the smooth increase in self-concept clarity indicators from 12 to 17 years.

If the increase in self-clarity indicators were linear from 11 to 17 years, this could be explained by the accumulation of experience and cognitive maturation occurring. The empirical discovery of a turning point confirms that identity development is not simply a smooth growth, but a process that includes crisis stages and restructurings. This aligns with E. Erikson's theory (identity crisis vs. role confusion). It also coincides with the so-called pre-adolescent crisis identified in the age periodization of D.B. El-konin, as well as in other more modern stud-

ies of adolescence (Vartanian, 2000; Meeus et al., 2010; Yang et al., 2025).

Significant differences were found for adolescents of different ages on the «Self-Perception Profile» method ($F(48, 498440) = 241,5; p < 0,0001; \eta^2 = 0,02$). The scales with the greatest differences are presented in Fig. 4. As can be seen, with age, adolescents' self-esteem in romantic relationships and self-esteem regarding readiness for work increases, while self-esteem of competence in sports decreases.

Despite the already familiar statistical picture (huge sample, small effect), the content-wise picture shows the direction of development as they grow older on average in the population, systematic shifts (albeit small) in certain areas of self-perception. Let us emphasize that the age-related restructuring primarily affects spheres associated with new, «adult» social roles (romantic partner, future worker). Let us examine this in more detail:

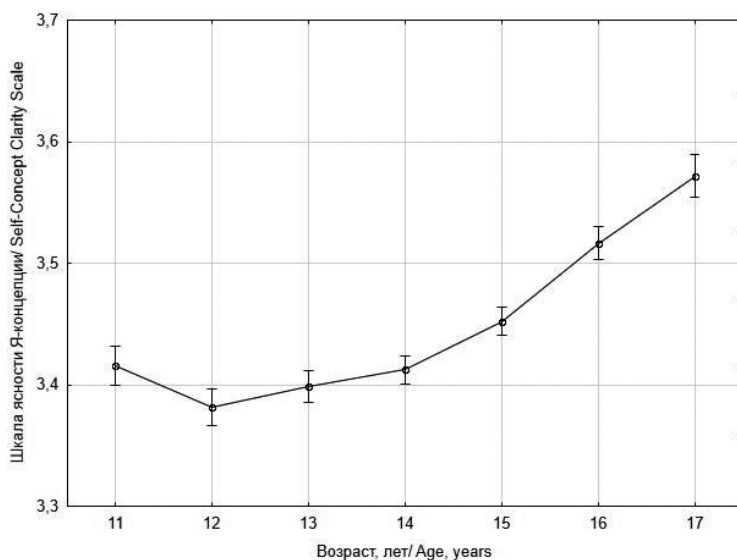


Fig. 3. Average values of the “Self-Concept Clarity Scale” for adolescents of different ages (vertical bars denote 0,95 confidence intervals)

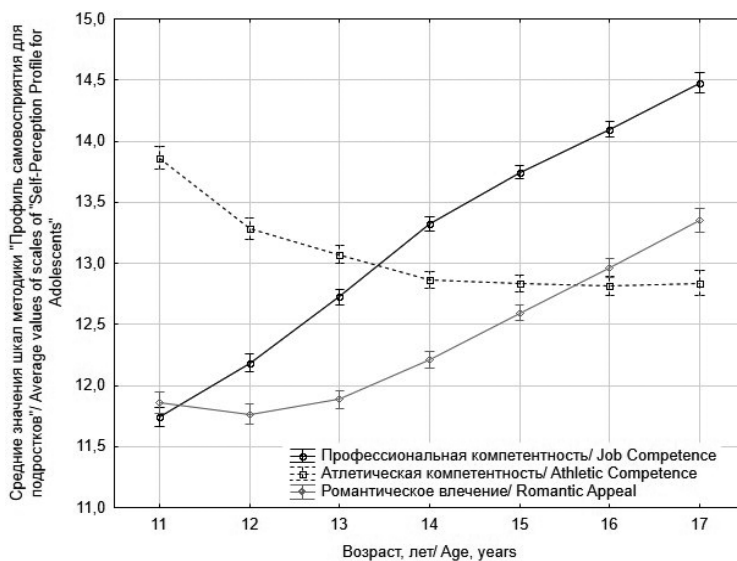


Fig. 4. Average values of 3 scales of the “Self-Perception Profile for Adolescents” method for adolescents of different ages (vertical bars denote 0,95 confidence intervals)

— The increase on the «romantic appeal» scale directly reflects the orientation towards the psychosocial task of establishing close, including romantic, relationships (according to Erikson, «Intimacy vs. Isolation» in the next stage). During adolescence, there is a tremendous leap in interest, experience, and understanding of oneself in a romantic context (Collins, Welsh, Furman, 2009).

— Regarding the formation of «job competence», this is also one of the central tasks of adolescence and young adulthood. Adolescents begin to think more seriously about the future, choose individual educational «post-school» trajectories, and try part-time jobs.

— The decrease in «athletic competence», at first glance, may seem unexpected. However, several explanations for this fact can be assumed: the adolescent's dissatisfaction with their body during puberty; a change in comparison standards and increased self-criticism; a shift in interests and significance to other spheres.

— At the same time, a number of self-perception domains, such as «friendship», «scholastic competence», «behavioral conduct», «global self-worth» (as the basis of self-esteem) — remain relatively stable throughout adolescence.

Academic performance factor. To account for the academic performance factor, 4 self-identification groups of study participants were identified: «excellent student», «good student», «C student», and «D student» (low achiever)¹.

When comparing adolescents with different academic performance, significant differences (with a weak effect size) were obtained on the «Self-Concept Clarity Scale» ($F(3, 62308) = 273,5; p < 0,0001; \eta^2 = 0,01$;

Figure 5). Based on Figure 5, it can be said that the self-concept clarity indicator is related to the adolescent's level of academic performance: the lowest level of self-concept clarity was found in adolescents with low academic performance («D students»), and the highest — in «excellent students». This might seem expected and consistent with the idea of academic achievements as a significant «core» of an adolescent's personality. And again, the effect size indicates: academic performance (like gender and age) explains only 1% of the variance in adolescents' self-concept clarity. The spread within each subgroup is colossal. The average «excellent student» and the average «low achiever» hardly differ in the degree of clarity and confidence regarding who they are as individuals. Among «C students», there are adolescents with crystal-clear and stable self-perception (their self-identification is based on hobbies, sports, social roles), and among «excellent students» — adolescents with high reflection, anxiety, and self-doubt («I am an excellent student, but who am I really?»).

When comparing self-perception profiles, significant differences were found in adolescents with different academic performance ($F(24, 498464) = 201,0; p < 0,0001; \eta^2 = 0,01$; Figure 6). A statistically significant trend towards an increase in indicators on three scales (scholastic competence, social acceptance, close friendship) was found as academic performance improves. However, the negligible magnitude of the overall effect does not allow academic performance to be considered as a significant factor of psychological well-being and indicates the need to search for more powerful predictors in the individual and environmental characteristics of the adolescent.

¹ These are conditional names for academic performance groups; they are used only in the analysis of empirical results. In the materials for study participants, the answer options were presented in descriptions, for example: «I often get D's (low marks)».

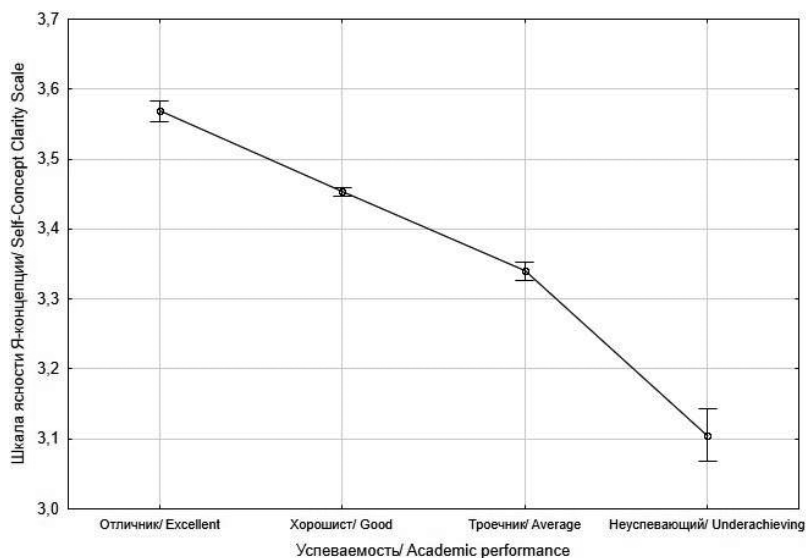


Fig. 5. Average values of the “Self-Concept Clarity Scale” for adolescents with varying academic performance (vertical bars denote 0,95 confidence intervals)

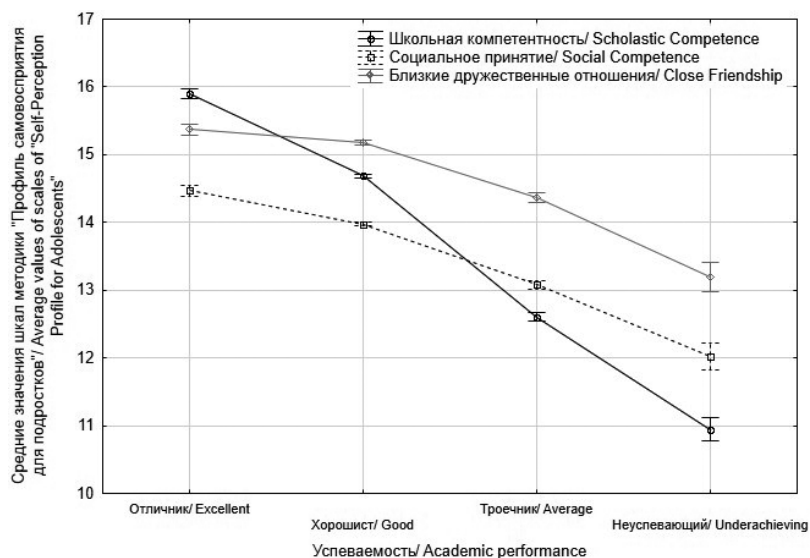


Fig. 6. Average values of 3 scales of the “Self-Perception Profile for Adolescents” method for adolescents with varying academic performance (vertical bars denote 0,95 confidence intervals)

Territory of residence factor. The study was conducted in 85 regions of Rus-

sia, but to determine the territorial zone to which their place of residence belongs, par-

ticipants were offered 10 answer options (e.g., «Ordinary territories», «Ecologically disadvantaged», «Border zone», etc.), the choice of which was made as instructed by the organizers. Despite the statistical significance of the differences, the extremely low effect size indicates the absence of practically significant differences in the self-perception profile ($F(72, 498416) = 14.9$; $p < 0.0001$; $\eta^2 < 0.01$) and level of self-concept clarity ($F(9, 62302) = 17.0$; $p < 0.0001$; $\eta^2 < 0.01$) of adolescents depending on their territories of residence. Territory of residence is not a significant factor influencing the formation of personal identity in adolescents. Let us emphasize that this result indicates the absence of significant differences in average indicators across groups, but it does not negate that specific adolescents who have experienced trauma may have very serious problems.

Relationships between indicators of the self-perception profile and self-concept clarity in adolescents. Table 2 presents the correlations between the «Self-Concept Clarity Scale» and the scales of the «Self-Perception Profile for Adolescents» method. In contrast to the group comparisons (where effects were negligible), here we see moderate, practically significant relationships between self-concept clarity and specific aspects of self-esteem.

The pattern of correlations paints a psychologically convincing picture of what is associated with a clear and stable adolescent «Self»:

— The strongest link is with global self-worth ($r = 0.41$). Self-concept clarity is closely related to the general feeling of self-worth and self-acceptance. The more holistic and stable the self-representation, the higher the overall positive attitude towards oneself. And vice versa.

— Strong links with «public» and evaluated domains — with physical appearance (0,39), scholastic competence (0,35), and social acceptance (0,33) — indicate the importance of feedback from the surrounding world. Clarity of the «Self» is built, among other things, on understanding how successful and accepted one is in areas key to society and peers.

— The link with behavioral control (0,32) indicates that adolescents with a clearer self-concept are better aware of social norms and expectations, are able to behave in accordance with their internal principles, which also strengthens their self-perception.

— Relatively weaker correlations of self-clarity with friendship (0,23) and romantic appeal (0,24) may mean that closeness in communication depends more on other factors (emotional intelligence, attachment style, etc.).

Table 2

Correlations between scales of methods (Pearson correlation coefficient)

Correlations	Self-Concept Clarity Scale
Scholastic Competence	0,35
Social Competence	0,33
Athletic Competence	0,27
Physical Appearance	0,39
Job Competence	0,14
Romantic Appeal	0,24
Behavioral Conduct	0,32
Close Friendship	0,23
Global Self-Worth	0,41

Note: All correlations are significant at the $p < 0.05$ level.

— The weakest link of self-clarity is with job competence (0,14), which seems quite logical. Adolescents' ideas about future work are vague and are not the core of their current identity.

Discussion of results

The conducted study was aimed at examining factors associated with the formation of personal identity in adolescence. Despite the statistical significance of factors such as gender, age, academic performance, and territory of residence (research hypotheses), their practical contribution to explaining the variability of the studied personality characteristics turned out to be negligibly small (η^2 from <0.01 to 0.02). This means that demographic and situational variables collectively explain no more than 2% of the differences between adolescents. This fact is an important empirical argument against the predetermination of personal development by external circumstances or group affiliation. Living conditions themselves, including extreme ones (areas of military operations, environmental disasters), do not predetermine the identity formation trajectory of a particular individual.

At the same time, the substantive analysis of the identified weak trends allowed for the construction of a reliable picture of age-related development. The dynamics of indicators correspond to classical theoretical models. The observed decrease in self-concept clarity at 11-12 years followed by an increase up to 17 years clearly illustrates the crisis phase and subsequent consolidation of identity (Erikson, 1996). Concurrently, the content of self-esteem is restructured: the significance of athletic competence as a more childish domain decreases, while confidence in the romantic and professional spheres, associated with the mastering of new adult roles, naturally increases. At the same time, the «core» of self-esteem (general self-worth, quality of close friend-

ship, and scholastic competence) remains relatively stable, providing support for the individual during a period of change.

The semantic center of the study became the correlation analysis, which revealed stable relationships between self-concept clarity and various aspects of adolescents' self-perception. The closest link was found with global self-worth ($r = 0,41$), confirming the conceptual proximity and mutual reinforcement of these constructs: positive self-attitude contributes to the integration of new experience, the construction of a holistic and consistent «Self», and vice versa. Thus, the study demonstrates that personality formation in adolescence is primarily a process of active self-construction within the system of relationships with significant people.

Conclusion

A large-scale study involving more than 62000 adolescents from 85 regions of Russia ensures high representativeness of the obtained data and allows us to speak about all-Russian trends in the development of personal identity.

Let us summarize the findings:

The study results empirically confirm the non-linear dynamics of identity formation. The clarity of self-representations, according to our data, decreases at 11–12 years («identity crisis», «pre-adolescent crisis»), and then increases up to 17 years, which confirms the relevance of the patterns of adolescent personality development formulated in the classical theories of E. Erikson and D.B. Elkonin.

The main paradox of the study results is that demographic and situational variables (gender, academic performance, territory of residence) have practically no effect on adolescents' self-perception and self-concept formation. These factors explain only 1–2% of the differences, shifting the focus to individual-personal and microsocial mechanisms of «Self» formation.

With age, adolescents' confidence in the romantic and future professional spheres («adult» roles) increases, but their evaluation of their own athletic abilities may decrease. At the same time, global self-worth, belief in their scholastic abilities, and the quality of friendship remain a stable support of the self-concept.

Specific links in the structure of adolescent identity have been established. The strongest link was found between self-clarity and global self-worth; confidence in one's appearance, academic, and social successes are also closely related to holistic self-perception in the adolescent period.

Adolescence is a period of active self-creation, not of passive «molding» of personality even by objective life circumstances. A stable personality is built through self-awareness, positive experience, and reliable relationships.

The results have both theoretical significance (expanding understanding of identity development processes) and practical value for the development of programs for

psychological and pedagogical support of adolescents. The identified features of self-perception of modern adolescents in the digital era require further study and consideration when developing educational interventions.

Psychological and pedagogical support for the personal development of adolescents must be deeply individualized, since universal strategies based on gender or academic performance factors will be ineffective. Key directions become facilitating the development of reflection, support in socially significant domains (academic activity, social skills, formation of a healthy body image), and creating a supportive microenvironment (family, school, circle of friends).

Limitations. It should be noted that the study was conducted using a cross-sectional design, which does not allow for capturing the true dynamics of changes as children age. The self-assessment psychodiagnostic instruments used may have limitations.

