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The correlation between a passion for computer games and the school performance of younger schoolchildren

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Today computer games occupy a significant place in children's lives and fundamentally affect the process of the formation and development of their personalities. A number of present-day researchers assert that computer games have a developmental effect on players. Others share the point of view that computer games have negative effects on the cognitive and emotional spheres of a child and claim that children with low self-esteem who neglect their schoolwork and have difficulties in communication are particularly passionate about computer games. This article reviews theoretical and experimental pedagogical and psychological studies of the nature of the correlation between a passion for computer games and the school performance of younger schoolchildren. Our analysis of foreign and Russian psychology studies regarding the problem of playing activities mediated by information and computer technologies allowed us to single out the main criteria for children's passion for computer games and school performance. This article presents the results of a pilot study of the nature of the correlation between a passion for computer games and the school performance of younger schoolchildren. The research involved 32 pupils (12 girls and 20 boys) aged 10–11 years in the 4th grade. The general hypothesis was that there are divergent correlations between the passion of younger schoolchildren for computer games and their school performance. A questionnaire survey administered to the pupils allowed us to obtain information about the amount of time they devoted to computer games, their preferences for computer-game genres, and the extent of their passion for games. To determine the level of school performance we analyzed class registers. To establish the correlation between a passion for computer games and the school performance of younger schoolchildren, as well as to determine the effect of a passion for computer games on the personal qualities of the children, the Pearson product-moment correlation coefficient (r -Pearson) was used. Analysis of the results of the study indicates that there is a correlation between computer-game genres and the school performance of younger schoolchildren, that a passion for role-playing computer games adversely affects the school performance of younger schoolchildren,

and that the time period for a single game determines the extent to which younger schoolchildren have the personality traits necessary to maintain educational motivation and interest in an academic subject.

Keywords: computer-gaming activities, passion for computer games, school performance, younger schoolchildren

Introduction

The role and the place of personal computers and information technologies in human lives has been changing rapidly. A personal computer helps modern humans not only at work and at school but in leisure activities as well. Computer games are becoming increasingly more common and popular. Psychologists, educators, and parents are particularly concerned about the excessive enthusiasm observed in children playing computer games. Today computer games occupy a significant place in children's lives and fundamentally affect the process of the formation and development of their personalities (Avetisova, 2011).

Seeing a game as a specifically children's form of activity has always been important. Researches of Russian psychologists (L. S. Vygotsky, A. N. Leontiev, D. B. Elkonin, M. I. Lisina, and others) showed that a game is a dominant activity that not only ensures the all-round development of preschool-age children but also continues to be an active means of personal development at the primary-school age.

However, here, we are, to a great extent, interested in the play activities of younger schoolchildren as mediated by information and computer technologies. Numerous research studies both in foreign and in Russian psychology are devoted to the interaction of children and computers. In order to identify and evaluate the possible psychological effects of information and computer technologies, the subject matter of the research is generally skills, operations, specific actions, individual mental processes, and various kinds of professional play and learning activities. Much information has been gathered in this area by, among others, S. Turkle, M. Cole, S. Papert, M. Griffiths, D. Gentile, E. Swing, O. K. Tikhomirov, A. E. Voyskounsky, V. P. Zinchenko, A. G. Shmelev) (Babaeva & Voyskounsky, 1998).

Turkle (1984) observed the development of the concepts of animate and inanimate in younger schoolchildren. The children developed the idea of a computer as something intermediate between animate and inanimate ("kind of living" or "as if living"); this idea had never been observed in the "noncomputerized" children examined by J. Piaget and other psychologists.

The use of computers by children in extracurricular activities is considered a specific problem. The most common new technology in extracurricular children's activities is computer games. M. Cole and his staff specifically designed and modelled an extracurricular education program based on new computer technologies; it combined games, learning, and communication in order to create optimal conditions for child development (Uzykhanova, 1993).

According to Cole (1998), the Internet can be the basis for building a cognitive-communication environment of a fundamentally new type. The learning environment he developed is called "the fifth dimension"; and it is one of the most promising environments in the realization of "the zone of proximal development" of a

child. Papert (1992), sharing the view of Cole, noted that “the computer is usually a step-by-step guide for a child” (pp. 32-33).

Griffiths (1999) notes that games can improve hand-eye coordination, the mental manipulation of objects in space, creativity, logical thinking, and the ability to make decisions and solve domain-specific problems.

Gentile, Swing, Lim, and Khoo (2012) report studies that confirm the hypothesis about lowering school performance by increasing a passion for games. This result can be explained by the fact that players spend most of their time on games to the detriment of their learning activities. Scientists have studied how TV and video games affect children’s attention. For a year they observed more than 1,300 schoolchildren who were spending several hours a day watching television or playing games. A survey of their teachers showed that the children experienced difficulties in concentrating their attention and in retention of material after they began to watch television and play video games regularly. Such phenomena were especially evident in those pupils who watched TV programs and played video games for more than a total of 2 hours a day.

