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The interplay of dominant factors that influence adolescents' academic performance: Motivation type and pressure vs involvement

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The study assesses the effectiveness of using motivation, pressure, and involvement in improving academic performance among adolescents on the example of Russia and Kazakhstan. The relationship between these factors and academic success was evaluated by calculating Pearson's correlation coefficients based on the Academic Motivation Scale test's results. The novelty of the study lies in the results: the study highlights the relationship between the individual aspects of this triad at the level of individual countries. The comparative analysis is performed using statistical data from the international knowledge assessment methodologies survey results. The findings show that intrinsic motivation and parental involvement in school life can improve adolescents' academic performance. The negative consequences are associated with the pressure put on students by the teachers and family.

KEYWORDS

academic motivation, educational achievements of students, extrinsic motivation, intrinsic motivation, school education quality

Introduction

In today's era of rapid development and dissemination of information, it is counterproductive to deliver knowledge that will become irrelevant in 3–5 years. As an alternative, the education system should prepare children for lifelong learning and teach them the skills to question what they think they know, seek solutions, expand the established frameworks, and take responsibility for their future (Filippello et al., 2020). It may seem hard to achieve this educational goal with adolescents, mostly

because adolescence is considered to be the period when a downward trend in academic performance is most likely to occur (Liu et al., 2013; Wijsman et al., 2019). A number of researchers point to the importance of student autonomy and self-determination as the leading predictors of academic achievement and interest in scientific motivation (Banerjee and Halder, 2021; De Loof et al., 2021). The downward trend can be reversed with adequate support from parents and teachers (Filippello et al., 2020; Famero, 2021). Given that most career choices are made during adolescence, a decline in academic achievement during this period can negatively affect the lifetime success. Thus, the academic performance of students should be a priority to their parents and teachers during adolescence.

The academic performance of individuals within this age group depends on multiple factors. One of them is stress caused by physical, psychological, emotional, or social changes; another factor is brain chemistry, which can result in the inconsistency of actions, mood swings, different interpretations of the same information, etc. (Romer et al., 2017; Castro-Sánchez et al., 2019; Paschke et al., 2021). The issues of stress elimination, in particular, through increasing the adaptability of adolescents with the help of parents through need-supportive practices, are considered in some studies (Moe et al., 2020; Moè and Katz, 2020). Academic performance worsening is very often associated with a drop in motivation (Wijsman et al., 2019; Banerjee and Halder, 2021). The reasons for this may be (1) the prestige that the image of an unruly student has and which adolescents seek to maintain in the eyes of their peers, (2) the discrepancy between student interests and the knowledge offered by the school, and (3) the failure of the educational system to unlock students' potential (Wijsman et al., 2019). This paper examines three factors that can influence adolescents' educational outcomes: motivation, as the major driver of learning (Muenks et al., 2018; Castro-Sánchez et al., 2019), pressure, and involvement.

Today, the most common stressor is the COVID-19 pandemic and measures introduced to by governments to tackle its consequences and prevent further spread (Belcher et al., 2022; Norris and Fenwick, 2022). Researchers all over the globe found that these quarantine measures had a negative effect on schooling, which manifested in heightened anxiety, insecurity, and increased time spent on social media or playing video games (Hertz and Barrios, 2021; Paschke et al., 2021). A decline in academic performance and motivation to learn was recorded almost in every corner of the world. In view of the recent events, a tremendous amount of research focused on the experience of distance learning during the lockdown period and on challenges associated with the transition to remote education (Hertz and Barrios, 2021).

The available experience and data on the topic allow asserting a significant role of partnerships between schools, communities, and groups in which the student is engaged. No less important is the role of parental support and their close contact with teachers and school administration (Baumann and Harvey, 2021; Olivos, 2021). As the practice shows, high-performing students generally maintain their leading positions during the quarantine period. Therefore, one may argue that personal characteristics and motivation have a decisive influence in this case (Baumann and Harvey, 2021).