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Motivational and volitional predictors of academic performance among university students

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Abstract

Context and relevance. The psychological literature provides significant links between motivational, volitional (meta-motivational) processes and academic performance of students, however, most research in this area has focused on schoolchildren, while university students are studied much less frequently. University students have been studied less frequently, yet it is important to understand which psychological variables predict high academic achievement, as the quality of a student's professional skills and, consequently, the quality of the graduate specialist depend on their success in completing a training program. **Objective.** The aim is to investigate motivational and volitional predictors of academic performance among university students. **Hypothesis.** Academic performance is directly related to intrinsic academic motivation and volitional regulation; volitional qualities and achievement motivation directly predict academic performance; volitional regulation is a mediator between academic motivation and academic performance. **Methods and materials.** The study involved 641 participants: 75 men and 566 women ($M = 27,9$, $SD = 9,4$) — students of the Moscow Institute of Psychoanalysis. Psychodiagnostics tools: "A short scale of academic motivation", "Action control scale" by J. Kuhl, "Questionnaire for identifying the severity of self-control in the emotional sphere, activity and behavior". **Results.** Results showed positive correlations between motivation, volitional regulation, and academic performance. Regression analysis revealed that achievement motivation, external and cognitive motivation are predictors of academic performance. Mediation analysis showed that motivation directly affected academic performance, but also indirectly through its effect on volitional regulation. **Conclusions.** The influence of volitional regulation on academic performance is mediated by academic motivation. However, this effect depends on the type of motivation. It is most pronounced for cognitive and achievement motivation, while for external motivation, it is only manifested in the indicator of control over action.

Keywords: academic motivation, volitional regulation, academic performance, self-control, self-regulation, higher education, students

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Мотивационные и волевые предикторы академической успеваемости у студентов вуза

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Резюме

Контекст и актуальность. В психологической литературе представлены значимые связи между мотивационными, волевыми (метамотивационными) процессами и академической успеваемостью учащихся, однако большинство исследований в данной области сосредоточено на школьниках, тогда как студенты университетов изучаются гораздо реже. Важно знать, какие психологические переменные являются предикторами высокой академической успеваемости у студентов, так как от успешности освоения программы обучения зависит качество овладения студентом профессиональными компетенциями и, соответственно, качество выпускаемого специалиста. **Цель.** Выявить мотивационные и волевые предикторы академической успеваемости у студентов, обучающихся в вузе. **Гипотезы.** Академическая успеваемость у студентов вуза прямо связана с внутренней академической мотивацией и особенностями волевой регуляции; прямыми предикторами академической успеваемости являются волевые качества и мотивация достижений. **Методы и материалы.** В исследовании приняли участие 641 человек: 75 мужчин и 566 женщин — студенты Московского института психоанализа ($M = 27,9$, $SD = 9,4$). Психодиагностические методики: «Краткая шкала академической мотивации», «Шкала контроля за действием» Ю. Куля, «Вопросник для выявления выраженности самоконтроля в эмоциональной сфере, деятельности и поведении» Г.С. Никифорова и соавт. **Результаты.** Результаты показали положительные связи между мотивацией, волевой регуляцией и академической успеваемостью. Регрессионный анализ выявил, что предикторами академической успеваемости являются мотивация достижения, экстернальная и познавательная мотивация. Медиаторный анализ продемонстрировал, что мотивация напрямую влияет на академическую успеваемость, а воля влияет опосредованно, через мотивацию. **Выводы.** Влияние волевой регуляции на успеваемость опосредовано академической мотивацией, однако этот эффект зависит от вида мотивации: он наиболее выражен для познавательной мотивации и мотивации достижения, а для экстернальной мотивации он проявился только для показателя контроля за действием.

Ключевые слова: академическая мотивация, волевая регуляция, академическая успеваемость, самоконтроль, саморегуляция, высшее образование, студенты

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Introduction

In today's world, increasing professional development requirements have fueled a growing interest in higher education among applicants and their parents (Varlamova et al., 2024). However, many first-year students fail to complete their degrees; non-completion rates range from 15% to 54% globally (Gorbunova, 2018). Furthermore, variations in the mastery of professional competencies among graduates can negatively impact both individual performance and the broader economy. Consequently, there is a critical need to investigate the predictors of academic success and performance in higher education.

Research on predictors of academic performance has a long history in psychology. Studies have primarily focused on cognitive factors, such as general abilities, individual cognitive functions, and cognitive styles, alongside contextual and environmental factors that mediate these relationships (Dvoynin et al., 2020). Recent reviews indicate that psychometric intelligence remains the most reliable predictor of academic performance, exerting both direct and mediating influences. Moreover, the significance of variables such as creativity, motivation, and personality appears to increase with age (Dvoynin, Trotskaya, 2022).

Research in academic motivation suggests that performance depends on both the intensity and the quality of motivation (Nikitskaya, Tolstykh, 2018). Drawing on PISA 2018 data, Gordeeva and Sychev (2024) noted that intrinsic motivation and self-efficacy demonstrate the most consistent and robust correlations with academic achievement. While links between reading comprehension and literacy have been ob-

served in schoolchildren (ibid.), studies on university students show that intrinsic motivation positively correlates with academic performance and serves as a key predictor of degree completion (Meens et al., 2019). Overall, these findings suggest that higher levels of autonomous engagement in learning activities lead to superior academic outcomes.

Recently, increasing attention has been directed toward the role of regulatory processes in learning. Evidence suggests that students possessing effective self-regulation strategies demonstrate superior academic performance, higher motivation, and greater satisfaction with the learning process. Internationally, this phenomenon has been extensively examined within the Self-Regulated Learning (SRL) framework (Fomina, 2022).

In Russian psychology, the relationship between regulatory processes and academic achievement has been thoroughly explored by V.I. Morosanova and colleagues. This school of thought views conscious self-regulation as a critical resource for establishing and attaining personally significant goals. Studies have identified significant positive correlations between conscious self-regulation, academic engagement, subjective well-being, and performance among middle and high school students (Fomina et al., 2021; Fomina et al., 2024). Furthermore, Bondarenko and Fomina (2023) developed a structural model of academic success for young adolescents that integrates conscious self-regulation with motivation and the Big Five personality traits. Their findings indicate that conscious self-regulation provides the most substantial contribution among these variables, while also functioning as a mediator for other factors.

Beyond metacognitive processes, researchers emphasize that metamotivational or volitional processes — responsible for sustaining motivation despite obstacles — play a vital role in learning (Ivannikov et al., 2014; Duckworth et al., 2019).

Currently, psychology lacks a unified definition of volition. Most researchers, however, conceptualize it as the process of managing motivation or the impulse to act. This perspective, first proposed by K. Lewin in the 20th century, was later refined by German psychologists H. Heckhausen and J. Kuhl, who defined volition as a function that maintains a working intention in an active state. Similarly, self-regulated learning models treat volition as a set of conscious strategies for managing learning motivation. Other scholars, including R. Baumeister, J. Ainslie, and A.L. Duckworth, view volition primarily as impulse control (for a review, see Shlyapnikov, 2022). In Russian psychology, this tradition is rooted in the work of L.S. Vygotsky and his successors.

This study adopts V.A. Ivannikov's approach, which defines volitional regulation as a personal form of voluntary regulation involved in managing impulses during conflicts between different levels of activity regulation (Ivannikov et al., 2014). Given that educational activities are prolonged, students inevitably encounter internal and external distractors. Consequently, volitional regulation is expected to play a critical role in the learning process. Although empirical evidence remains limited, existing research indicates a link between volitional self-control and academic outcomes, including grades, standardized test scores, and graduation rates (Duckworth et al., 2019). Among Russian students, academic performance has

been positively associated with scores on J. Kuhl's Action Control Scale, behavioral self-control, and volitional self-esteem, though these relationships vary by field and year of study (Shlyapnikov, 2021).

Most researchers agree that volition and motivation are inextricably linked. According to Heckhausen and Kuhl, motivation determines the direction of activity by influencing goal formation, whereas volition ensures the realization of these intentions by protecting them over time (Shlyapnikov, 2022). Ivannikov further posits that during volitional regulation, individuals create additional incentives through various social and personal means (Ivannikov et al., 2014). Despite these theoretical frameworks, the combined contribution of academic motivation and volitional regulation to academic performance remains under-researched.

Conclusion of the Literature Review. In summary, existing research highlights significant links between motivational and volitional (meta-motivational) processes and academic performance. However, most studies have focused on secondary education, leaving higher education relatively under-examined. University education possesses unique characteristics that likely influence these psychological processes. Unlike compulsory schooling, university attendance is a voluntary choice. Upon completing high school, individuals face diverse life paths, including entering the workforce, starting a family, or pursuing higher education — each requiring substantial time and effort. In the university setting, students must navigate their academic journey with increased autonomy, relying less on the direct support of parents and teachers. Under these conditions, the role of internal regulators, spe-

cifically motivation and volition, becomes increasingly critical.

Study objective. This study aims to examine the motivational and volitional predictors of academic performance among university students.

Hypotheses. Based on the literature review, we hypothesize that:

Academic performance in university students is positively associated with academic motivation (primarily intrinsic motivation).

Academic performance is significantly linked to characteristics of volitional regulation, specifically volitional dispositions (as defined by J. Kuhl) and volitional self-control

Our second hypothesis posits that academic motivation and volitional regulation exert a joint influence on academic performance, as suggested by various scholars (e.g., K. Lewin, L.S. Vygotsky, H. Heckhausen, J. Kuhl, L. Corno, M. Boekaerts, and V.A. Ivannikov) (Ivannikov et al., 2014). However, the underlying mechanisms of this interaction remain poorly understood, leading to two alternative models:

Model A ("Volition mediates Motivation"): Based on the frameworks of Heckhausen and Kuhl, motivation is responsible for intention formation, while volition ensures its protection and implementation. From this perspective, motivation alone is insufficient for goal attainment; volitional regulation is required (Koole, Baumann, 2018). Here, academic motivation serves as a predictor, and volitional regulation acts as a mediator of academic performance.

Model B ("Motivation mediates Volition"): In Russian psychological tradition (e.g., L.S. Vygotsky, D.N. Uznadze, V.A. Ivannikov), volition is conceptualized as impulse mastery or "artificial motivation"

(Ivannikov et al., 2014). This suggests that volition exerts an indirect influence by maintaining an optimal level of motivation. In this model, volitional regulation acts as a predictor, while academic motivation serves as the mediator for academic performance.

Materials and methods

Sample characteristics. To test the hypotheses, a correlational study was conducted among first- and second-year students at the Moscow Institute of Psychoanalysis. The sample included individuals enrolled in full-time and part-time Bachelor's, Specialist, and Master's programs in Psychology and Clinical Psychology. A total of 641 participants took part ($N = 641$), comprising 75 men and 566 women. The mean age was 27.9 years ($SD = 9.4$), which reflects the specific demographic profile of the university's student body. Bachelor's students constituted 35.6% of the sample, Master's students 39.1%, and Specialist students 25.3%. Full-time and part-time students accounted for 57.5% and 42.5% of the sample, respectively.

Methods.

Motivational predictors: Academic motivation was assessed using the Brief Academic Motivation Scale (Gordeeva, Sychev, Osin, 2014).

Volitional predictors: These were measured using the "Action Control during Planning" subscale from J. Kuhl's Action Control Scale (adapted by Shapkin, 1997) and the Self-Control Questionnaire for emotional, activity, and behavioral domains (Nikiforov, Vasilyeva, Firsova, as cited in Ilyin, 2000).

Academic performance: The performance indicator was calculated as the Grade Point Average (GPA) from the spring

semester midterm assessments in general subjects (specialized subjects were excluded). Based on the university's 10-point grading system, both exams and tests were included in the calculation. Missing grades (absences) were excluded from the GPA computation. All performance data were provided by the university's Academic and Methodological Department.

Procedure. The study was conducted during the spring semester of 2024. Participants completed either paper-based or electronic versions of the questionnaires. Faculty supervisors informed students about the study, which was voluntary, unpaid, and non-anonymous. Prior to participation, all students were briefed on the study's goals and provided informed consent.

Statistical data analysis.

Parametric statistics were employed as all variables in the sample followed a normal distribution. To ensure comparability across different scales, all variables were converted into standardized z-scores. To test the first hypothesis, Pearson correlation coefficients were calculated between academic performance indicators and motivational and volitional variables. Subsequently, stepwise multiple linear regression was performed.

To test the second hypothesis, mediation analysis was conducted to compare two competing models. In Model A, motivation served as the predictor with volition as the mediator. Conversely, in Model B, volition acted as the predictor and motivation as the mediator. In both models, academic performance was the dependent variable.

Data processing was performed using IBM SPSS Statistics (v. 23). Mediation analysis was executed using the

PROCESS macro (v. 3.3) developed by A. Hayes (Model 4). A bootstrapping procedure with 5000 resamples was utilized to estimate the significance of indirect effects. Mediation was considered significant if the indirect effect was statistically reliable and if its magnitude exceeded the direct effect.

To control for the influence of demographic and academic factors on performance, a univariate analysis of covariance (ANCOVA) was conducted. Academic performance served as the dependent variable, while gender, level of study, and year of study were treated as independent variables, with age included as a covariate.

Results

Table 1 presents the descriptive statistics and the results of the correlation analysis for academic performance, academic motivation, and volitional regulation..

As shown in Table 1, academic performance correlates significantly with numerous indicators of academic motivation and volitional regulation. Positive correlations were observed with the Action Control Scale, behavioral self-control, and both cognitive and achievement motivation. Conversely, negative correlations were found for introjected and external motivation. Notably, the correlation coefficients between performance and motivation ($r = 0,25-0,30$) were substantially higher than those between performance and volitional regulation ($r = 0,10-0,20$). These results suggest that higher intrinsic motivation, greater behavioral self-control, and a stronger action orientation are associated with superior academic performance. In contrast, higher extrinsic motivation and a pronounced state orientation are linked to lower grades.

Table 1

Relationship between the indicators of academic performance, academic motivation and features of volitional regulation among students (N = 641)

Переменные	M (SD)	α	Пирсона
Academic performance	8,77 (1,06)	–	1
Act control scale	5,18 (2,83)	0,745	0,10**
Emotional Self-control	13,24 (3,24)	0,516	0,07
Behavioral Self-control	16,48 (3,75)	0,670	0,14**
Social Self-control	15,24 (3,77)	0,574	0,07
Cognitive motivation	17,53 (2,81)	0,897	0,30**
Achievement motivation	15,64 (3,49)	0,886	0,31**
Introjected motivation	9,74 (4,15)	0,756	–0,14**
External motivation	6,59 (2,92)	0,678	–0,25**

Note: «*» — correlation is significant at the 0,05 level (two-sided); «**» — correlation is significant at the 0,01 level (two-sided).

Table 1

Relationship between the indicators of academic performance, academic motivation and features of volitional regulation among students (N = 641) (continuation)

Переменные	1	2	3	4	5	6	7
Act control scale (1)							
Emotional Self-control (2)	0,088*						
Behavioral Self-control (3)	0,215**	0,232**					
Social Self-control (4)	0,121**	0,356**	0,486**				
Cognitive motivation (5)	0,234**	0,113**	0,283**	0,163**			
Achievement motivation (6)	0,338**	0,189**	0,324**	0,169**	0,719**		
Introjected motivation (7)	–0,149**	–0,05	0,101**	0,142**	–,169**	–0,194**	
External motivation (8)	–0,215**	–0,143**	–0,114**	–0,028	–0,423**	–0,392**	0,623**

Table 1 further demonstrates that motivational and volitional indicators are inter-related. Cognitive and achievement motivation showed significant positive correlations with all volitional measures. External motivation was significantly and negatively correlated with the Action Control Scale and both emotional and behavioral self-control scores. Introjected motivation correlated positively with behavioral and social self-control but negatively with Action Control Scale scores. These interrelationships justify the subsequent use of mediation analysis.

The ANCOVA results revealed that academic performance was significantly influenced by age ($F(1) = 29,02$, $p < 0,01$), education level ($F(2) = 12,44$, $p < 0,01$), and year of study ($F(1) = 9,01$, $p < 0,01$), while the influence of gender was non-significant ($F(1) = 2,27$, $p > 0,05$). The regression analysis (Table 2) yielded a three-factor model ($R^2 = 0,111$), identifying the following as significant predictors of academic performance: achievement motivation (0,176), external motivation (–0,127), and cognitive motivation (–0,110). Low Variance Inflation Factor (VIF) values

confirmed the absence of multicollinearity among the predictors.

To test the second hypothesis, a mediation analysis was conducted using academic performance as the dependent variable, while volitional and motivational measures alternately served as predictors and mediators. Due to space constraints, only the Action Control Scale and behavioral self-control were included as volitional measures (Figures 1–4).