American psychologists at Carnegie Mellon University conducted a study that showed that the more time people spend on the Internet, the more they are prone to emotional disturbances (Kraut, 1998). According to the researchers, information overload is an apparent cause of stress.

At the end of the previous century Wallace (1999) offered the term *psychology of the Internet* in order to specify a range of scientific studies of the psychological aspects of activities mediated by modern information systems. The main directions of the research in this area are the impact of Internet activities on cognitive abilities and dependence on the Internet.

In the 1980s Shotton (1989) found that teenagers with symptoms of computer addiction are more likely to lose control not only in different spheres of activities but also in social relations. Shotton also noted depletion of the emotional sphere of teenagers as an obvious loss in a game that generates a series of negative emotional outbursts.

In the 1980s in the Soviet Union, empirical studies were conducted that later became the basis for work on the psychology of the Internet. At that time computer-gaming activities were first examined in the school of O. K. Tikhomirov, and the main provisions of the psychology of computerization were formulated (Tikhomirov & Lysenko, 1988). It was rightly noted that with information and computer technologies the structure of higher mental functions develops and is enriched — in particular, because of the need not only to work with significant systems but also to study technologies of their application. According to the conception of Tikhomirov (1988), a computer user’s intellectual activity is transformed. Thinking takes abstract and logical form with well-developed prognostic functions.

Our analysis of modern Russian psychological studies of activities mediated by information computer technologies identified the following themes: the impact of computer games on personal characteristics (M. V. Bredikhina, I. V. Burmistrov, A. E. Voyskounsky, E. A. Kabanova, Yu. V. Fomicheva, S. A. Shapkin); the impact of computer games on the manifestation of aggressive behavior in the gamer (Yu. D. Babaeva, V. N. Burkova, M. L. Butovskaya, V. P. Kaznacheev, V. I. Med-

vedev); the impact of a passion for computer games on the process of teaching children (V. G. Boltyansky, E. P. Velikhov, E. Yu. Zanichkovsky, V. V. Rubtsov).

A number of present-day researchers (O. R. Yelmikeyev, M. A. Isaykina, L. P. Timofeyeva, L. S. Yampolsky) assert that computer games have a developmental effect on players: they contribute to the development of creative thinking and to the mastery of new knowledge and logical operations, and they suggest how to manipulate objects and symbols and contribute to the rapid and effective training of sensorimotor functions (Isaykina, 2004; Yampolsky, 2003; Yelmikeyev, 2004).

A. G. Mazour, N. P. Markova, I. Ya. Medvedeva, M. N. Mironova, E. A. Reprintseva, Yu. S. Shevchenko, and T. V. Shishova share the view that computer games have negative effects on the cognitive and emotional spheres of a child. According to Shishova (2002), “problem children” are particularly passionate about computer games; these are children with low self-esteem who neglect their schoolwork and have difficulties in communication. In other words, the more psychological barriers a child has in real life, the deeper that child sinks into virtual reality.

A characteristic of the computer-gaming passion of younger schoolchildren is that the time spent at the computer results in concentrating all their interests in the computer, in particular computer games, and their rejection of other activities. A passion for computer games is most characteristic of children in primary school and juvenile-age children, especially boys. Researchers believe that one of the main causes of a passion for computer games is the need for a game itself, which is peculiar to human beings throughout life. During the game, an unconscious cognitive demand is usually satisfied, in consequence of which a child derives pleasure. We can also specify factors that to some extent influence the origin of a passion for computer games:

- (1) lack of communication, trust, and emotional relationships in a family
- (2) lack of interests and hobbies not connected with computers
- (3) lack of skills for interacting with others, lack of friends (Mogdaleva, n.d.).

School performance is determined not so much by abilities as by the desire to learn — in other words, by motivation. In the early school years, we emphasize cognitive motives related to the content of learning activities and the process of their implementation, as well as social motives associated with various relations of the pupils with other people. Broad cognitive motives (interest in knowledge) may, by the middle of this age, be transformed into learning and cognitive motives (interest in ways of acquiring knowledge); motives for self-education are represented for now by the simplest form — the interest in additional sources of knowledge; broad social motives are developed ranging from a general, nondiscrete understanding of the social significance of education to a great awareness of the need to study; narrow social motives are represented by the desire of a child to get the teacher’s approval. For a child to study successfully, it is necessary to combine cognitive and social motives (Kalugina & Kolyutsky, 2006).

In general, children who play computer games are notable for their wide area of thought: they have a well-developed view of the world, and it is more consistent with the worldview of adults. Such “computer-developed” children are usually ahead of their classmates in mental development; they master educational materi-

als more easily and are confident in their knowledge. These traits, in turn, have a positive impact on the academic achievements of younger schoolchildren.

However, there is a negative aspect to a passion for computer games. Given that the time spent by a child at a computer game is usually not controlled by the parents, there is a danger that cyberspace will become a reality for the child. In this case, studying, preparing for classes, reading books, and being creative require some efforts from the child.