Literature review

Today, a decline in adolescent's academic performance is of growing concern not only to parents and teachers but also to many specialists. Researchers have outlined a number of factors affecting learning results, including, first of all, self-esteem, family and peer relationships, life satisfaction, and the positive effect of physical activity (Castro-Sánchez et al., 2019). Academic research emphasizes the connection between the factors of external social and family influences on the personality of a teenager and their own efforts (Nyaga, 2019; Olivos, 2021). The formation of an environment and involvement corresponding to the goals of learning creates conditions for the motivation of an adolescent (Wijsman et al., 2019; Tus, 2020). There are numerous arguments that motivation is an essential condition for improving academic outcomes. Thus, it has been studied from different perspectives to investigate its impact on various dimensions: on learning foreign languages (Kim and Kim, 2017; Komlósi, 2017; Lamb, 2017), on physics and chemistry (Wang et al., 2017), and on mathematics (Ng et al., 2016; Arulmoly and Branavan, 2017). In a similar vein, many researchers have focused on the point of how motivation in sports affects motivation to study (Castro-Sánchez et al., 2019) and the general state of development of information technologies (Shanmugam and Balakrishnan, 2019). According to some researchers (Allen et al., 2018), the relationship between motivation and academic standing is not direct. However, one cannot deny that, along with gender, race, ethnicity, emotional stability, personality traits, parental/peer/teacher support, safety, and extracurricular activities, such determinants as academic motivation, student's involvement in training, and resulting achievements do affect adolescents' affiliation with school (Allen et al., 2018; Van Der Kaap-Deeder et al., 2019; Hertz and Barrios, 2021).

A number of studies highlight the complementary effect of autonomy support from parents and teachers to increase learning motivation for both middle and secondary school (Filippello et al., 2020; De Loof et al., 2021). Autonomy in adolescents may be strongly associated with peer support. and social competence with peers is consistently related to academic success (Wentzel, 2017). There is also a negative impact of increased teacher control of student motivation, and this impact remains relevant regardless of gender or age (Banerjee and Halder, 2021). Motivation for science and academic achievement has been closely linked in the past 2 years to student

autonomy and the ability of teachers and parents to maintain this autonomy (Filippello et al., 2020; Ryan and Deci, 2020). A rather deeply studied topic of teaching styles is considered by some researchers from the point of view of motivating and demotivating styles, which can significantly affect the success of students. According to researchers, motivating styles are based on support for autonomy, the presence of a structure in learning activities, and a certain freedom of student behavior (Aelterman et al., 2019). There is evidence that autonomy and academic development are related to the self-determination of the individual and the process of its development (Famero, 2021). Research during COVID shows that teachers' appeal to fear as a way to increase motivation and improve performance is a failure (Belcher et al., 2022). At the same time, the lack of direct contact with the teacher in long online learning sessions reduces academic performance on average (Norris and Fenwick, 2022).

In recent academic studies, motivation refers to the expectation of success, goal setting, and future aspirations (Allen et al., 2018). Bortes et al. (2021) note that there is a bidirectional relationship between adolescents' well-being, motivation, and academic achievement. As such, motivation can be intrinsic (Liu et al., 2013) or extrinsic (Lamb, 2017; Wijsman et al., 2019; Ryan and Deci, 2020). If the activity is aimed at satisfying interest in learning, its results (not marks but knowledge), self-development, and acquiring new qualities and abilities, then such motivation is called intrinsic. It makes the most significant contribution to improving adolescents' performance compared to other methods (Makarycheva, 2012; Buzdar et al., 2017). On the contrary, if the educational activity is carried out only because it will give an opportunity to get a high grade as parents want or a teacher requires, or it will help achieve a certain status among classmates, then such motivation is called extrinsic (Wentzel, 2017). As research results show (Lamb, 2017), such motivation is not long-term and hardly ever able to raise the academic performance of adolescents greatly or keep it at a high level for a long time. Nevertheless, a number of studies in recent years offer approaches to mutual support of internal and external motivation, which make it possible to increase the motivation and levels of performance of secondary school students in a long time period (Wijsman et al., 2019).