Figure 1 presents four models concerning cognitive motivation. In Models 1a and 2a, cognitive motivation serves as the predictor, whereas in Models 1b and 2b, it acts as the mediator. Results indicate that Models 1a and 2a demonstrate a significant positive direct effect of motivation on academic performance. However, the indirect effects mediated by the Action Control Scale and behavioral self-control were non-significant, indicating the absence of a mediation effect.

In contrast, Models 1b and 2b showed that the direct effects of the Action Control Scale and behavioral self-control on academic performance were non-significant, while the indirect effects mediated by cognitive motivation were significant. Notably, the effect of the Action Control Scale on academic motivation was higher (0,083) than that of behavioral self-control (0,069). However, these indirect effects were smaller than the direct effects of cognitive motiva-

tion (0,286 and 0,296, respectively). These findings suggest that cognitive motivation influences academic performance independently of volitional regulation, whereas volitional characteristics impact performance primarily indirectly through their influence on motivation

For Models 3a and 4a, a significant direct effect of achievement motivation on academic performance was observed, while the indirect effects mediated by the Action Control Scale and behavioral self-control were non-significant (Figure 2). Consequently, no mediation effects were present in these models. In contrast, for Models 3b and 4b, the direct effects of the Action Control Scale and behavioral self-control were non-significant, whereas the indirect effects mediated by achievement motivation were significant. These results indicate that achievement motivation follows a pattern similar to cognitive motivation, acting as a mediator for volitional variables. Notably, the direct effects of achievement motivation (0,311) and (0,299) were substantially higher than the mediated effects of the volitional measures, with the Action Control Scale exerting a stronger influence than behavioral self-control (0,102) vs. (0,098), respectively).

In Models 5a and 6a (Figure 3), introjected motivation was treated as the predictor, while in Models 5b and 6b, it served as the mediator. Significant direct and indirect

Predictors of academic performance (N = 641)

Table 2

Предикторы	β	t	p	VIF
Achievement motivation	0,176	3,183	0,002	2,173
External motivation	–0,127	–3,048	0,002	1,230
Cognitive motivation	0,110	1,977	0,048	2,204

Note: β — standardized regression coefficient, t — T-statistic associated with the significance level, p — significance level, VIF — dispersion inflation factor.

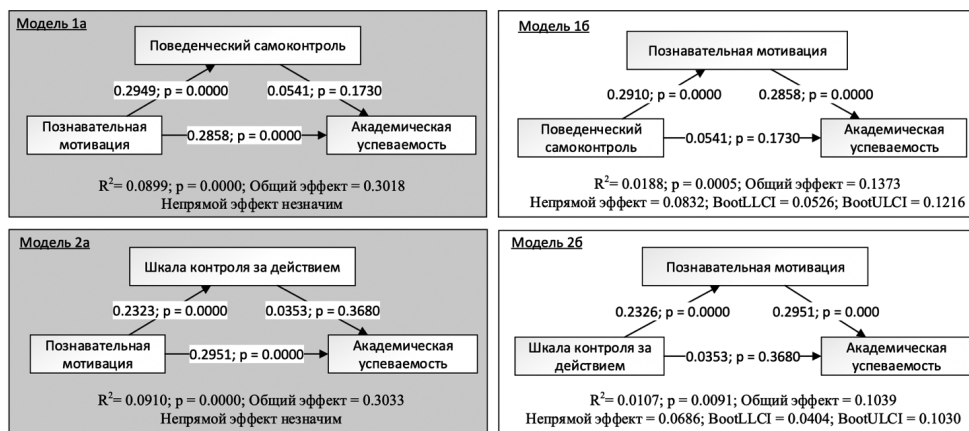


Fig. 1. Comparison of the suitability of models where the predictors are alternately indicators of cognitive motivation (model 1a and 2a) and volitional regulation (behavioral self-control and action control scale: models 1b and 2b) (N = 641)

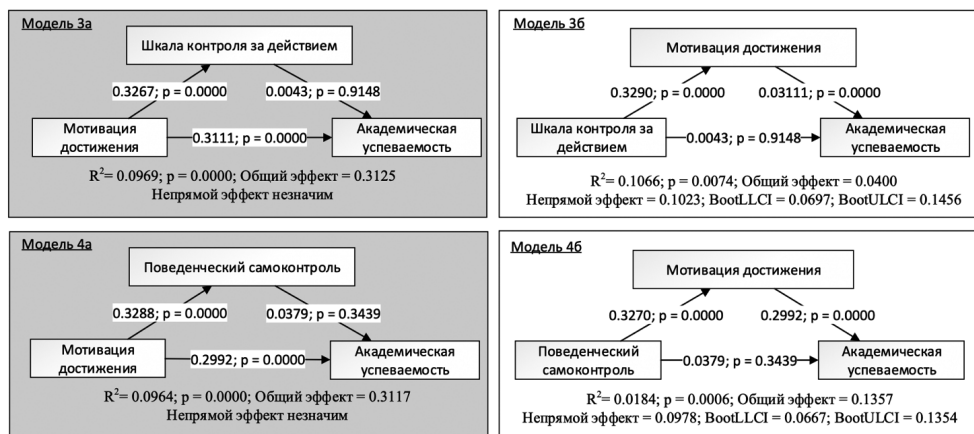


Fig. 2. Comparison of the suitability of models where indicators of achievement motivation (model 3a and 4a) and volitional regulation (models 3b and 4b) are alternately predictors (N = 641)

effects were found across all four models; specifically, introjected motivation exhibited negative direct and total effects, whereas the Action Control Scale and behavioral self-control showed positive effects. However, the magnitude of the direct effects was approximately tenfold larger than the indirect effects, suggesting that any emergent mediation effects are marginal. These

findings imply that introjected motivation and individual volitional characteristics are relatively independent and do not exert substantial reciprocal mediation effects on academic performance

Figure 4 presents the models for external motivation, with Models 7a and 8a treating it as the predictor and Models 7b and 8b as the mediator. In Model 7a, a

significant negative direct effect of external motivation on academic performance was observed, whereas the indirect effect mediated by the Action Control Scale was non-significant. Conversely, in Model 7b, the direct effect of the Action Control Scale on academic performance was non-significant, while the indirect effect mediated by external motivation was statistically significant. However, the identical magnitudes of the direct and indirect effects in this instance suggest that the practical significance of this mediation is inconclusive.

For Models 8a and 8b, both direct and indirect effects were significant. Nonetheless, the direct effects were substantially larger than the indirect effects. These findings indicate that in the case of behavioral self-control and external motivation, mediation effects do not exert a substantial impact on academic performance.

Discussion

The findings provide robust support for the first hypothesis. The primary result in-

dicates that academic performance is significantly associated with both academic motivation and students' volitional regulation. Regression analysis further suggests that achievement, external, and cognitive motivation exert independent effects on academic achievement.

Regarding the second hypothesis, the empirical data support a model where individual volitional characteristics serve as predictors of academic performance, with academic motivation acting as a mediator. These mediation results indicate that the influence of volitional regulation on performance is primarily channeled through academic motivation. However, this effect is type-dependent: it is most pronounced for cognitive and achievement motivation, while remaining negligible for introjected motivation. For external motivation, the effect was only evident in relation to the Action Control Scale.

These results align with existing literature, confirming that academic success is linked to both motivational and volitional factors. The strong correlations observed

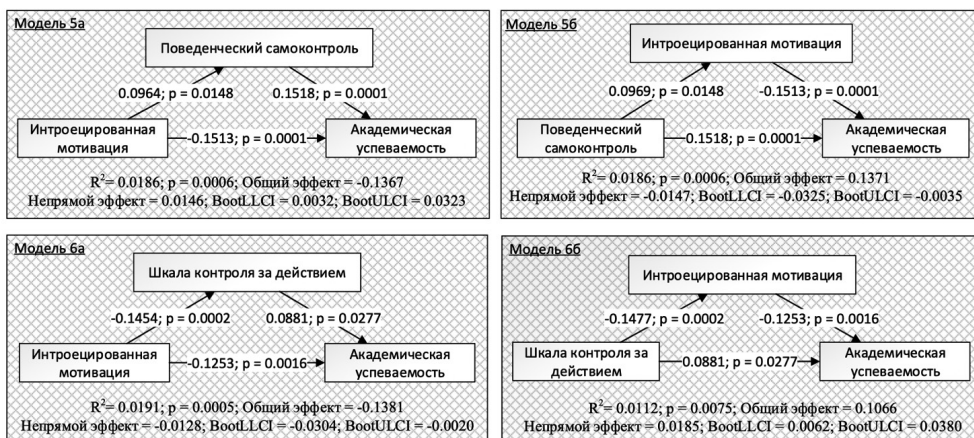


Fig. 3. Comparison of the suitability of models where indicators of introjected motivation (models 5a and 6a) and volitional regulation (models 5b and 6b) are alternately predictors (N = 641)

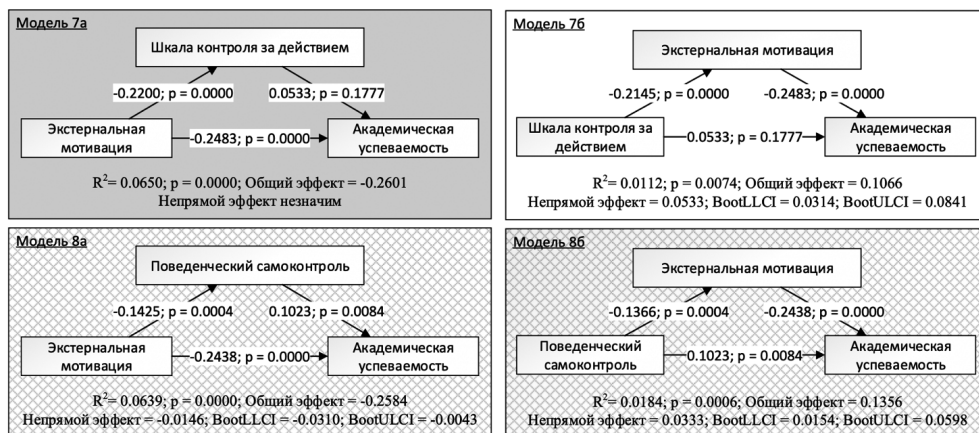


Fig. 4. Comparison of the suitability of models where indicators of external motivation (models 7a and 8a) and volitional regulation (models 7b and 8b) are alternately predictors (N = 641)

for cognitive and achievement motivation are consistent with previous findings among schoolchildren (Gordeeva, Sychev, 2020). Conversely, the significant negative associations found for introjected and external motivation reinforce the premise that intrinsic motivation, rather than extrinsic drivers, is the primary determinant of success in higher education.

Notably, the correlations between volitional regulation and academic performance were significantly weaker than those between motivation and performance. Significant correlations were restricted to the Action Control Scale and behavioral self-control. These findings suggest that individuals with an action orientation tend to achieve higher academic performance than those with a state orientation, consistent with J. Kuhl's theoretical framework (Koole, Baumann, 2018). Furthermore, the observed links between academic performance and self-control are congruent with both domestic and international research (Shlyapnikov, 2021; Duckworth et al., 2019).

The regression analysis indicates that motivational and volitional factors explain approximately 11,1% of the variance in academic performance ($R^2 = 0,111$). This contribution is substantial, considering the model excludes cognitive factors and contextual variables, which are often cited as primary predictors of academic achievement (Dvoynin, Trotskaya, 2022). According to the final model, achievement, external, and cognitive motivation serve as the most robust predictors of performance. Notably, this study assessed only specific individual traits of volitional regulation, such as volitional dispositions and self-control. However, as previously noted, volitional regulation is conceptualized not as a stable trait, but as a dynamic process of actions or operations (volitional acts) aimed at compensating for motivational deficits (Ivannikov et al., 2014). Although standardized methods for assessing these specific actions are currently lacking, they likely make a significant contribution to learning success, highlighting the need for more sophisticated assessment tools.

While the correlation and regression analyses reproduce patterns previously observed in secondary school students, the mediation analysis reveals novel relationships between volitional regulation and student motivation. The results suggest that high academic motivation — primarily intrinsic — is an independent predictor of performance that does not necessarily require volitional regulation. Conversely, individual volitional characteristics influence academic performance only in the presence of high intrinsic motivation. A notable exception is Model 7b, where the Action Control Scale is associated with external motivation. However, all relationships in this model were negative, suggesting that individuals with a state-oriented approach may exhibit higher external motivation, which overall negatively impacts academic success.

In summary, these results indicate that the impact of volitional regulation emerges from a complex interaction between motivation and individual volitional traits. It appears that stable volitional characteristics, such as dispositions or self-control levels, are insufficient to exert a direct influence on academic performance; rather, their influence becomes most pronounced when mediated by intrinsic motivation. This finding is highly congruent with the theoretical frameworks of volitional regulation developed by V.A. Ivannikov and colleagues (Ivannikov et al., 2014).

The relationships between academic performance and factors such as age, education level, and year of study also merit consideration. These variables appear to be inherently interrelated and collectively exert a positive influence on academic success; specifically, older students tend to achieve higher performance levels.

However, this relationship is multifaceted, as age and academic standing are often confounded by several difficult-to-control variables. These include the cumulative experience gained during residency, selective attrition rates (where lower-performing students are more likely to withdraw), and curriculum shifts toward more specialized courses in later years.

Critically, the life situations of the participants significantly influence these dynamics. The students in this sample were older than those typically found in traditional university settings, as most had pursued higher education after completing vocational college, serving in the military, or gaining work experience. Such non-traditional trajectories likely shape distinct motivational and volitional profiles. As the demographic of lifelong learners continues to expand within the global educational landscape, investigating these phenomena remains a priority for future research. Consequently, subsequent studies should focus on the specific mechanisms through which adult life experiences interact with academic self-regulation.

Conclusions

Overall, the findings support the proposed hypotheses and provide a deeper understanding of how motivational and volitional factors contribute to university student performance. Both academic motivation and volitional regulation serve as significant predictors of academic achievement. Notably, academic motivation exerts the most substantial influence: intrinsic and achievement motivations correlate positively with performance, whereas extrinsic and introjected motivations show negative associations. Regarding volitional regulation, academic performance is

linked specifically to action control and behavioral self-control. However, mediation analysis suggests that the influence of volitional factors on performance is primarily indirect, with intrinsic and achievement motivation acting as key mediators. These results imply that individual volitional characteristics enhance academic success predominantly when high levels of intrinsic motivation are present.

Practical implications. These findings underscore the critical role of intrinsic motivation in higher education. As adult learners who have independently chosen their academic paths, students rely heavily on internal drivers and willpower. Educational institutions should consider these factors when designing curricula and pedagogical regulations. To enhance educational quality, universities should foster environments that cultivate intrinsic motivation by providing academic freedom, constructive feedback, and robust student support.

Limitations and future research. A limitation of this study is its cross-sectional design. According to H. Heckhausen, the significance of motivation and volition tends to increase over time. Therefore, future research will focus on the longitudinal dynamics of academic performance throughout the entire course of study. We also plan to integrate digital engagement metrics from the university's online learning environment as additional success indica-

tors. Furthermore, subsequent studies will investigate the nuanced relationships between motivation, age, and education level to identify age-specific predictors of academic achievement across diverse student populations.

Several limitations of this study warrant consideration. First, the data were obtained from a large but relatively specific sample consisting exclusively of psychology students. Previous research suggests that the relationship between volition and academic performance may vary significantly across different academic disciplines (Shlyapnikov, 2021). Second, the study was conducted at a private university where the majority of students are self-funded, a factor that could uniquely influence motivational profiles. Consequently, these patterns should be validated across more diverse institutional settings.

Third, the demographic composition, specifically the age and gender distribution, may limit the generalizability of the findings. Furthermore, the reliance on Grade Point Average (GPA) as the sole metric for academic performance raises questions regarding its comprehensiveness. Future research should incorporate supplementary success indicators — such as professional competency assessments or longitudinal engagement metrics — to provide a more nuanced understanding of student achievement.

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Contribution of the authors

Vladimir N. Shlyapnikov — ideas; planning of the research; application of statistical methods for data analysis, writing the manuscript; control over the research.

Mariia A. Shestova — annotation and designed of the manuscript, conducting the research: data collection; visualization of research results.

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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The development of N.A. Aminov's model of pedagogical abilities in the context of teachers' understanding of students' emotions related to mathematics

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Abstract

Context and relevance. Contradictions between the importance of teacher professionalism for the state and society, and the uncertainty of his main professional abilities; the importance of mathematics for the development of the individual and its prospects, and the quality of mathematical education indicated in the documents of the Government — all this causes a scientific problem, which consists in the uncertainty of approaches to the study of the key abilities of the teacher, which cannot but affect education and society. **Objective.** Actualization of N.A. Aminov's model of pedagogical abilities within its core component — the reflective module — using the example of mathematics teachers. **Methods and materials.** Historical and psychological reflection on the works of N.A. Aminov; a theoretical analysis of studies on the psychology of teacher abilities, including the ability to understand the emotions of schoolchildren, using the example of mathematics teachers; and the formalization and refinement of N.A. Aminov's model of pedagogical abilities. **Conclusions.** The reflective module, which is the basic module for the structure of the main components of pedagogical abilities when using the additive principle, is concretized in reflexivity, pedagogical intentionality — the focus of the teacher's consciousness on the student as a subject of education, resistance to emotional burnout, and perceptive abilities — sensitivity to the student's experiences and difficulties. The severity of the basic — reflective module of teacher's pedagogical abilities can be determined using the proposed formula for the integral index. Since teaching mathematics predetermines the success of a student in other disciplines, the study of the pedagogical abilities of a mathematics teacher is an important and promising direction in psychological and pedagogical research. In the future, it is planned to study the application of the integral index to the analysis of the reflective module of pedagogical abilities using artificial intelligence, including for teachers of other profiles.

Keywords: teachers of mathematics, pedagogical abilities, emotions, reflexivity, pedagogical intentionality, model of N.A. Aminov

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Развитие модели педагогических способностей Н.А. Аминова в контексте понимания учителями математики эмоций учащихся

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Резюме

Контекст и актуальность. Противоречия между важностью профессионализма учителя для государства и общества и неопределенностью его главных профессиональных способностей; значение математики для развития личности и ее перспектив и качество математического образования, указанные в документах правительства Российской Федерации, — все это обуславливает научную проблему, которая состоит в неопределенности подходов к исследованию ключевых способностей учителя, что не может не влиять на образование и общество. **Цель.** Актуализация модели педагогических способностей Н.А. Аминова в рамках ее базовой части, рефлексивного модуля, на примере учителей математики. **Методы и материалы.** Историко-психологическая рефлексия трудов Н.А. Аминова; теоретический анализ исследований психологии способностей учителя, в том числе способностей к пониманию эмоций школьников, на примере учителей математики; формализация и уточнение модели педагогических способностей Н.А. Аминова. **Выводы.** Рефлексивный модуль, являющийся базовым для структуры главных компонентов педагогических способностей при использовании аддитивного принципа, конкретизируется в рефлексивности, педагогической интенциональности — направленности сознания учителя на ученика как субъекта образования, устойчивости к эмоциональному выгоранию и перцептивным способностям — чувствительности к переживаниям ученика и его затруднениям. Выраженность базового рефлексивного модуля педагогических способностей учителя может быть определена с помощью предложенной формулы интегрального индекса. Поскольку обучение математике предопределяет успешность школьника и по другим дисциплинам, то исследование педагогических способностей учителя математики является важным и перспективным направлением в психолого-педагогических исследованиях. В дальнейшем планируется исследовать применение интегрального индекса к анализу рефлексивного модуля педагогических способностей с помощью искусственного интеллекта, в том числе и для учителей других профилей.

Ключевые слова: учителя математики, педагогические способности, эмоции, рефлексивность, педагогическая интенциональность, модель Н.А. Аминова

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Introduction

Psychological and pedagogical studies of the teacher's personality and professionalism were studied by Russian scientists L.S. Vygotsky, N.V. Kuzmina, A.K. Markova, I.A. Zimnaya, M.K. Kabardov, L.M. Mitina, N.A. Aminov and others. Researchers and participants in educational relations tend to attribute a large number of functions and abilities to the teacher, while he may not understand or accept other people's expectations, and his compliance with the requirements largely depends on the environment. Within the framework of current trends in prefigurative culture—the younger generation often "teaches" the elders, it is not easy for a modern teacher to realize his professional potential. Mathematics is a particularly difficult subject because it is characterized by abstraction, and modern schoolchildren find it difficult to comprehend the texts of conditions due to "clip thinking." Today, the work of a mathematics teacher is also extremely difficult because it is difficult to include the emotional sphere of a child in the study of the subject. Mathematical education is a strategically important factor in the development of an individual's intellectual potential. The development of society is directly related to the work of a teacher, but concrete objectification of the abilities of a teacher and, in particular, a teacher of mathematics, from the standpoint of theoretical and empirical data, is clearly insufficient. In 1995, N.A. Aminov, a researcher

at PI RAO (the laboratory founded by B.M. Teplov), after many years of studying individual characteristics and special pedagogical abilities, developed a highly relevant differential approach to the study of the structural organization of the main components of pedagogical abilities, the provisions of which have yet to find worthy application. N.A. Aminov developed an instrumental system for psychodiagnostics of the level of expression of pedagogical abilities among working teachers. The model of the expression of pedagogical abilities reflected its conceptual content. The development of the theoretical model itself suggested ways to verify its empirical validity for solving specific applied tasks of diagnosing a teacher's abilities. Modern technological capabilities make it possible to create such systems, psychologists and educators have a need for them as necessary tools, but such tools have not been developed. In this regard, the current problem of this study is the lack of theoretical foundations for identifying the basic components of the pedagogical abilities of modern teachers, the role of their understanding of the emotions of schoolchildren, in the context of the approach of N.A. Aminov.

In the context of the modern educational space, characterized by the dominance of digital formats, the declining prestige of the teaching profession and the growing demands on the emotional stability of the teacher, there is a need to supplement the theoretical model that can

explain how a teacher can be effective, especially in such complex subject areas as mathematics.

The model of pedagogical abilities developed by N.A. Aminov in the 1990s is of particular importance. Within the framework of this model, not just a list of qualities is proposed, but a well-founded structural organization of pedagogical abilities, which is based on a reflexive module. This model, despite its depth and predictive power, remains in insufficient demand in modern theoretical and methodological discussions. This article is aimed at its theoretical development and application in the context of the emotional interaction of a mathematics teacher with students.

The main part

The Law on Education regulates public relations that arise in the educational process, where the teacher's activity "is aimed at personal development and the acquisition of knowledge, skills, and the formation of competencies necessary for human life in society, an informed choice of profession, and vocational education" (273 FL)¹. That is, the main subject of the teacher's activity is the development of the student's personality, and his competencies and knowledge follow the development. Therefore, the teacher is responsible for the personality and activity of the student. Therefore, on the one hand, the teacher is responsible, and on the other hand, in pedagogical science, methodological approaches and practice, the list of requirements and universal competencies of a teacher is "incredibly vague" (Margolis, 2021). The resolution of contradictions can be the definition of pedagogical

abilities and professional qualities of modern teachers.

The study of individual differences, general and special abilities of a person in our country is connected with the works of the founder of Russian differential psychology and psychophysiology B.M. Teplov (Teplov, 1985). The scientists of the FNC PMI (formerly the Psychological Institute of the Russian Academy of Sciences) continue to develop his concept of abilities and study individual typological differences. N.A.'s research is devoted to the comprehensive study of special pedagogical abilities — identification, measurement, disclosure. Aminov and his students and colleagues conducted research in different regions on different samples, which allowed him to develop a model of pedagogical abilities in which the teacher's success is the initial criterion (Aminov, 1988, 1995, 2013). In his opinion, high results in pedagogical activity are ensured by the interaction of functional, operational and regulatory mechanisms, that is, by the symptom complex of the teacher's personal properties. From the perspective of the modular organization of the brain, pedagogical abilities are provided by the "frontolimbic block, which is determined by the severity of the emotional resources of future teachers, or, in other words, we can say that this block characterizes the resistance to the development of emotional burnout syndrome in the work of teachers with children" (Aminov, 1997).

The classification of pedagogical abilities is based on the differentiation of terminal abilities (individual psychological characteristics — they ensure success in activities, increase competitiveness in

¹ Federal Law No. 273-FZ dated December 29, 2012 (as amended on July 31, 2025) "On Education in the Russian Federation" <https://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=499764&dst=100001#YvmZawUekzWRzizv> (accessed: August 10, 2025).

a competitive situation) and instrumental abilities (with their help, success is achieved without competition), abilities are divided into general and special. To the general ones N.A. Aminov attributed the perceptual abilities of the teacher: the ability to understand the student and feel his emotional state, while special abilities include emotional characteristics (resistance to burnout syndrome).

The abilities of a mathematics teacher dealing with a discipline that "puts the mind in order" (MV Lomonosov) should be studied in particular. V.N. Druzhinin's work shows that to determine the profile and level of learning, it is sufficient to determine three types of abilities — verbal, mathematical and spatial, while the success of learning in algebra and geometry is reliably related to the level of all these types of abilities (the highest positive correlation) (Druzhinin, 2025). It is the level of study of mathematics that determines the success of a student in all disciplines. Therefore, the acquisition of mathematics is of such importance in the course of teaching other disciplines that they can be considered potentially the most significant, as well as extrapolated to the abilities of teachers of other disciplines. The relevance of this is emphasized and addressed in the Comprehensive Action Plan for Improving the Quality of Mathematical and Natural Science Education until 2030, approved by the Government of the Russian Federation in November 2024, which contains areas for improving the quality of training for teachers of mathematics and natural science subjects and improving their qualifications. Thus, the pedagogical abilities of a mathematics teacher contribute to the development of intellectual and personal resources in general. They affect the academic performance of students and are determined by the dialogical nature of modern educa-

tion. In Russian and foreign psychology, there are ideas that teachers' personal and professional resources are associated with resistance to burnout (Rogov, Trubitsyna, 2022), (Carroll et al., 2022).

One of the prerequisites for burnout is emotional labor, as a process of expressing socially expected emotions in interpersonal interaction. Hiding one's feelings or showing insincere emotions correlates with burnout (Kariou, Koutsimani, Montgomery, 2021).

Burnout, in the context of the emotional side of a teacher's professional activity, is a natural stage in the case when a teacher does not reflect, does not accept and hides his feelings, expressing a socially desirable reaction, researchers have confirmed that this strategy correlates with burnout (Krushelnitskaya, Kochetkov, Marinaeva et al. 2024), (Kochetkov, Marinaeva, Orlov, 2023), (Mitina, 2025, Khusnutdinova, 2017), (Kariou, Koutsimani, Montgomery, 2021; Carroll, 2022), (Middleton, Wiesel, Jansen, Smith, 2023).

N.A. Aminov showed that one of the important and underestimated factors of the success of teaching mathematics is the professional abilities associated with the emotions of the teacher. The emotional component of the lesson, the emotions of the students are included in the general continuum of attitudes towards education and the subject of mathematics. Modern foreign researchers believe that the study of the emotional sphere is a promising but underrepresented area of research in mathematical education (Schoenherr, Schukajlow, Pekrun, 2025), (Semeraro, Giofre, Coppola et al., 2020), (Di Martino, Gregorio, Iannone, 2023), (Pekrun, 2024), (Schoenherr, Schukajlow, Pekrun, 2025). The professional resources of a mathematics teacher in the context of emotions are widely updated

abroad. (Goetz, Lüdtke, Nett, 2013), (Jacob, Frenzel, Stephens, 2017), (Wang, Xu, Fei, 2024), (Schoenherr, Schukajlow, Pekrun, 2025).

Despite the large number of theoretical objects of research "pedagogical skills", "abilities", "pedagogical professionalism", explaining or predicting the results of a teacher's activity, the "key" is currently needed — the theoretical content — the definition of the essence, functions and organization of the main components of pedagogical abilities that explains the relationship between the characteristics of a teacher and the results of his students. This problem was solved in the research of N.A. Aminov (Aminov, 1988, 1995a). In particular, he showed that the basic module of pedagogical abilities is a reflective module reflecting the additive nature of pedagogical abilities. Having narrowed the search area using a theoretical analysis of research and step-by-step regression analysis of empirical data on the characteristics of teachers (including winners of professional competitions), Aminov showed that the structure of the main pedagogical abilities is based on productivity, as well as emotional stability, which is a factor of resistance against burnout syndrome and personality retention (Aminov, 1995a).

The severity of pedagogical abilities is determined by five independent variables combined into two classes: a subgroup of factors of effective capabilities of the teacher's personality and a subgroup of factors of effective capabilities of the "working environment" (Aminov, 1995a, Aminov, Osadcheva, Chernyavskaya, 2020). We consider the first subgroup — factors of effective personal capabilities. Within this subgroup lies reflexivity, an ability that N.A. Aminov identified as the main one, therefore he called the basic module the

reflexive module of the main components of pedagogical abilities. The essence of reflexivity, as an ability, reflects activity in the ability to make oneself the object of one's own observation, formulate one's pedagogical credo and conform to it in professional activity (Aminov, 1995a, Karpov, Zhedunova, 1998).

The reflexivity of a teacher is the basis of professional qualities and abilities, which helps establish relationships in the educational process. It is important that students' results are delayed, and it is difficult, or rather almost impossible, to determine the contribution of a particular teacher. An important component of the reflexive module is intentionality — the teacher's focus on the student as a subject of education, his knowledge of the goals of education and the alignment of activities in accordance with the goals. In the development of the ideas of N.A. Aminova, one of the authors of the article, develops the phenomenon of pedagogical intentionality, an essential component of pedagogical orientation, which shows that for a teacher, the subject of his professional activity is the student, with his abilities and subjective experience (Aminov, Chernyavskaya, 2019).

The criterion of reflexivity, within the framework of a teacher's (oral or written) speech, is the presence in it (the teacher's speech) of statements indicating reflections on his (her) role in the educational process, ways to achieve goals. Therefore, such statements are called reflexive.

It has been shown in the works of N.A. Aminov that the more a teacher corresponds to his individual, psychophysiologically determined type in his professional activity and accepts it, the more successful he is (Aminov, 1988, 1995b). This indicates the important role of authenticity and reflexive abilities of the teacher. It has

been shown that an important component of pedagogical abilities is the ability to resist burnout syndrome. N.A. Aminov attributes this ability to a reflexive module (Aminov, Osadcheva, Chernyavskaya, 2020).

In mathematics, emotions are primarily procedural in nature. They arise not from the content (numbers, functions, axioms are neutral in nature), but from encountering a cognitive barrier: a lack of understanding of the logical chain, fear of error, frustration from abstraction. Emotions in mathematics lessons most often manifest themselves as a reaction to difficulty, rather than to meaning. That is why the ability of a mathematics teacher to recognize, verbalize and transform such states — from anxiety to curiosity, from passivity to research interest — becomes a key competence of the teacher. This difference allows us to introduce the concept of "specific emotional competencies" in subjects. The teacher is not just "emotionally literate" in the general sense, but has subject emotional literacy the ability to:

- diagnose typical emotional patterns associated with a given discipline;
- use a subject language to reflect emotions;
- design learning situations in which emotions become a resource rather than an obstacle.

Thus, the "emotional literacy of a subject student" is not a universal trait, but a professionally specific skill formed in the process of mastering disciplinary culture and pedagogical experience.

The theoretical value of the model of pedagogical abilities is revealed not only in explaining the differences between teachers, but also in its potential as a basis for the practical transformation of the educational process. If the reflexive module is indeed the core of professionalism,

then its components — reflexivity proper and pedagogical intentionality — should not only be diagnosable, but also developed through specific didactic practices. This allows us to move from describing the educational process to designing it — from understanding "what is" to shaping "how it should be." In this context, the activity — based approach in teacher education, developed by A.A. Margolis (2021), is particularly relevant, which emphasizes the need to operationalize professional competencies — to translate them into observable, measurable and developable forms. Although our article is theoretical in nature, we consider it important to show how the N.A. model Aminova can be structured for diagnostic and methodological purposes without losing its humanistic depth.

Following the logic of N.A. Aminov, pedagogical abilities can be represented as an additive structure, where the reflexive module acts as a basic one and determines the severity of the nominal level of pedagogical abilities.

A generalized characteristic of the weighted contributions of the key components of the reflexive module (RM) is represented by: reflexivity (P); pedagogical intentionality (PI), emotional stability (EU), perceptual abilities (PS). Such a structure objectifies the success of a teacher as a function of the ability to understand oneself, introspection and a meaningful orientation of the activity attitude towards the student, and not only as subject knowledge, understanding and acceptance of one's emotions and the student's emotions, his cognitive difficulties. This model is qualitatively descriptive and can serve as a basis for the development of diagnostic profiles and development programs.

Based on his logic, we propose the following formal scheme of the reflexive

module of a teacher's pedagogical abilities expressed through an integral index:

$$RM = \alpha UR + \beta PI + \gamma EU + \delta PS$$

where: UR — level of reflexivity — the ability for self-analysis and formulation of a pedagogical credo;

PI — pedagogical intentionality — teacher's consciousness oriented towards the student as a subject of development; EU — emotional stability — resilience to emotional burnout; PS — perceptual abilities — the skill to recognize students' emotional states and cognitive difficulties; α , β , γ , δ — coefficients reflecting the specifics of the subject that need to be adapted.

All components can be normalized in a certain range, the weight coefficients are set depending on the subject profile.