Among the major motives to study, the following six groups are distinguished (Makarycheva, 2012):

(1) Academic – manifests itself in a direct interest in knowledge;
(2) Social – knowledge is used as a tool for bringing benefits to society;
(3) Positional – promotes self-education and self-improvement in order to take a certain position in the class;
(4) Evaluative – satisfies the need to demonstrate success to adults and get feedback;
(5) External – is activated under the influence of teachers, parents, and peers;
(6) Game-based – when the rules and content of the game are not dictated by adults but the process itself brings positive emotions.

Allen et al. (2018) indicate that motivation is influenced greatly by such personal qualities of an adolescent as conscientiousness, the desire for social support, self-confidence, the ability to adapt to changing environment, self-efficacy, and the ability to avoid troubles and get along with teachers, family, and classmates. The involvement, in turn, is a more complex system, depending on many factors (skills, student-teacher relationships, academic outcomes; Lamb, 2017; Na et al., 2020).

It is not big news today that during adolescence, academic performance of students can be influenced by their parents (Nyaga, 2019), teachers (Allen et al., 2018; Liu et al., 2020), and peers (Olanrewaju and Omoponle, 2017). However, to date, the extent of these factors' influence remains controversial (Allen et al., 2018). Even so, parents and teachers should remember the importance of autonomy in the learning process or, in other words, give students the opportunity to choose the trajectory of future activity (Lamb, 2017). Despite the fact that peer-to-peer interaction is usually far from aiming to improve educational outcomes, students of the same age do can provide exceptional social care and academic support to boost their classmates' academic results (Allen et al., 2018).

A significant role in academic achievement, as shown by recent studies, is played by investments in the form of funds, attention and certain behavior on the part of parents and the depth of their involvement in the learning process of adolescents (Krivova et al., 2017; Vasilyeva et al., 2018). This fact implies the paramount importance of the involvement of the parents in their children's school life as well as of a positive relationship between students and educators (Allen et al., 2018). As shown by the practical experience, a teacher can become an excellent motivator for learning, not only as a good mentor but also as an example to follow (Lamb, 2017).

Problem statement

The present work reviews the impact of motivation, pressure, and parental involvement (support) as potential tools to improve the learning outcomes of adolescents. The primary goal is to investigate the relationship between these factors and academic performance in an adolescent sample by using international knowledge assessment methodologies (TIMSS and PISA). The focus is on Russia and Kazakhstan. The objectives of the study are to:

1. determine the relationship between motivation and academic performance in high-performing

adolescent Russians and Kazakhs by assessing their career certainty through empirical research and PISA-based tests;
2. evaluate the effect of pressure and stress on adolescents' academic progress based on empirical research and data from a learning confidence survey;
3. determine the relationship of academic performance with parental involvement in the learning process and teacher engagement using data from empirical research and PISA-based tests;
4. provide a comparison of academic performance between adolescent Russians/Kazakhs and same-aged students in other countries based on international statistics on mathematics and science achievements.

Materials and methods

Participants

The empirical part of the study involved 430 school students (**Table 1**), out of which 181 attended two schools in Almaty and Shymkent (Kazakhstan), and 249 were enrolled in three schools in Moscow (Russia). The study sample includes 7th and 8th graders. This category of students has sufficient knowledge and experience, but is not subjected to career building pressure that those who enter their final year of study experience.

The study did not aim to achieve a statistically representative sample. However, taking into account the general population, the margin of sampling error is $p = 1.81$.