N.A. Aminov's model demonstrates high adaptability: it not only explains the internal structure of pedagogical abilities, but also offers guidelines for their development in various contexts, from subject specifics to methodological work. However, any theoretical construction, in order to remain relevant, must evolve along with the changing conditions of professional activity. In the light of the digitalization of education, the transformation of teacher roles and the growing attention to the emotional well-being of participants in the educational process, there is a need to expand and modernize the initial model.

The model has a high potential for practical application in the system of teacher training and advanced training. The prospects for the development of the model of pedagogical abilities are seen in the development in three key areas.

First, it is necessary to integrate it into the digital context. To do this, it is important to examine the teacher's ability to understand the specifics of interaction in online and mixed formats, where emotional signals are limited and the risk of emotional

alienation is high. The difficulty of recognizing a student's emotions by text, voice, and behavior requires special attention and is a new challenge for the reflexive module of the teacher's abilities.

Secondly, it is advisable to develop an "emotional profile" of a mathematics teacher, a theoretical construct describing typical patterns of emotional perception, regulation, and expression characteristic of effective teachers in this subject area. Such a profile could serve as a guideline for selection, training, and self-assessment.

Thirdly, based on the reflexive module, it is possible to create a theoretical and methodological tool, for example, a manual or a diagnostic kit for psychological support of teachers. It could include: a map of reflexive questions for lesson analysis, a scale of pedagogical intentionality, an algorithm for interpreting students' emotional reactions in the context of mathematical content.

This development of the model not only actualizes the legacy of N.A. Aminov, but also turns it into a living, developing theoretical resource capable of responding to the challenges of modern education.

Conclusion

1. In the context of the dominance of foreign-language concepts in psychology, which are not always consistent with the Russian mentality, the potential of the model of N.A. Aminov, a domestic scientist, whose work has broad prospects not only regarding the analysis of pedagogical professionalism, inclusion in the context, and possibly the standard of professional education of future teachers, certification, evaluation and improvement, has been revealed. professional qualifications of working teachers.

2. The role of the teacher's ability to understand his emotions in preventing the formation of burnout syndrome is

substantiated. The role of emotions in the educational process in the mathematics lesson is revealed, despite the high level of abstraction of the discipline itself and the individual nature of the experience of solving mathematical problems. This role is significant in the modern situation, where the dynamics of the influence of technology on education contributes to a decrease in attention to the manifestations of purely human emotions and reflection

among participants in the educational process and leads to anthropological risks for whole generations.

3. The components of N.A. Aminov's model of pedagogical abilities are clarified and disclosed, taking into account mathematical culture, its content is formalized, which makes it possible to further apply technologies to expand its resource for use in theoretical and applied aspects of education.

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Sustaining teacher social-emotional competence: a systematic review of implementation and retention strategies

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Abstract

Social-emotional competence (SEC) refers to educators' capacity to regulate emotions, sustain psychological resilience, and cultivate constructive relationships with students, colleagues, and school leadership. Elevated levels of SEC among teachers are strongly associated with enhanced well-being, emotionally supportive classrooms, and improved student engagement and achievement. Despite growing attention to SEC development initiatives, critical gaps remain regarding demographic variability in outcomes, optimal implementation strategies, and enduring institutional barriers. This systematic review, conducted in accordance with PRISMA guidelines, screened 1519 studies published between 2012 and 2024, yielding 16 peer-reviewed articles that met the inclusion criteria. Findings demonstrate that SEC interventions reliably enhance educators' emotional regulation, mindfulness, and overall psychological well-being, irrespective of gender, professional experience, or cultural context. However, the long-term sustainability of these benefits is contingent upon enabling school environments, strong leadership, continuous professional development, and adequate resource allocation. Implementation challenges — including time constraints, inconsistent program fidelity, and varying levels of teacher readiness — underscore the need for adaptive, context-sensitive models. This review provides evidence-based recommendations for the effective design, integration, and sustained impact of SEC programs across diverse educational settings.

Keywords: social-emotional competence, teacher well-being, SEC interventions, professional development, education policy, implementation fidelity

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Поддержание социально-эмоциональной компетентности учителей: систематический обзор стратегий реализации и закрепления

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Резюме

Социально-эмоциональная компетентность (СЭК) — это умение педагогов управлять своими эмоциями, сохранять психологическую устойчивость и налаживать хорошие отношения с учениками, коллегами и руководством школы. Учителя с высоким уровнем СЭК обычно чувствуют себя лучше, создают в классах более поддерживающую атмосферу и лучше мотивируют и помогают своим ученикам достигать успехов. Хотя все больше внимания уделяется развитию СЭК, остаются важные вопросы: как разные группы людей по-разному достигают результатов, какие стратегии работы наиболее эффективны и какие сложности связаны с организацией работы в школах. В данном систематическом обзоре, который проведен в соответствии с руководящими принципами PRISMA, проанализировано 1519 исследований, опубликованных с 2012 по 2024 годы. В результате было выбрано 16 статей, соответствующих требованиям. Исследования показывают, что программы по развитию социально-эмоциональной компетентности помогают учителям лучше управлять эмоциями, быть более внимательными и чувствовать себя психологически более устойчивыми. Эти плюсы отмечаются независимо от пола, опыта работы или культурного фона учителей. Но для того, чтобы эти преимущества сохранялись надолго, нужны школа с благоприятной атмосферой, сильное руководство, постоянное обучение и достаточные ресурсы. Проблемы при внедрении программ, такие как нехватка времени, расхождение с первоначальной задумкой и разный уровень готовности учителей, показывают, что нужны гибкие и адаптируемые подходы, учитывающие особенности каждой школы или класса. В этом обзоре собраны рекомендации, основанные на исследованиях, как правильно разрабатывать, внедрять и сохранять эффективность программ по развитию СЭК в разных учебных заведениях.

Ключевые слова: социально-эмоциональная компетентность, благополучие учителей, программы развития социально-эмоциональной компетентности, профессиональное развитие, политика в сфере образования, соблюдение методики

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Introduction

Teacher social-emotional competence (SEC) refers to educators' ability to regulate emotions and build constructive relationships

with students, colleagues, and administrators (Jennings & Greenberg, 2009). Core competencies — including self-awareness, emotional regulation, social awareness, relationship skills,

and responsible decision-making — are closely linked to teacher well-being, instructional quality, and student engagement (Schonert-Reichl, 2017; Kim et al., 2021). Research shows that SEC reduces stress, prevents burnout, and improves classroom management (Lozano-Peña et al., 2021; Oliveira et al., 2022; Zarra-Nezhad et al., 2023). Given that nearly half of new teachers leave the profession within five years, addressing SEC is vital for teacher retention and sustainable educational improvement (Soutter, 2023; ZENKI-DALIPI et al., 2024).

Social and emotional learning (SEL) interventions aimed at strengthening teacher SEC have gained momentum in recent years (Jennings et al., 2017; Schonert-Reichl, 2017). While most programs have traditionally focused on student outcomes, recent evidence highlights the parallel value of teacher-directed SEL in promoting resilience, job satisfaction, and retention (Oliveira et al., 2021; Carvalho et al., 2017; Firdos et al., 2024; Bardach et al., 2021; Zarra-Nezhad et al., 2023). Further, when these programs are tailored considering teacher sociodemographic, they yield better outcomes (Carbonero-Martín et al., 2022; Grazzani et al., 2024).

Despite its relevance, SEC is not consistently embedded in teacher preparation, which often prioritizes content knowledge over emotional and relational competencies (Markowitz, Bouffard, 2025). As a result, many educators enter the profession without the tools to manage emotional labor or navigate complex interpersonal demands, which can affect both well-being and classroom dynamics (Jennings, Greenberg, 2009).

To address this gap, SEC training must move beyond theory and offer practice-oriented, experiential learning that supports real-world application (Akelaitis et al., 2023; Hadar et al., 2020). This review critically examines teacher-focused SEL interventions, identifies factors that support their long-term use, and explores barriers to implementation in educational settings.

The importance of teacher SEC

The Prosocial Classroom Model by Jennings and Greenberg (2009) frames teacher SEC as central to student relationships, classroom cli-

mate, and academic outcomes. Research consistently shows that students' social-emotional development is shaped by the emotional competence of their teachers.

Teachers with strong SEC foster engagement, reduce behavioral disruptions, and build emotionally supportive classrooms (Greenberg et al., 2003). By modeling empathy, regulation, and emotional intelligence, they enhance both student learning and well-being (Jennings, Greenberg, 2009; Schonert-Reichl, 2017; Kim et al., 2021; Jennings et al., 2017; Polou et al., 2022). SEC also strengthens collaboration and trust among educators, students, and peers (Xu, Pang, 2024). In contrast, low SEC is associated with stress, burnout, and reduced teaching effectiveness (Lozano-Peña et al., 2021; Collie, Perry, 2019; Bardach et al., 2021; Zarra-Nezhad et al., 2023).

With institutional support and regular professional development, SEC acts as a protective factor against burnout (Oliveira et al., 2021; Zarra-Nezhad et al., 2023). Teachers with well-developed SEC report lower emotional exhaustion, greater adaptability, and stronger career commitment (Firdos et al., 2024; Kim et al., 2021; Berg et al., 2021; Markowitz, Bouffard, 2025). Embedding SEC into both pre-service and in-service training is therefore essential to building teacher resilience and sustaining instructional quality (Xu, Pang, 2024).

Research gap and rationale

In today's emotionally complex classrooms, teacher SEC is indispensable. Yet most SEL programs continue to prioritize student outcomes, offering limited direct support for teachers' emotional development (Oliveira et al., 2022). Educator training often emphasizes subject knowledge over relational readiness, leaving teachers to manage stress and emotional demands without adequate institutional backing (Thierry et al., 2022; Hadar et al., 2020; Domitrovich et al., 2016). School culture that values teacher SEL encourages teacher motivation and program integration (ZENKI-DALIPI et al., 2024).

Although the link between SEC and teaching quality is well established, its integration into

training remains uneven and often overlooked (Akelaits et al., 2023; Markowitz, Bouffard, 2025). This is particularly concerning as teachers increasingly face emotional exhaustion, behavioral challenges, and rising workloads (Akelaits et al., 2023; Dyson et al., 2023). While SEC-based interventions show promise in addressing these pressures, few models offer ecologically valid, context-specific approaches for educators (Oliveira et al., 2022; Lovett et al., 2024; Markowitz, Bouffard, 2025).

This review evaluates the design and impact of SEL programs targeting teachers. It identifies the factors that support sustainability and examines the institutional and structural barriers that influence implementation across school contexts. The conceptual framework guiding this review integrates definitions of SEC as the capacity to perceive, understand, and regulate emotions within social contexts (Cihan et al., 2024; Zheng, 2023). It situates teacher SEC as foundational to SEL program implementation, teacher well-being, and classroom dynamics (Jennings, Greenberg, 2009; Collie, 2017).

Materials and methods

This systematic review followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and reproducibility. Between January 3 and 18, 2025, comprehensive searches were conducted in PubMed, ScienceDirect, PsycINFO, and Google Scholar using Boolean operators. Search terms included “social-emotional competence,” “teacher well-being,” “SEL interventions,” and “professional development programs.” The search targeted peer-reviewed, English-language studies published between 2012 and 2024, with filters applied to titles, abstracts, and keywords.

Inclusion and exclusion criteria

Studies were included if they examined SEC-related interventions or professional development programs for K–12 educators, including early childhood teachers, and reported measurable, teacher-specific outcomes. Studies were excluded if they focused exclusively on student

outcomes, were not peer-reviewed (e.g., theses, editorials, grey literature), or were published in languages other than English.

Study selection

Following PRISMA procedures, all titles and abstracts were screened for relevance. Eligible records underwent full-text review using pre-defined inclusion criteria. Search strategies were adapted to the indexing systems of each database to optimize accuracy and coverage (see Figure).

Data extraction and synthesis

Included studies were independently reviewed. Duplicates and inaccessible records were removed. Full-text articles were assessed to extract data on participant demographics, intervention components, outcomes, and relevance to the review’s research questions. The synthesis addressed three guiding questions:

How do teacher demographics influence the outcomes of SEC interventions?

What factors contribute to the long-term sustainability of SEC programs?

What barriers hinder the effective implementation of SEC interventions?

Results

The review’s findings have been distilled from a selection of studies that explored various dimensions of teacher social-emotional competencies (SEC) interventions. A detailed overview of the key results is provided in Table, while the subsequent discussion is structured around the main research questions that guided this investigation.

Demographic moderators of SEL

Impact social-emotional learning (SEL) interventions have been shown to improve teacher social-emotional competence (SEC) across diverse demographic profiles (Ciucci et al., 2024; Jennings et al., 2017; Oliveira et al., 2022). Outcomes are generally consistent across gender, with mindfulness-based approaches benefiting male and female educators alike (de Carvalho et al., 2021; Talvio et al., 2019). While earlier

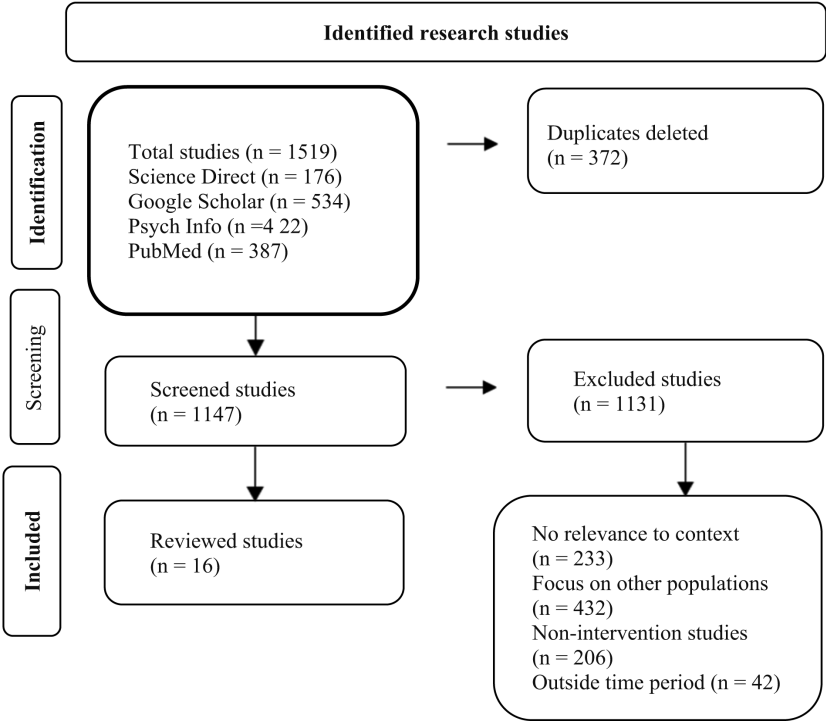


Fig. PRISMA flow representing selected studies

Table

Overview of study results

Study no	Author / year / location	Research design	Explicit findings
1.	Talvio et al. (2013, Finland)	Quasi-experimental design	The teacher effectiveness training (TET) intervention improved teachers' SEL skills. Class teachers showed minor positive changes, but subject-matter teachers reported dissatisfaction in relationships with parents.
2.	Domitrovich et al. (2016, USA)	Randomized controlled trial	The PATHS to PAX program enhanced self-efficacy and personal accomplishment among elementary school teachers. The program demonstrated effectiveness in classroom management and teacher well-being.
3.	Talvio et al. (2016, Finland, Italy, Japan, Lithuania)	Exploratory factor analysis	Lions Quest (LQ) workshops improved teachers' perceptions of SEL goals and competence among teachers in Finland, Italy, Japan, and Lithuania. Teachers' attitudes towards SEL became more positive post-workshop.
4.	Jennings et al. (2017, USA)	Cluster randomized trial	The CARE program significantly improved teachers' mindfulness, emotion regulation, and psychological well-being. It also enhanced teacher-student interactions, leading to improved emotional support in classrooms.

Study no	Author / year / location	Research design	Explicit findings
5.	Jennings et al. (2019, USA)	Randomized controlled trial	Long-term findings showed the CARE program reduced psychological distress and improved emotion regulation, with sustained benefits observed a year post-intervention.
6.	Talvio et al. (2019, Argentina, Australia, Austria, Finland, Germany, Italy, Lithuania, Turkey, Japan)	Multivariate mixed design	Lions Quest (LQ) workshops improved teachers' SEL competence across nine countries. The intervention led to increased competence, knowledge application, and positive changes in SEL-related attitudes.
7.	Mihić et al. (2020, Croatia)	Linear regression models	The CARE program improved self-compassion and mindfulness among teachers, with cardiovascular health benefits. However, no significant reduction in burnout was observed.
8.	Lang et al. (2020, USA)	Pre survey and post survey	The SELF-T program enhanced teachers' knowledge of stress management and emotion regulation strategies. Teachers showed mixed responsiveness to children, but overall, the program supported early childhood educators.
9.	Kim et al. (2021, Canada)	Mixed-methods study	The MindUP program effectively reduced burnout and improved trauma-informed attitudes. Educators who implemented the program for two years showed the most improvement in self-efficacy and personal accomplishment.
10.	Berg et al. (2021, Italy, Latvia, Lithuania, Slovenia, Spain)	Experimental project framework	SEL training improved teachers' readiness for SEL implementation, particularly self-management skills. However, relationship skills showed a decline, indicating the need for further development.
11.	de Carvalho et al. (2021, Portugal)	Randomized trial	The mindfulness-based intervention improved emotional regulation and well-being among primary school teachers. Positive classroom behaviors were observed, benefiting both teachers and students.
12.	Oliveira et al. (2022, Portugal)	Quasi-experimental	The A+ intervention enhanced SEC among elementary teachers. Higher engagement correlated with better outcomes, emphasizing the importance of active participation.
13.	Fitzgerald et al. (2022, USA)	Pre-post repeated measures	The RISE program improved educators' SEC and well-being, reducing student-teacher conflicts. The program was feasible for diverse school settings.
14.	Polou et al. (2022, Greece)	Quasi-experimental cluster design	The PROMEHS program led to moderate improvements in SEL competencies for both teachers and students. Gains were observed in relationship skills and decision-making.
15.	Sandilos et al. (2023, USA)	Quantitative Study	The SEL CIP program improved classroom organization and emotional supportiveness among early elementary teachers. However, its impact on teacher-student interactions was not statistically significant.
16.	Ciucci et al. (2024, Italy)	Quasi-experimental	The ME4YOU program improved teachers' self-efficacy as emotional socializers and reduced emotional denial. Teachers reported enhanced authenticity in emotional expression.

studies suggested gendered differences in SEL effectiveness, more recent findings indicate no significant disparities (Talvio et al., 2016). Age, teaching experience, and career stage appear

to have limited influence on SEL outcomes. Both new and experienced teachers report similar improvements in emotional regulation and mindfulness, particularly when programs offer extended

or repeated engagement (Domitrovich et al., 2016; Jennings et al., 2017; Kim et al., 2021). Cultural factors moderately shape program impact (Legette et al., 2021). In some regions, adaptations are required to align SEL content with local values (Berg et al., 2021; Lang et al., 2020). However, interventions such as Lions Quest have demonstrated cross-cultural effectiveness (Talvio et al., 2016). Teachers working with students facing behavioral or developmental challenges may experience more limited benefits, likely due to higher emotional demands (Domitrovich et al., 2016; Lang et al., 2020). Institutional environment also plays a critical role. Educators in supportive, well-resourced schools show stronger outcomes and lower burnout rates (Domitrovich et al., 2016; Oliveira et al., 2022; Talvio et al., 2019). Interestingly, teachers with higher academic qualifications sometimes report fewer gains, possibly due to elevated work demands (Lang et al., 2020). Voluntary participation tends to enhance engagement and openness, reinforcing the value of teacher agency in program uptake (Ciucci et al., 2024).

Sustainability enablers of SEC

The long-term effectiveness of teacher-directed SEL interventions depends on robust training and sustained support. Programs such as PATHS to PAX and RISE illustrate the importance of initial training paired with structured coaching, including goal setting and feedback via virtual observation, to improve teacher SEC over time (Domitrovich et al., 2016; Fitzgerald et al., 2022). Booster sessions further consolidate mindfulness practices and extend program benefits (de Carvalho et al., 2021). Experiential learning workshops that adhere to adult education principles allow teachers to apply strategies in real-world contexts, enhancing instructional self-efficacy (Kim et al., 2021; Talvio et al., 2019). Culturally responsive interventions — such as CARE and Lions Quest — demonstrate scalability across diverse educational settings (Mihic et al., 2020; Talvio et al., 2016, 2019). Programs incorporating fidelity monitoring and routine qualitative feedback are particularly effective in maintaining long-term gains (Fitzgerald

et al., 2022; Oliveira et al., 2022; Sandilos et al., 2023). Facilitator expertise also proves critical. Those with strong pedagogical credentials and the ability to flexibly tailor instruction significantly enhance program integrity and participant engagement (Jennings et al., 2017, 2019; Oliveira et al., 2022). Institutional leadership, adequate funding, and a collaborative school climate are additional pillars of sustainability. Schools that provide financial support for facilitator training, substitute teachers, and implementation resources show stronger program adherence (Domitrovich et al., 2016; Oliveira et al., 2022; Talvio et al., 2019; Thierry et al., 2022). Finally, teacher motivation, openness to change, and reflective capacity strongly influence the quality and persistence of implementation (Domitrovich et al., 2016; Kim et al., 2021; Talvio et al., 2016).

Implementation barriers to SEL

Programs Despite their promise, SEL interventions often face substantial implementation challenges (Akelaitis et al., 2023; O'Brien et al., 2023; Dyson et al., 2023). Variability in coaching quality, inconsistent adherence to intervention protocols, and the complexity of local adaptation can undermine effectiveness (Domitrovich et al., 2016; Kim et al., 2021; Sandilos et al., 2023). Disruptions such as the COVID-19 pandemic have further limited success, as remote delivery and participant attrition weakened engagement and outcomes (Polou et al., 2022). Time constraints remain one of the most cited barriers. Teachers often struggle to integrate SEL with their instructional duties, administrative responsibilities, and parental communication demands (Domitrovich et al., 2016; Talvio et al., 2013, 2019). Furthermore, voluntary participation introduces self-selection bias, which limits the generalizability of findings (Ciucci et al., 2024; Jennings et al., 2017, 2019). Institutional limitations — such as weak leadership, inadequate funding, and lack of administrative support pose additional challenges (Ulla, Poom-Valickis, 2023). Schools without sufficient budget for facilitators, substitutes, and program materials are less likely to implement SEL interventions effectively (Jennings et al., 2019; Oliveira et al.,

2022). A lack of longitudinal tracking impedes evaluation of sustained effectiveness. Overreliance on self-report instruments raises concerns about response bias, and digital delivery platforms often suffer from poor engagement analytics (Kim et al., 2021; Lang et al., 2020; Talvio et al., 2016). Teachers experiencing high levels of stress or burnout — or those confident in their existing competencies — may either disengage from SEL efforts or inaccurately assess their own progress (Berg et al., 2021; Domitrovich et al., 2016). Lastly, resistance stemming from perceived self-sufficiency in emotional competencies can hinder participation and undermine program effectiveness (Talvio et al., 2016).

Discussion

Comparison of SEL programs for teachers

Social-emotional learning (SEL) interventions such as teacher effectiveness training (TET) and CARE share foundational features — structured training, individualized coaching, and fidelity monitoring — that support the effective translation of theoretical principles into classroom practice. These components enhance educators' emotional regulation, self-efficacy, and resilience (Domitrovich et al., 2016; Jennings et al., 2017, 2019; Talvio et al., 2013).

Despite shared goals, program delivery and adaptability vary. Digital platforms like A+ and SELF-T provide scalable solutions and were especially valuable during the COVID-19 pandemic; however, they require additional reinforcement mechanisms to ensure long-term impact (Domitrovich et al., 2016; Lang et al., 2020; Oliveira et al., 2022). In contrast, system-wide interventions such as RISE and PROMEHS embed SEL into school culture, integrating leadership and institutional support (Fitzgerald et al., 2022; Polou et al., 2022). Culturally adaptive models, including Lions Quest, retain core content while aligning delivery with local educational values, achieving effectiveness across diverse cultural contexts (Talvio et al., 2016, 2019).

Program sustainability depends heavily on post-intervention coaching, fidelity structures, and responsiveness to educators' specific

needs and institutional contexts (de Carvalho et al., 2021; Oliveira et al., 2022; Lovett et al., 2024).

Critique of existing literature

While SEL interventions demonstrate positive outcomes, literature is constrained by methodological limitations. Most studies rely on self-report measures, which introduce subjectivity and response bias (Fitzgerald et al., 2022; Jennings et al., 2019; Mihić et al., 2020). Small sample sizes, voluntary participation, and absence of long-term follow-up further restrict external validity and the generalizability of findings (Jennings et al., 2017; Kim et al., 2021; Oliveira et al., 2022).

Several foundational studies lacked randomized control groups (Talvio et al., 2013, 2019), and the use of waitlist rather than active controls (de Carvalho et al., 2021) limits causal inference. Compounding this, timing of data collection and high teacher workload may have confounded outcomes (Berg et al., 2021; Lang et al., 2020). Future research must adopt more rigorous designs — featuring randomization, larger representative samples, mixed-method evaluations, and longitudinal data collection — to validate efficacy and isolate key mechanisms of change.

Policy and institutional recommendations

Integrating SEL into both pre-service training and ongoing professional development is essential to support teachers' emotional resilience and instructional effectiveness (Jennings et al., 2017; Talvio et al., 2013, 2016). Implementation of fidelity depends on structured training with embedded coaching, ongoing feedback, and systematic progress monitoring (Domitrovich et al., 2016; Jennings et al., 2019; Sandilos et al., 2023; Cihan et al., 2024).

Sustainable adoption requires institutional commitment, stable funding, and cultural contextualization. Adequate resources — covering facilitator training, substitute staffing, and digital infrastructure — enable consistent program delivery (Lang et al., 2020; Oliveira et al., 2022). Leadership support and positive school climate are critical in facilitating SEC program success,

influencing teacher engagement and program fidelity (Thierry et al., 2022; Lee, 2024; Ulla et al., 2023). Programs must also tailor interventions to fit socio-cultural dynamics to maximize educator engagement and relevance (Berg et al., 2021; Polou et al., 2022; Talvio et al., 2019). Interventions that incorporate mindfulness and trauma-informed care can substantially alleviate teacher stress and burnout (de Carvalho et al., 2021; Kim et al., 2021; Mihić et al., 2020). Finally, fostering collaborative, school-wide initiatives that involve administrators, parents, and teaching staff enhances resilience and supports systemic educational reform (Ciucci et al., 2024; Fitzgerald et al., 2022).

Conclusions

This review finds that SEL programs improve teachers' emotional regulation, classroom climate, and instructional quality. However, scaling these benefits requires sustained institutional support, clearly defined policies, and structured professional development. Although the outcomes are promising, implementation is often hindered by limited resources, inconsistent

delivery, and resistance from educators. Programs are more effective when they are culturally adapted, regularly monitored for fidelity, and evaluated using standardized tools.

Limitations

The review is based on sixteen peer-reviewed studies. It excludes non-English publications, grey literature, and research that does not report teacher-specific outcomes. These omissions may reduce the breadth and generalizability of the findings.

Future research

Larger and more diverse educator samples are needed to improve external validity. Combining classroom observations with self-report measures will help capture actual changes in teaching practices. Longitudinal studies are essential to determine whether improvements in social-emotional competence are sustained over time. Further research should also examine how cultural and institutional factors influence the success of SEL implementation across different contexts.

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Avni Ved — conducted the review and drafted the manuscript.

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Both authors approved the final version.

Вклад авторов

Авни Вед — провела рецензирование и подготовила рукопись.

Джеклин Карим — руководила исследованием и рецензировала рукопись.

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DISCUSSION AND DISCOURSES ДИСКУССИИ И ДИСКУРСЫ

Научная статья | Original paper

The universal algorithm for designing educational programs based on the analysis of students' educational needs

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Abstract

Context and relevance. The theoretical basis of the study is a competence-oriented educational paradigm and a personalized approach, ensuring the transition from the formal compliance of educational programs with the requirements of educational standards to their practical orientation towards the real cognitive needs of students. **Objective.** The aim is to propose a universal algorithm for designing an educational program based on the analysis of students' educational needs, in order to further refine its structure and provide opportunities for creating individualized educational trajectories. **Hypothesis.** If the process of designing an educational program is based on a systematic analysis of students' educational needs, then this approach will provide a universal mechanism for its continuous updating, facilitating the implementation of personalized professional university training. **Methods and materials.** The study utilized a questionnaire to quantitatively assess the significance of the professional competencies developed by the educational program for students. The criterion for comparative analysis was the arithmetic mean weighted scores of professional competencies, taking into account the varying weights of their indicators. Based on the quantitative assessments obtained, professional competencies were ranked, and a competency profile was constructed reflecting the educational priorities of the program's target audience. Through expert discussions with faculty, a correspondence was established between professional competencies and educational modules by constructing adjacency matrices. A graph method was used to visualize the program structure, showing the relationships between competencies and modules. **Results.** Using the example of the Master's degree program "Tutoring and Mentoring in Education," we demonstrate a systematic approach to its design. This approach allowed us to create personalized educational trajectories relevant to the needs of the target audience by identifying the cognitive needs of master's students, constructing a sought-after profile of professional competencies, matching them with educational modules, and visualizing the structure of the professional block of the program. **Conclusions.** By conducting a systematic study of students' educational needs and, based on the structure of the resulting competency

profile, it is possible to update educational programs based on the proposed universal algorithm for their design.

Keywords: personalized approach, professional competencies, student competency profile, educational program design, individual personalized educational trajectory

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Универсальный алгоритм проектирования образовательных программ на основе анализа образовательного запроса студентов

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Резюме

Контекст и актуальность. Теоретической основой исследования служат компетентностно-ориентированная образовательная парадигма и персонализированный подход, обеспечивающие переход от формального соответствия образовательных программ требованиям образовательных стандартов к их практической ориентированности на реальные познавательные потребности студентов. **Цель.** Разработка универсального алгоритма проектирования основных профессиональных образовательных программ на основе анализа образовательного запроса и отношения студентов к предлагаемым результатам освоения в виде профессиональных компетенций для последующего уточнения структуры образовательной программы и обеспечения возможностей формирования индивидуальных персонализированных образовательных траекторий. **Гипотеза.** Если образовательная организация, проектирующая образовательную программу и самостоятельно определяющая перечень включенных в нее профессиональных компетенций, будет руководствоваться образовательными запросами студентов, то такой подход обеспечит универсальный механизм ее непрерывной актуализации, способствуя внедрению персонализированной университетской подготовки. **Методы и материалы.** При проведении исследования использовано анкетирование, позволившее количественно оценить значимость для студентов формируемых образовательной программой профессиональных компетенций. Критерием для проведения сравнительного анализа служат средние арифметические взвешенные значения баллов профессиональных компетенций, учитывающие различную балльную весомость их индикаторов. На основе полученных количественных оценок произведено ранжирование профессиональных компетенций и построен компетентностный профиль, отражающий образовательные приоритеты целевой аудитории

образовательной программы. Методом экспертных обсуждений профессорско-преподавательским составом установлено соответствие между профессиональными компетенциями и учебными модулями через построение матриц смежности. Для визуализации структуры профессионального блока образовательной программы использован метод графов, отображающий взаимосвязи между компетенциями и модулями. **Результаты.** На примере образовательной программы магистерской подготовки «Тьюторство и наставничество в сфере образования» показан системный подход к ее проектированию, позволивший на основе выявления познавательного запроса магистрантов, построения востребованного профиля профессиональных компетенций, постановки им в соответствие учебных модулей, а также визуализации структуры профессионального блока программы создать персонифицированные образовательные траектории, релевантные запросам целевой аудитории. **Выводы.** Проводя систематическое исследование образовательного запроса студентов и отталкиваясь от структуры получаемого компетентностного профиля, возможно актуализировать образовательные программы на основе предложенного универсального алгоритма их проектирования.

Ключевые слова: персонифицированный подход, профессиональные компетенции, компетентностный профиль студента, проектирование образовательных программ, индивидуальная персонифицированная образовательная траектория

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Introduction

Modern pedagogical science has theoretically substantiated and successfully implemented a competency-oriented educational process in educational practice (Ignatiev, Varlamova, Daramaeva, 2022), the methodological basis of which is the principles of: individualization (Sazonov, 2012) and personalization of education (Zeer, Symanyuk, 2021), taking into account the individual abilities and educational needs of each student in the midst of professional development (Zeer, 2021); cognitive activity (Osipova, Agisheva, 2016), leading to the cognitive competence of the student (Shmigirilova, 2014), characterizing their learning engagement; practice-based approach, demonstrating the relevance of the acquired knowledge in real life (Bondarenko, Latkin, 2012); conceptual

understanding (Frolov, Frolova, 2010), which involves understanding the essence of the information provided by the teacher, the ability to apply the acquired knowledge in the future to independently solve problem situations in various fields of activity, including in education (Margolis A.A., 2021).