Research design

The primary data collection tool used in this study was the English version of the Academic Motivation Scale, or AMS (Vallerand et al., 1992). All participants were proficient in English and experienced no difficulty in completing the AMS. Reliability and validity of this instrument was reported as high in previous research. The Scale has 28 items that measure intrinsic motivation, extrinsic motivation and amotivation on a 7-point Likert-type scale. The relationship between the type of motivation and academic achievements (grades) was assessed by Pearson's correlation analysis. Data obtained for each academic subject were averaged to analyze the general correlation.

Additionally, students were asked to report the subjective extent of pressure and support they felt by assessing the frequency of encounters on a 5-point Liker scale (1 – Never; 5 – Always) in a 2-item interview. The questions were as follows:

> Q1. Do your parents, teachers, and those surrounding you put pressure on you during the learning process?

> Q2. Do your parents and teachers provide you with any moral, pedagogical, or other support during the learning process?

The correlation between responses and academic achievements was determined by calculating the Pearson's correlation coefficients. The results were then averaged.

The next step after data collection and processing was the comparison of empirical data and previous findings. In order to safeguard objectivity, the analysis used TIMSS (2021) and PISA (OECD, 2019) data. TIMSS (or Trends in International Mathematics and Science Study) is an international assessment of the mathematics and science knowledge of 4th and 8th grade students. It has been conducted every 4 years since 1995; in 2015, the assessment covered 39 countries. PISA (Programme for International Student Assessment) has been around since 2000. Every 3 years, it measures the reading, mathematical, and scientific literacy of 15-year-old students. In 2018, PISA enrolled participants from 78 countries.

To assess the impact of pressure on adolescents' academic performance, this study focused on statistical data retrieved from the executive summary of the Confidence in Learning Poll (The Harris Poll, 2019), which reflects the effect of stress, and on exploring the relationship between absenteeism and PISA-assessed student performance. Alongside this, the present study makes use of data from the PISA 2018 report (parental involvement in the learning process) and scientific sources concerning the effectiveness of teaching methods in engaging adolescent learners.

Statistical instruments

Statistical data processing and visualization were carried out in Microsoft Excel 2019.

TABLE 1 Research sample distribution.

	Russia		Kazakhstan	
	Boys	**Girls**	**Boys**	**Girls**
Year 7	56	61	45	44
Year 8	68	64	46	46

Ethical issues

The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. The participation of all respondents was completely voluntary and approved by their parents and school teachers. In order to ensure unbiased statistical results, each participant was replaced by a unique identifier, to which scores and testing outcomes were linked. The tests were carried out in an online format (distributed via e-mail). This facilitated the subsequent results' processing and contributed to personal data non-disclosure, collection, storage, or use.

Research limitations

This research provides data generalizations, rather than individual assessments made using factor analysis and multivariate correlations. The latter methods can be useful to study student motivation to learn specific subjects across different social and gender groups, but it is beyond the scope of this article to explore these differences.

Results

Motivation type and academic performance in adolescent students

Most participants (64.66% Russians and 59.67% Kazakhs) demonstrated extrinsic motivations. The external influences, in this case, is the pressure put on students by their relatives, teachers, or the overall social situation. The distribution of academic performance within the extrinsically motivated group shows that there are all levels of performance and no statistically significant deviations. Amotivated students comprised the smallest group (11.65% of Russians and 6.63% of Kazakhs; Figure 1). Note that the majority of participants are either extrinsically motivated or not motivated, while those with intrinsic motivations make up a quarter to a third of the sample.

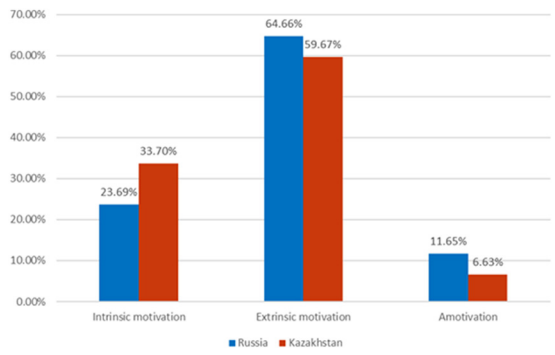

FIGURE 1
Survey results according to the Academic Motivation Scale (in %).

The relationship between motivation type and academic performance was found to be strongly positive (Table 2) regardless of the success level. It suggests that any level of academic performance is connected with a particular type of motivation. There were no statistically significant differences between the Kazakh and Russian respondents, nor were such found between male and female students.

The effect of pressure and stress on adolescents' academic progress

Strong positive correlations were found between pressure and amotivation (r = 0.821) and between intrinsic motivation and involvement (r = 0.691). On the other hand, a close relationship was seen between pressure and low academic performance (r = 0.686) and between high academic performance and involvement (r = 0.705). Other correlations were considered insignificant because their maximum value of r did not exceed.211 (Table 3).

The results obtained for Russia and Kazakhstan can be compared with those received in 2018 through PISA international testing (Table 4). This study is limited to mathematics, science, and reading, for only these dimensions are covered in the available international reports related to academic success (OECD, 2019; The Harris Poll, 2019).

Motivation and academic performance in adolescent student: The results of empirical research and Programme for International Student Assessment-based tests

In the global PISA ranking from 2018, Russia ranked 30th in math, with the mean score of 488 points, which correspond to Level 3 proficiency (Table 4). The reading score was slightly lower (479 points), indicating the Level 2 proficiency. The same level of performance Russian adolescents demonstrated in science. The country ranked 33rd out of the 79 countries and regions, according to the mean score in science (478 points). Kazakhstan, on the other hand, made it into the 54th place with the mean math score of 423 points (Level 2 proficiency). The mean reading and science scores were 387 and 397 points, respectively, indicating the Level 1 proficiency. Country, which performed to the highest level (Level 4) in all education systems, was China. Among the best math performers were Singapore,

TABLE 2 Correlation between the motivation types and academic performance of research participants (averaged values).

	Intrinsic motivation		Extrinsic motivation		Amotivation	
	Boys	Girls	Boys	Girls	Boys	Girls
r	0.781	0.804	0.696	0.774	0.751	0.809

TABLE 3 Correlation between the motivation types, academic performance and pressure/support from teachers and parents.

	Intrinsic motivation	Extrinsic motivation	Amotivation	Academic performance		
				Low	Average	High
Pressure	0.201	0.116	0.821	0.686	0.184	0.025
Involvement in learning	0.691	0.092	0.034	0.056	0.113	0.705

TABLE 4 PISA 2018 test results for Russia and Kazakhstan.

Country	Reading			Mathematics			Science		
	Level	Rank	Mean score	Level	Rank	Mean score	Level	Rank	Mean score
Russia	L2	31	479	L3	30	488	L2	33	478
Kazakhstan	L1	69	387	L2	54	423	L1	69	397

Based on data retrieved from OECD (2019).

Macau, and Hong Kong, but their level of performance (Level 2) in other two education systems was lower compared to China.

According to the TIMSS test scores from 2015 (**Table 5**), Russian schoolchildren are sixth in mathematics with the mean score of 538 points. The mean score in science is lower (544 points). Kazakhstan came right after Russia in terms of mathematics and took a seventh position with the mean score of 528 points. In natural science, the country was only two ranks below the Russian Federation – it stood ninth with the mean score of 533 points. As concerns the leaders in terms of TIMSS, the top spots in two directions was clinched by Singapore. South Korea came second in mathematics, Japan was second in science, and Taiwan ranked third in both. Hong Kong and Japan stood fourth and fifth in mathematics, whereas South Korea, Slovenia, Hong Kong, and the United Kingdom took the fourth, fifth, sixth, and eighth positions in science, respectively.

The influence of a social component on student performance, in mathematics and science particularly, was determined by the Confidence in Learning Poll.