The primary tool for the practical implementation of the theoretical principles of a competency-based educational process is modern educational technologies, which enable the effective development of a student's individual educational trajectory (IET) (Zeer et al., 2017). Creating an individual, personalized educational trajectory (IPET) for each student, based on an assessment of their personal cognitive interests and involving the development of an individualized educational program, is a pressing issue in modern

education (Zeer, 2021). The complexity and diversity of the personalized approach and a lack of joint understanding of its components in the scientific community highlight the problem of identifying the main structural elements of personalization (Shemshack et al., 2021; Zhong, 2022), arrangement of effective strategies for personalized learning (Cheung, et al., 2021), understanding the need to take into account the cognitive preferences of students in higher education (Morozova et al., 2023; Hooshyar et al., 2024), as well as taking into account the technological capabilities of implementing personalized learning in the era of digital transformation of education (Kem, 2022; Komalawardhana, Panjaburee, 2023).

Problem. Despite the theoretical justification by pedagogical science (Zeer, Symanyuk, 2021) for a "shift in the educational paradigm: from the traditional teacher-centered approach to a student-centered approach" (Kasprzhak, Kalashnikov, 2014), modern university educational practices practically lack universal mechanisms for systematically considering students' educational needs when designing and updating the content of basic professional educational programs (BPEP) (Hooshyar et al., 2024). There is a clear gap between the learning outcomes declared by the developers of educational programs and the learning outcomes actually sought by students, which are professional competencies (PCs). This leads to the formal compliance of educational programs with the requirements of the federal state educational standards (FSSES) without matching the needs of the target audience due to the lack of standardized procedures for the practical implementation of student feedback and the integration of the resulting assessment of educational needs into the FSSES design process. Accordingly, the hypothesis of our study was formulated: if an educational organization, designing an educational program and inde-

pendently determining the list of professional competencies included in it, is guided by the educational needs of students, then this approach will provide a universal mechanism for its continuous updating, facilitating the implementation of personalized university training.

The **purpose** of this study is to develop a universal algorithm for designing core professional educational programs based on an analysis of educational needs and student attitudes toward the proposed learning outcomes in the form of professional competencies. This approach will subsequently refine its structure and enable the development of individual, personalized educational trajectories.

This approach has been repeatedly applied to the design of both master's programs in psychological and pedagogical education (Rubtsov et al., 2014) and undergraduate teacher training programs (Smolyaninova, Korshunova, 2015). However, it remains relevant, as "the specific educational needs of students necessitate tailoring their learning experiences to their educational background, experience, and personal qualities" (Oslon, Semya, Zinchenko, 2019).

Materials and methods

To develop a universal algorithm for designing a program based on students' educational needs and to test the proposed hypothesis about systematic analysis as a personalization mechanism, a combination of methods was used: questionnaires to construct a competency profile, expert assessments to correlate competencies and modules, and graph modeling to visualize the program structure.

We agree with the opinion that "the purpose of obtaining a master's degree, related to professional development, may reflect the most 'mature' level of the student's motivational and semantic sphere" (Gorkova, Bakanova, 2015). Therefore, the master's

program in pedagogical education at Southern Federal University (SFedU) was selected for consideration. Its profile, "Tutoring and Mentoring in Education" (TME), presupposes the development of teachers' readiness to implement the individualized and personalized principles of education. First — and second-year master's students were administered the author questionnaire, dedicated to the reasons for choosing to study the SFedU TME program. The questionnaire consisted of three sections (General Information, Objectives, and Learning Outcomes), which used open-ended and closed-ended questions with single and multiple choice options. This provided a detailed qualitative analysis of the respondents' opinions and a verification of its validity (Appendix).

When assessing the subjective significance of the competences included and potentially included in the Basic Educational Program, a rating scale was used that reduces the interpretation subjectivity of the responses and allows for a quantitative assessment of the results obtained even with a small sample of respondents ($N = 16$). The weighted arithmetic mean values of the competence scores (PCSi) were used as a criterion for conducting a comparative analysis and ranking of the PCs, which also took into account the different point weighting for master's students. The indicators presented competences (PCSi_{ij}) where i is the competency number (PC1, PC2, etc.), and j is the number of its indicator (PC1.1, PC1.2, PC2.1, PC2.2, etc.). For example, when evaluating the weighted arithmetic mean of the PC1 score, the numerator is the product of the scores given by the master's student for competence PC1 and the sum of the scores of its indicators PC1.1 and PC1.2. The resulting scores were summed up for all survey participants and divided by the total scores for the indicators of a particular PC level assigned by all survey participants. Master's students'

PC assessment listed in the current BPEP, as well as those not used but included in the general list of possible mastery for SFedU master's pedagogical programs, allowed us to create a competency profile for students in the BPEP TME.

To associate specific educational modules (M) with each PC, adjacency matrices were used. Their construction was preceded by an expert discussion among the academic teaching staff (TS) regarding the substantive significance of the M and their focus on developing specific PCs and their indicators.

For a qualitative analysis of the PC-M interrelation, a graph method was used, the structure of which is entirely determined by the adjacency matrix. This visualization allows for the clear identification of the structure, central elements, integration zones, and potential gaps in the BPEP.

Results

To test the proposed set of methods and verify the hypothesis, we will consider the design of a master's program in "Tutoring and Mentoring in Education" based on students' educational needs.

The sample of master's students was random, but was fairly balanced in terms of their teaching experience. The survey revealed that 56,25% of respondents had teaching experience, working in educational institutions of various levels. Notably, 25% of active teachers and 12,5% of tutors chose the BPEP TME program, indicating the existence of certain professional deficiencies. About half of the master's students pursue careers outside of teaching, in positions that involve coaching in various fields.

Master's students were offered a variety of answers as their primary goals upon enrollment in the BPEP TME program, from which they were required to select no more than three ones. The overwhelming majority of respondents (68,75%) cited mastering

computer skills for tutoring as their goal of study. 31,5% identified mastering computer skills for implementing a personalized approach and the principle of individualization in education as their priority educational goals, which can be viewed as a conceptual understanding of the need to implement these principles in their professional work. It should be noted that the expected learning outcomes of master's students align with these educational goals, including developing tutoring competencies for working with various categories of students (56,25%), acquiring skills in implementing the principle of individualization in education (50%), and implementing a personalized approach (37,5%). Different number of respondents who identified skills in implementing the principles of individualization and personalization may serve as an indicator of understanding of the essence of these phenomena and the differences between them, which is undoubtedly a significant substantive outcome of the master's program of BPEP TME. Master's students understand that individualization is associated with adapting the learning process to the objective characteristics of the student, but based on the data and goals of the entire class. Personalization implies adapting learning to the personal interests, goals, and motivation of a specific student, focused on choosing "the content and technology of educational and cognitive activity, developing an individual (personalized) learning trajectory, and assessing their achievements" (Zeer, 2021). Moreover, the greater number of respondents prefers acquiring skills in implementing the principle of individualization. This is likely due to the existence of current Federal State Educational Standards at different levels of education, according to which teachers must lead all their students to a common educational goal, but do so through different paths. Implementing personalization skills in a general

school setting is a more complex pedagogical task and, therefore, less in demand by most master's students.

In response to the survey about the professional deficiencies they hope to address during their studies and how they plan to apply their acquired knowledge after completing the BPEP, more than half of the master's students (56,25%) identified a lack of skills in coaching for individuals with special educational needs. More than a third of respondents (37,5%) noted an inability to address the diverse educational needs of students and a lack of knowledge about modern targeted support technologies. These findings lead to a contradictory conclusion, simultaneously indicating a positive trend toward inclusion in society and a lack of understanding of the need for personalized support not only for individuals with disabilities or special educational needs.

When assessing the substantive significance of the BPEP TME, 75% of respondents emphasized mastering the methodological foundations of tutoring and methods for managing students' IET. However, the methodological foundations of mentoring were not a focus for most master's students (31,25%). However, the same number of students (31,25%) noted the importance of gaining expert knowledge for coordinating mentoring programs, which may indicate the demand for socio-pedagogical design for future self-fulfillment. These quantitative indicators correspond to the number of the working master's students whose professional activities are not related to education, demonstrating the internal consistency and coherence of respondents' judgments in their responses to the questionnaire.

It's also worth noting that SFedU is seeking research tracks that integrate master's and postgraduate programs into a comprehensive IET program. It's concerning, however, that only 18,75% of respondents identi-

fied the development of research skills as a significant learning outcome. However, this indicates that the BPEP TME is being chosen by practicing teachers who plan to continue their teaching careers at the same educational institution after completing it.

Turning to the assessment of the PCs formed by the BPEP by master's students, it should be noted that, according to SFedU's internal educational standard, there are mandatory PCs (PC-1, PC-2, PC-3) and recommended PCs for pedagogical master's programs. Variation in the indicator is permitted only for the recommended PCs. The indicator formulations for the mandatory PCs remain consistent across all pedagogical education programs at this level, regardless of the BPEP profile.

The names of the mandatory PCs and their indicators, as well as the obtained weighted arithmetic mean scores, based on the students' results, are presented in Table 1. The obtained quantitative data demonstrate full compliance between the selection of the list of mandatory PCs for mastering by

the developers of the BPEP for pedagogical master's degree and their ranking based on the opinions of master's students in the presented list (Safontseva, 2024).

The ranking of the recommended PCs based on the weighted arithmetic mean scores arranged in descending order allowed us to identify the PC preference profile of the BPEP TME master's degree students (Table 2).

It should be noted that BPEP TME for the student intake in 2024 and 2025 PC-4, PC-6, and PC-10 were included as learning outcomes. However, Table 2 shows that the inclusion of PC-10 in the BPEP is justified, as, according to quantitative assessments, this competency ranks second among master's degree students. Meanwhile, PC-4 and PC-6 divide up fifth and sixth place, significantly behind not only the most preferred one (PC-13), but also PC-8 and PC-5. It should also be noted that they have an equal chance of being included in the BPEP along with PC-7, which has the same points. The resulting quantitative data for the list of PCs, eligible

Table 1

Mandatory professional competencies for pedagogical master's programs at SFedU

PC code and name	PC achievement indicator code and name	PCSi
PC-1. Able to carry out professional activities in a digital information and educational environment.	PC-1.1. Navigates the modern digital educational environment.	4,52
	PC-1.2. Carries out professional activities taking into account the capabilities of the digital educational environment.	
PC-2. Able to design and organize the educational process in educational organizations of various levels and types.	PC-2.1. Designs the educational process in educational organizations.	4,49
	PC-2.2. Assesses the effectiveness of the educational process in an educational organization.	
PC-3. Able to design and implement educational programs of various levels and focus areas based on modern approaches to teaching and educating students.	PC-3.1. Is familiar with modern approaches to teaching and educating students.	4,31
	PC-3.2. Designs and implements educational programs taking into account current scientific research data.	

Таблица 2 / Table 2

Профиль предпочтений профессиональных компетенций магистрантов
Profile of preferences for professional competencies of master's students

N	PC code and name	PCS _i
1.	PC-13. Able to encourage students' independence and initiative and foster their creative development through project — and research-based learning.	4,5
2.	PC-10. Able to provide regular organized pedagogical and methodological support to participants in the educational process, including persons with special educational needs, as well as to organize their own professional and personal development	4,39
3.	PC-8. Able to study the cultural and educational needs of students, to develop and implement cultural and educational programs for participants in educational relations according to the level and focus of the educational programs being implemented.	4,19
4.	PC-5. Able to design educational practices, programs, and systems in the context of innovative educational policy objectives.	4,13
5.	PC-6. Able to develop scientific and informational, methodological support during implementing educational programs, to create an informational, educational environment for professional activity.	4,00
6.	PC-4. Able to carry out teaching activities in educational organizations in accordance with the level and focus of the education received.	4,00
7.	PC-7. Able to manage the activities of an educational organization, to coordinate the interaction of participants, social and educational institutions in the educational process	4,00
8.	PC-9. Able to analyze the results of scientific research, to apply them to solving specific research problems in science and education, and to design and implement independent scientific research in professional activity.	3,75

for inclusion in master's degree pedagogical programs, reflect the educational needs of master's degree BPEP TME students. The resulting competency profile allows for the clarification of the goals and content of a specific educational program, as well as the improvement of the program's pedagogical design, which involves the creation of relevant educational materials for mastering the content and optimal achievement of the educational goals set by each student.

Each PC is associated with specific educational modules (M) in the structure of the professional unit (PU) of the BPEP, using adjacency matrices. The PU can then be visually represented as a directed graph, the vertices of which are the PC and M, and the arrows represent the connections between them (PC → M). Note that the PU structure

also includes various types of practical training, but their association with the PC is generally comprehensive and straightforward.

The graph for 2024 student intake for the BPEP (Fig. 1) is incoherent, as the profile of six initially declared competencies is implemented by seven training modules (M1–M7), each of which is aimed at developing a specific competency. The exception is PC-3, which is developed by two modules, M3 and M4.

Matrix representation and graphical visualization of relations allowed the developers of the BPEP to refine its design for the 2025 intake. New modules (M8, M9, M10) were introduced into the BPEP, the pedagogical design of the majority of "old modules" was improved, and M5 was removed from implementation. This led to changes of the original PC profile and increased coherence

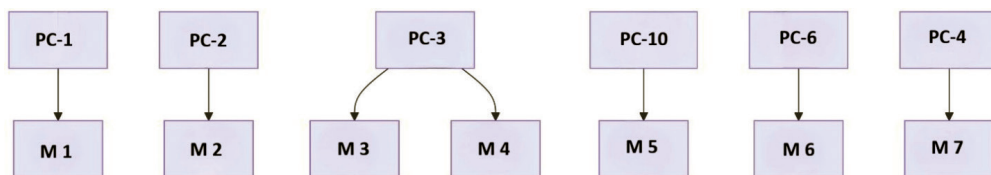


Fig. 1. Graph of the professional block of the educational program, recruitment 2024

in the BPEP PU graph (Fig. 2), to which, at SFedU request, PC-9 was added, aimed at developing the research competence of master's students.

A student survey allowed for updating the BPEP competencies profile, which must include, in addition to the mandatory PC-1 — PC-3, at least two more: PC-13 and PC-10. It was decided to retain PC-9, which is not a priority for master's students. This decision by the academic teaching staff is based on the fact that PC-13 is directly related to the educational and research activities of potential master's students, which only a teacher proficient in research competencies is capable of imparting.

The graph shown in Fig. 3 demonstrates the apparent increase in complexity of the PU; however, modules M11–M14 are not new to the overall structure of the BPEP 2025. Previously, their content in the BPEP 2024 was aimed at developing universal and/or general professional competencies in accordance with the Federal State Educational Standard. A survey of master's students allowed the de-

velopers to clarify the content of M and their interrelations with the relevant professional competencies. Understanding the adjacency matrix allowed us to differentiate the BPEP PU structure, identifying modules that are mandatory for all master's students (M1–M3, M6, M7, M10, M11, M13), elective (M8, M12), and optional (M4, M9, M14).

The BPEP design for the 2026 student intake has begun, developers turn from individualization to personalization of education. While agreeing with the notion that "the theoretical basis for personalized learning activity is the subjectivity of learners" (Zeer, 2021), we note that the development of the BPEP TME is directly linked to the identified demand among master's students for in-depth mastery of coaching technologies in inclusive education. Therefore, the PU will include elective M15 and optional M16, which will enable the implementation of four personalized educational tracks in the BPEP 2026.

IPET 1.1: "Tutoring and Mentoring in Inclusive Education," in which personalization is achieved by allowing master's students to

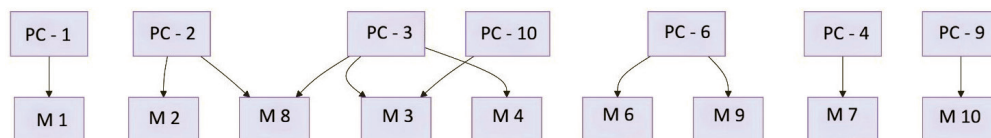


Fig. 2. Graph of the initial professional block of the educational program, set 2025



Fig. 3. Graph of the updated professional block of the educational program, 2025 intake

choose from elective modules M8, M15, and optional M16 (Fig. 4).

IPOT 2.1: “Tutoring and Mentoring in Social and Pedagogical Design” (Fig. 5), aimed at master’s students whose professional interests lie outside the inclusive environment.

As well as IPET 1.2 and IPET 2.2, which represent research tracks within the above mentioned IPETs, the implementation of which may include the optional M9, aimed at students’ detailed understanding of scientific research methodology and developing PC-9 in-depth. The graphs of these IPETs should differ from those shown in Fig. 4 and Fig. 5 by the presence of an additional interrelation: PC-9 → M9.

Visualization of the structure of PB BPEP 2024, 2025, and 2026 projects demonstrate the significant work of the administrative department to develop the TME program based on the educational needs of master’s students, which is confirmed by the integration zones with a high concentration of PC → M interrelations in the graphs. An exception is PC-1, which is formed by a single module and is associated with the use of digital tools. However, this may serve as a reason for further updating the program in the context of the digital transformation of education.