Among all Russian students who performed high in mathematics or sciences (**Table 6**), 32.6% expressed a desire to become a professional in science or technology by the age of 30; this intention was reported by 20.3% of male and 12.3% of female respondents. In Kazakhstan, such ambitions were inherent to a somehow greater number of 15-year-olds: 28.3% of boys and 14.2% of girls. The frequency of intentions to acquire a medical profession was significantly lower among adolescents in both countries (10.4% of boys and 16.7% of girls in Kazakhstan vs 8.5% of boys and 16.3% of girls in Russia). In other countries, such as Singapore, where adolescents are likely to study better, the percentage of adolescent students who decided on their future medical specialty was much higher and accounted for 29.9% among girls and 27% among boys. This finding indicates a positive effect of social motives on adolescents' academic performance.

Extrinsic motivation is directly and strongly related to pressure that is put on students by their parents and teachers. Teenagers may come under pressure from teachers to make grades higher. Sometimes, teachers assign extracurricular tasks and activities, creating additional stress. Such behavior may cause a loss of interest in learning, absenteeism, and decreased academic performance. The PISA 2018 findings indicate that student performance in reading is higher in those countries where students miss fewer classes without a good reason. Absenteeism may be seen, in this case, as both a cause and a consequence of poor learning. Given that there are two tendencies of motivation in adolescents (the desire for success and failure avoidance), the school skipping trend may be explained by the intention to avoid education-related failures.

Academic performance in adolescents based on international statistics (science and mathematics)

In general, pressing for high performance increases stress, which, according to the Confidence in Learning Poll findings, adolescents already experience (The Harris Poll, 2019).

TABLE 5 TIMSS, 2015 testing results for Russia and Kazakhstan.

Country	Mathematics (Year 8)		Science (Year 8)	
	Rank	Mean score	Rank	Mean score
Russia	6	538	7	544
Kazakhstan	7	528	9	533

Based on data retrieved from TIMSS (2021).

TABLE 6 Assessment of the influence of social motive on adolescents' performance according to the results of PISA 2018 (OECD, 2019).

Country	Percentage of top performers in science or mathematics who expect to work as. when they turn 30.			
	Science and technology professionals		Health care professionals	
	Boys, %	Girls, %	Boys, %	Girls, %
Russia	20.3	12.3	8.5	16.3
Kazakhstan	28.3	14.2	10.4	16.7

The 2019 poll of 5,002 students, 5,001 parents, and 1,152 teachers from Germany, China, Russia, the US, and Japan found that 76% of educators consider anxiety and lack of confidence to hinder learning. At the same time, 51% of schoolchildren said they were nervous when trying to do something new, and 47% reported avoiding those classes where they previously failed.

As concerns parental pressure, parents can limit their child's time for communication with peers, using computer and telephone, leisure, etc. (Makarycheva, 2012). It is unacceptable to impose communication restrictions at this age, for it is a valuable asset in learning. According to the PISA 2018 findings, the influence of parental involvement in the school life of adolescents is not limited to choosing a safe, reputable, and climate-friendly school. Parental involvement also implies a continued interest in their child's academic achievements. The share of parents who show such an interest is 11% in Russia and 5% in Kazakhstan. For comparison, in Singapore, their share constituted 21%, in Hong Kong – 19%, and in China – 17%. That is, in countries with generally higher levels of performance among adolescents, parental involvement in the educational process is much higher than in states characterized by somehow worse academic results. This finding suggests that parental involvement has a positive effect on their children's school life.

The results of PISA testing show that the most effective methods to engage students into the learning process and, as a consequence, improve their performance are pedagogical enthusiasm and corresponding teachers' incentives. This relationship was seen in 43 out of 78 analyzed education systems. Hence, when shaping an environment that promotes adolescents' academic performance, it is important to create appropriate conditions for them to experience success. A desire to feel successful again and again could be a good learning motivation. Another important factor to consider and prioritize when building learning trajectories is communication with peers. Hence, teachers should plan the learning process in such a way that would satisfy students' communication needs (Makarycheva, 2012; Artemova and Vetosheva, 2018).

Discussion

The study shows that the majority of participants represent extrinsic motivation or amotivation, those with intrinsic motivation make up from a quarter to a third of participants. This situation, as many previous studies have shown, is common and possibly natural in large populations (Wijsman et al., 2019; Ryan and Deci, 2020). Practical research shows that a significant increase in the share of intrinsic motivation in a group can be achieved, and most researchers consider this issue through the prism of Self-Determination Theory (Banerjee and Halder, 2021; Famero, 2021). Researchers have also demonstrated in approach of Self Determination Theory that intrinsic motivation is directly related to academic achievement and inversely correlated with student dropout intentions (Jeno et al., 2018). These studies did not look at the strong correlation of intrinsic motivation and improvement in academic achievement, they considered support from parents and teachers and increased student autonomy as a predictor of improvement. However, the findings of the present study suggest that autonomy is a behavioral reflection of an increase in the importance of intrinsic motivation.

According to the results of PISA 2018, the educational system of China is at the forefront among 78 countries of the world (The Harris Poll, 2019). The reason for this may be the fact that its society pays a great deal of attention to the development of creative potential of children and adolescents due to the widespread opinion that in adulthood it will help them succeed in a rapidly changing environment (Liu et al., 2013).

The present empirical research confirms the importance of being highly involved in developing intrinsic motivation and training to achieve high academic results. The dominance of extrinsic motivation among students is supported by many studies (Buzdar et al., 2017; Ryan and Deci, 2020). These same studies point to a combination of extrinsic motivation with more anxiety, less satisfaction and stress (Baumann and Harvey, 2021; Bortes et al., 2021). The advantages of intrinsic motivation are obvious in that they lay the foundation for the student to continue shaping his own learning trajectory in accordance with his own will, with minimal involvement of the formative pressure of the external environment (Anderson, 2017; Abildayeva et al., 2020).

This idea is supported by many other modern researchers (Buzdar et al., 2017; Wentzel, 2017), who state that intrinsic motivation is crucial on the path to creativity and success. As concerns extrinsic motivation, it is often regarded as a result of pressure imposed by the environment or third parties (Liu et al., 2013; Tus, 2020). There is no doubt that the involvement of parents in the educational process is essential for upbringing a creative personality. However, parental support in meeting student needs and peer support have been experimentally proven to improve student outcomes (Jeno et al., 2018; Moe et al., 2020; Moè and Katz, 2020). Nevertheless, in this situation, it is extremely critical not to press on the child but respect personal autonomy, which becomes especially relevant in online learning conditions (Wentzel, 2017; Na et al., 2020). Another important implication from the experience of China is that the National College Entrance Exam acts as a powerful extrinsic motivator for its adolescents (Liu et al., 2013). In general, PISA 2018 showed that about 77% of Chinese students of the age 15 with a low socio-economic status plan to get higher education. Olivos (2021) rightfully state that, just like the above circumstances, the desire of parents to improve the social situation of their children is extrinsic motivation for advancing their performance. This argument is in complete agreement with the results obtained for Russian and Kazakh respondents, for whom extrinsic motivation becomes decisive as they approach the end of the school study period.

Unlike China, in South Korea, which, according to TIMSS (2021) ranked second in mathematics and fourth in science, the motivation of students' academic activity is viewed as a response to the expectations of their authoritative parents (Tam, 2016). In this country, family members are more involved in educational activities than in other states, which naturally leads to better average academic results (Tam, 2016). In the case of the Russian Federation and Kazakhstan, deep parental concern in children achievements may give the same result. However, as reflected by statistical data, the degree of students' involvement is significantly lower than that in South Korea (Tam, 2016; Vasilyeva et al., 2018). Provided that a number of US scientists declare that parental support is most important for academic motivation (Ricard and Pelletier, 2016), the collected empirical results correspond to the data obtained in different countries of the world.