Discussion

It is clear that a single educational program cannot develop all possible or desired competencies in students. However, it is possible

to propose a universal algorithm for designing a basic educational program for any level and profile based on an analysis of students’ educational needs, which can be represented by the following sequential stages:

Diagnostic assessment of educational needs, which requires developing a comprehensive questionnaire to identify the respondents’ social and age profile; analyzing professional deficiencies and students’ educational expectations; and assessing the significance of the developed competencies for them. We emphasize the use of a standardized scale in the questionnaire, which ensures data comparability even with a small sample.

Quantitative analysis of the PC significance based on the calculation of weighted arithmetic mean scores, taking into account the varying weights of the indicators for students.

Development of a competency profile reflecting the current needs and priorities of the target audience of the BPEP, based on the PC ranking and on the obtained quantitative assessments.

4) Designing the BPEP content based on establishing a correspondence between the PC and M after expert discussion by the academic staff and the construction of adjacency matrices.

5) Visualizing the BPEP structure to display the PC → M interrelations, which facilitates updating its content, ensuring a match

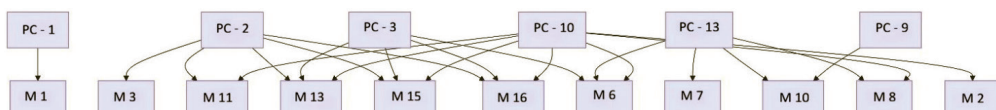


Fig. 4. Graph of personalized educational trajectory 1.1

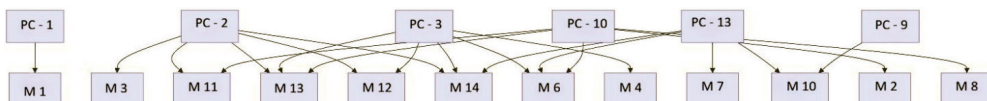


Fig. 5. Graph of personalized educational trajectory 2.1

between students' educational needs and the proposed educational content.

The proposed universal algorithm can be considered as a system approach to designing a BPEP. By conducting a similar systematic study of student preferences, as well as potential applicants to any educational program, it is possible to identify real subjective educational needs. A quantitative assessment of the significance of the PC using weighted average data creates an objective basis for management decisions when updating the BPEP, allowing for the ranking of learning outcomes based on relevance and practical significance. Integrating the resulting educational demand assessment into the design process ensures the flexibility and adaptability of the BPEP substantive significance, enabling the creation of personalized educational trajectories relevant to the needs of any target audience, including small one.

Focusing on the shift of the educational paradigm in modern conditions from the traditional expert-centered model, in which the student is viewed as an object of pedagogical influence, to a student-centered one, we emphasize the need for serious efforts by the expert teaching community to bridge the existing gap between the learning outcomes declared by developers of educational programs and the learning outcomes actually sought by students. Recognizing students as subjects and co-creators of their education, we note that feedback does not replace, but rather enhances and legitimizes the work of experts, making it more effective and substantiated. Indeed, expert discussion by the academic teaching staff determines the content and pedagogical design of the education-

al program, but only the student can provide feedback on how these align not only with the current labor market but also with their subjective needs. This information helps to precisely adjust the educational program, preserving its fundamental nature and enhancing its practical application.

Another important consequence of providing feedback is a reduction in passive, consumptive attitudes and the emergence of co-responsibility among students for the process and outcome of their learning. Developing a mindset of conscious learning increases engagement and helps maintain attention and interest, which directly impacts academic results, which serve as a quality of education indicator.

Conclusion

To achieve the objective of this study and develop a universal algorithm for designing an educational program based on an analysis of students' educational needs, we hypothesized that systematic analysis of such needs would provide a mechanism for continuous program updating and personalized training. To test this hypothesis and achieve this objective, we used a combination of complementary methods: a questionnaire method for quantitative assessment and ranking competencies and constructing a competency profile; expert discussions to establish correspondence between competencies and educational modules through adjacency matrices; and a graph method for the final visualization and analysis of the program structure. Together, these methods allowed us to translate the educational needs into a specific project for the updated BPEP.

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Приложение / Appendix

Приложение А

Анкета «Мотивация выбора для обучения образовательной программы 44.04.01 Педагогическое образование, профиль «Тьюторство и наставничество в сфере образования»

Appendix A

Questionnaire “Motivation for choosing to study the educational program 44.04.01 Pedagogical education, profile “Tutoring and mentoring in the field of education”

Уважаемый магистрант! Просим Вас ответить на вопросы Анкеты, посвященной выбору для обучения образовательной программы «Тьюторство и наставничество в сфере образования». Ваши ответы позволят понять мотивацию поступления на программу, профессиональные ожидания и наиболее востребованные результаты ее освоения. Анкета анонимна, результаты будут использованы в обобщенном виде.

I. Общая информация

1. Ваш стаж педагогической работы:

- Не имею
- До 5 лет
- 5–10 лет
- 10–20 лет
- Более 20 лет

2. Работаете ли Вы:

- Нет, только учусь
- Да, в дошкольном образовательном учреждении
- Да, в общеобразовательной школе
- Да, в вузе
- Да, в Центре развития детей
- Другое (укажите) _____

3. Ваша должность:

- Студент
- Воспитатель/учитель/преподаватель
- Методист/завуч
- Тьютор/ассистент
- Другое (укажите) _____

II. Цели обучения

4. Каковы Ваши основные профессиональные цели при поступлении на данную магистерскую программу?

- Получить профессиональные компетенции для реализации персонифицированного подхода и принципа индивидуализации в образовании
- Освоить современные технологии индивидуализации и персонификации обучения
- Получить профессиональные компетенции в области тьюторского сопровождения обучающихся

- Развить навыки наставничества в разных контекстах
- Повысить квалификацию для карьерного роста в образовательной сфере
- Другое (укажите) _____

5. Как Вы планируете применять полученные знания и навыки после окончания программы?

- Работа в дошкольном образовательном учреждении
- Работа в общеобразовательных школах
- Деятельность в образовательных кружках или центрах дополнительного образования
- Сопровождение в профессиональном образовании (колледжи, вузы)
- Корпоративное обучение (образовательные центры бизнес-структур и сферы производства)
- Научно-исследовательская работа в направлении персонификации и индивидуализации образования
- Инклюзивное образование независимо от уровня реализации
- Социальные и реабилитационные образовательные проекты
- Другое (укажите) _____

6. Какие содержательные аспекты программы для Вас наиболее важны? (выберите не более 3 вариантов)

- Методологические основы тьюторского сопровождения обучающихся
- Применение тьюторских технологий
- Цифровые инструменты в тьюторской практике
- Методологические основы наставничества и его виды
- Технологии наставничества
- Цифровые инструменты в деятельности тьютора и наставника
- Управление образовательными траекториями обучающихся
- Другое (укажите) _____

7. Какие профессиональные дефициты Вы хотите восполнить в ходе обучения?

- Недостаток навыков реализации персонифицированного подхода и принципа индивидуализации в образовании
- Недостаток навыков педагогического сопровождения лиц с особыми образовательными потребностями
- Неумение работать с разнородными образовательными запросами обучающихся
- Сложности в организации наставнических программ
- Дефицит знаний о современных тьюторских технологиях
- Дефицит практического использования цифровых инструментов в процессе сопровождения обучающихся
- Другое (укажите) _____

III. Результаты обучения

8. Какие результаты обучения Вы считаете для себя наиболее значимыми?

- Получение навыков внедрения персонифицированного подхода в образовании
- Получение навыков реализации принципа индивидуализации в образовании
- Получение квалификации, позволяющей занимать должности тьютора в образовании
- Развитие исследовательских навыков в контексте индивидуализации образования
- Получение экспертного уровня знаний для координации наставнических программ
- Формирование тьюторских компетенций для работы с разными категориями обучающихся
- Другое (укажите) _____

9. Ниже Вашему вниманию предлагается перечень общепрофессиональных компетенций (ОПК), на формирование которых направлена Ваша образовательная программа. Оцените, насколько развитие этих компетенций важно для Вас, а также насколько важны те действия (индикаторы), которые Вы сможете выполнять в результате освоения каждой компетенции.

Используйте для оценки пятибалльную шкалу: 1 — совсем не важно, 2 — не важно, 3 — важно, 4 — очень важно, 5 — принципиально важно

Код и наименование общепрофессиональных компетенций						Код и наименование индикатора достижения общепрофессиональной компетенции					
	1	2	3	4	5		1	2	3	4	5
ОПК-1. Способен осуществлять и оптимизировать профессиональную деятельность в соответствии с нормативными правовыми актами в сфере образования и нормами профессиональной этики						ОПК-1.1. Знает и понимает приоритетные направления и тенденции развития отечественной системы образования, нормативные основания (законы, правовые акты и др.), регламентирующие ее деятельность.					
						ОПК-1.2. Применяет основные нормативные правовые акты в системе образования и профессиональной деятельности с учетом норм профессиональной этики, учитывает актуальные проблемы в сфере образования с целью оптимизации профессиональной деятельности.					
						ОПК-1.3. Осуществляет профессиональную деятельность на основе правовых, нравственных и этических норм, требований профессиональной этики.					
ОПК-2. Способен проектировать основные и дополнительные образовательные программы и разрабатывать научно-методическое обеспечение их реализации						ОПК-2.1. Знает и понимает структуру, логику и алгоритм проектирования основных и дополнительных образовательных программ в соответствии с нормативными правовыми актами в сфере образования.					
						ОПК-2.2. Готов разрабатывать методическое обеспечение образовательных программ и организовывать деятельность субъектов образования, обеспечивающих качество образовательных результатов.					
ОПК-3. Способен проектировать организацию совместной и индивидуальной учебной и воспитательной деятельности обучающихся, в том числе с особыми образовательными потребностями						ОПК-3.1. Проектирует организацию совместной учебной и воспитательной деятельности обучающихся, в том числе с особыми образовательными потребностями на основе взаимодействия с другими специалистами при реализации образовательного процесса.					
						ОПК-3.2. Готов оказывать адресную помощь обучающимся с учетом их индивидуальных образовательных потребностей на соответствующем уровне образования.					
ОПК-4. Способен создавать и реализовывать условия и принципы духовно-нравственного воспитания						ОПК-4.1. Понимает необходимость определения условий и принципов, необходимых для реализации процесса духовно-нравственного воспитания обучающихся.					

Код и наименование общефессиональных компетенций	1	2	3	4	5	Код и наименование индикатора достижения общефессиональной компетенции	1	2	3	4	5
обучающихся на основе базовых национальных ценностей						ОПК-4.2. Реализует процесс духовно-нравственного воспитания обучающихся на основе нормативных документов, регламентирующих содержание базовых национальных ценностей					
ОПК-5. Способен разрабатывать программы мониторинга результатов образования обучающихся, разрабатывать и реализовывать программы преодоления трудностей в обучении						ОПК-5.1. Разрабатывает программы мониторинга образовательных результатов образования обучающихся.					
						ОПК-5.2. Разрабатывает и реализует программу преодоления трудностей обучающихся в обучении.					
ОПК-6. Способен проектировать и использовать эффективные психолого-педагогические, в том числе инклюзивные, технологии в профессиональной деятельности, необходимые для индивидуализации обучения, развития, воспитания обучающихся с особыми образовательными потребностями						ОПК-6.1. Проектирует и использует психолого-педагогические технологии образовательной деятельности обучающихся с учетом их личностных и возрастных особенностей.					
						ОПК-6.2. Разрабатывает индивидуально-ориентированные образовательные маршруты и программы (совместно с другими субъектами образовательных отношений), необходимые для индивидуализации обучения, развития, воспитания обучающихся с особыми образовательными потребностями.					
ОПК-7. Способен планировать и организовывать взаимодействия участников образовательных отношений						ОПК-7.1. Планирует взаимодействие и сотрудничество с субъектами образовательного процесса.					
						ОПК-7.2. Организует взаимодействие участников образовательных отношений.					
						ОПК-7.3. Оценивает эффективность организации взаимодействия участников образовательных отношений.					
ОПК-8. Способен проектировать педагогическую деятельность на основе специальных научных знаний и результатов исследований						ОПК-8.1. Учитывает основные тенденции развития образования и данные научных исследований как основу для определения стратегии, целей и задач педагогической деятельности.					
						ОПК-8.2. Проектирует педагогическую деятельность для эффективной реализации образовательных маршрутов обучающихся как основы для обеспечения качества их образовательных результатов.					

Сформулируйте и укажите дополнительные индикаторы перечисленных ОПК, которые представляют для Вас интерес _____

10. Ниже Вашему вниманию предлагается перечень профессиональных компетенций (ПК), на формирование которых направлена Ваша образовательная программа. Оцените, насколько развитие этих компетенций важно для Вас, а также насколько

важны те действия (индикаторы), которые Вы сможете выполнять в результате освоения каждой компетенции.

Используйте для оценки пятибалльную шкалу: 1 — совсем не важно, 2 — не важно, 3 — важно, 4 — очень важно, 5 — принципиально важно

Код и наименование профессиональных компетенций	1	2	3	4	5	Код и наименование индикатора достижения профессиональной компетенции	1	2	3	4	5
ПК-1. Способен осуществлять профессиональную деятельность в цифровой информационно-образовательной среде.						ПК-1.1. Ориентируется в современной цифровой образовательной среде.					
						ПК-1.2. Осуществляет профессиональную деятельность с учетом возможностей цифровой образовательной среды.					
ПК-2. Способен проектировать и организовывать образовательный процесс в образовательных организациях различных уровней и типов.						ПК-2.1. Проектирует образовательный процесс в образовательных организациях.					
						ПК-2.2. Оценивает эффективность организации образовательного процесса в образовательной организации.					
ПК-3. Способен проектировать и реализовывать образовательные программы различных уровней и направленностей на основе современных подходов к обучению и воспитанию обучающихся.						ПК 3.1. Ориентируется в современных подходах к обучению и воспитанию обучающихся.					
						ПК 3.2. Проектирует и реализует образовательные программы с учетом актуальных данных научных исследований.					
ПК-6. Способен разрабатывать научно- и информационно-методическое обеспечение процесса реализации образовательных программ, создавать информационно-образовательную среду профессиональной деятельности.						ПК-6.1. Разрабатывает научно- и информационно-методическое обеспечение процесса реализации образовательных программ.					
						ПК 6.2. Создает информационно-образовательную среду профессиональной деятельности тьютора.					
ПК-10. Способен обеспечивать регулярное организационно-педагогическое и организационно-методическое сопровождение участников образовательного процесса, в т. ч. лиц с особыми образовательными потребностями, а также организовывать собственное профессионально-личностное развитие.						ПК-10.1. Обеспечивает регулярное организационно-методическое сопровождение участников образовательного процесса, в т. ч. лиц с особыми образовательными потребностями.					
						ПК-10.2. Обеспечивает организационно-педагогическое сопровождение участников образовательного процесса, в т. ч. лиц с особыми образовательными потребностями.					
						ПК-10.3. Способен организовывать собственное профессионально-личностное развитие с учетом тенденций и требований современного законодательства.					

Сформулируйте и укажите дополнительные индикаторы перечисленных ПК, которые представляют для Вас интерес _____

11. Ниже Вашему вниманию предлагается перечень профессиональных компетенций (ПК), которые не являются результатом освоения Вашей образовательной программы. Оцените, насколько развитие этих компетенций могло бы представлять для Вас интерес?

Код и наименование профессиональных компетенций	1	2	3	4	5
ПК-4. Способен осуществлять педагогическую деятельность в образовательных организациях в соответствии с уровнем и направленностью полученного образования.					
ПК-5. Способен проектировать образовательные практики, программы и системы в контексте задач инновационной образовательной политики.					
ПК-7. Способен управлять деятельностью образовательной организации, координировать взаимодействие участников образовательного процесса, социальных и образовательных институтов.					
ПК-8. Способен изучать культурно-просветительские потребности обучающихся, разрабатывать и реализовывать культурно-просветительские программы для участников образовательных отношений в соответствии с уровнем и направленностью реализуемых образовательных программ.					
ПК-9. Способен анализировать результаты научных исследований, применять их при решении конкретных научно-исследовательских задач в сфере науки и образования самостоятельно					
ПК-13. Способен поддерживать самостоятельность, инициативность обучающихся, способствовать развитию их творческих способностей в рамках проектной и учебно-исследовательской деятельности.					

Поясните причины Вашего интереса _____

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Ekaterina M. Zemlina — experiment execution; data collection and analysis.

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

Вклад авторов

Горюнова Л.В. — идеи исследования; аннотирование, планирование исследования; контроль за проведением исследования.

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Все авторы приняли участие в обсуждении результатов и согласовали окончательный текст рукописи.

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The authors declare no conflict of interest.

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