In Singapore, which ranks second in all three disciplines in terms of PISA 2018 (The Harris Poll, 2019) and first in mathematics and science in terms of TIMSS (2021), researchers support the theory of self-determination, which includes six components. These are cognitive assessment of intrinsic and extrinsic motivation, organic integration of the unmotivated, cause-and-effect orientation, basic psychological needs and their connection with psychological health and well-being, internal and external content theory goals and their impact on motivation and well-being, and relationship motivation (Liu et al., 2015; Buzdar et al., 2017). Each of the listed components relates to learning motivation. At the same time, the sixth also refers to the relationship of the adolescent with the teachers (which contributes to their involvement in the educational process), peers (who can exert pressure leading to both positive and negative results), and parents (whose support and appreciation contributes to improved academic performance).

The Russian Federation has only recently begun a smooth transition from a utilitarian and pragmatic form of training focused on knowledge, skills, and abilities to a humanistic education aimed at personal development and lifelong learning (Shishov, 2016). The use of smart learning and new technologies in the form of training sessions, group teaching methods, collaborative learning, role-playing games, the use of smart components, etc., in training still has a short history and is not implemented everywhere (Krivova et al., 2017). Today, increasing motivation is included in the list of tasks for its teachers who are awaited to create an environment that will attract students to the educational process and maintain their interest (Ivanova et al., 2019; Abildayeva et al., 2020). Therefore, to achieve learning goals, the teacher should not only be fluent in the subject but also be a psychologist in order to skillfully influence the emotional state of adolescents (Ivanova et al., 2019).

Conclusion

The current study of 430 adolescent students in Russia and Kazakhstan sought to determine the dominant types of student motivation, the extent of pressure they experience, and the extent to which their parent and teachers are involved in the learning process. This information was used to examine the relationship of motivation, pressure, and involvement with academic performance. The analysis revealed a strong and direct relationship between pressure and amotivation ($r = 0.821$) and between intrinsic motivation and involvement ($r = 0.691$). A relatively close relationship was seen between pressure and low performance ($r = 0.686$) and between high performance and involvement ($r = 0.705$). The comparison of statistical data on average performance shows that adolescent Russians

are high-achievers in mathematics and science, with sixth and seventh places in the TIMSS (2015) ranking, whereas Kazakhstan ranked seventh and ninth, respectively. According to the PISA 2018 findings, adolescent Russians have higher literacy in all education systems (mathematics, reading, and science) with 30th, 31st, and 33rd places, than adolescent Kazakhs, who ranked 54th, 69th, and 69th, respectively.

A direct positive relationship was found between academic performance and social motivation (intentions to serve humanity and be involved in science, technology, or medicine). The pressure put on adolescents by their parents and teachers had relatively little effect on academic performance but it relationship with poor educational achievements was stronger. As such, external pressure was found to increase absenteeism and anxiety, subsequently causing a decline in performance. Another factor, which was proven effective in enhancing adolescents' academic performance, besides intrinsic motivation, was teacher involvement, manifested in the integration of top-priority activities (communication) and the encouragement of personal autonomy. Parental involvement was no less strong and favorable.

The present research can serve as platform for future investigation of effective methods to improve the academic performance of adolescents. The findings can be useful for researchers and educators to search for new ways of improving educational achievements and to improve the existing strategies.

Practical implication

The results of the research can be implicated in the formation of the curriculum for middle and secondary schools, STEM education and science education to increase the academic performance of adolescents and create conditions for focusing on professional achievements and further professional development of students in the field of high-tech activities and science.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Secondary School Named After A. S. Pushkin. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

GA, MM, and VZ were performed by material preparation, data collection, and analysis. VS was written by the first draft of the manuscript. All authors contributed to the study conception and design, read and approved the final manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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