Methods

All the foregoing determined the choice of the topic of our pilot study, entitled “Correlation between a passion for computer games and the school performance of younger schoolchildren”; the aim of this project was the theoretical and experimental study of the nature of the correlation between a passion for computer games and the school performance of younger schoolchildren and of possible ways of preventing the negative influence of computer games. Experimental research was conducted at Tula Upper Secondary School No. 4, Municipal Educational Institution. The research involved 32 pupils (12 girls and 20 boys) aged 10–11 years in the 4th grade. The general hypothesis of the study was that there are divergent correlations between the passion of younger schoolchildren for computer games and their school performance.

Our analysis of studies by foreign and Russian psychologists allowed us to single out the main criteria for the children’s passion for computer games and to assess their school performance. These criteria and assessments determined the choice of diagnostic methods (Table 1).

Table 1. Diagnostic methods for research on the passion for computer games and school performance

Passion for computer games		School performance	
Criterion	Method	Criterion	Method
Time that a child spends on a computer game	Author’s questionnaire	Level of school motivation	1. The method of “Evaluation of the level of school motivation” (N. Luskanova) 2. The method of «Focus on a mark» (E. P. Ilyin, N. A. Kurdyukova)
Genre of computer games	Author’s questionnaire	Social adjustment	Personality questionnaire by R. B. Cattell (children’s version)
Level of passion for computer games	Author’s questionnaire	Level of school performance/average grade of performance	Analysis of school registers

To determine the level of passion for computer games we developed a questionnaire consisting of 15 questions divided into three sections. Each section corresponds to one of the criteria for passion for computer games:

Section I. Time that a child spends on computer games

1. How much time do you spend on a computer during a day?
2. Do you play computer games?
3. How long have you been playing computer games?
4. How many hours a day do you spend on computer games?
5. Do you take a break during a computer game?

Section II. Genre of computer games

6. What genres of computer games do you like?
7. What computer game did you play last time?
8. What exactly attracts you in this game?

Section III. Level of passion for computer games

9. Have you ever been absent from school because you were playing a computer game?
10. Do you quarrel with your parents if they do not allow you to play computer games for a long time?
11. Does it happen sometimes that you eat or drink tea in front of the computer?
12. Could you manage without a computer game?
13. In your opinion, how do computer games influence children's development?
14. Do you get annoyed if you haven't played computer games for a long time?
15. How do your closest relatives and friends treat your passion for computer games?

The first section identifies the frequency and the amount of time spent on computer games during a day, a month, and a year. The second section shows the preferences of children for different genres of computer games. The third section determines the level of passion for computer games and the extent and nature of their influence on children.

For defining levels of pupils' school motivation and leading motives we used the method of "Evaluation of the level of school motivation" by N. Luskanova, a questionnaire with 10 closed questions. The method allowed us to define four levels of school motivation (high, higher than average, average, low).

The method of "Focus on a mark" (E. P. Ilyin, N. A. Kurdyukova) consists of a questionnaire with 12 dichotomous questions. Our analysis of the responses allowed us to define the prevailing motive of each testee: "focus on knowledge acquisition" (a tendency to regard gained knowledge as the main result of a learning activity) or "focus on a mark" (a tendency to regard a mark given by a teacher as the main result of a learning activity).

In order to study the social adaptation of younger schoolchildren we used the multivariate personality questionnaire of R. B. Cattell (children's version). We paid special attention to three factors: extraversion, emotional excitability, self-control.

We used data obtained from analysis of a school register for defining an average grade of performance and identifying the correlation between the genre of a computer game and a younger schoolchild's performance.

Results

The questionnaire survey of the pupils allowed us to obtain information about the amount of time the children devoted to computer games, their preferences for the genres of computer games, and the extent of their passion for games. When answering the question “How many hours a day do you spend on computer games?”, almost half the children (47%) indicated that they played computer games 1–2 hours a day; 25% of the children spent more than 2 hours a day on computer games; 16%, less than 30 minutes; and 13% spent a half day on computer games.

When answering the question “What genres of computer games do you like?”, the girls indicated that they were more likely to do puzzles and play arcade-like games, where mental work and concentration are required; the boys liked to play strategic games, where it is necessary to build houses, to lead troops, and they also liked quests and role-playing games, where they need to perform various tasks while managing their heroes.

To the question “Does it happen sometimes that you eat or drink tea in front of the computer?”, 20% of the respondents answered affirmatively. Another 50% of the children responded “sometimes.” And only 30% of the participants responded negatively. The affirmative answer indicates the passion of the children for playing computer games and their inability to “break away” from them.

Using the method of “Evaluation of the level of school motivation” by N. Luskanova, we determined the levels of school motivation of pupils (Figure 1). Of the children 9% showed high levels of school motivation. Such children are notable for high cognitive motives and the desire to successfully comply with all requirements imposed by the school. They strictly follow all instructions of their teacher, are conscientious and responsible, are worried if they receive unsatisfactory marks or if they are reprimanded by teachers. In their pictures on a school topic, they depict a teacher at the blackboard, a lesson, and educational materials.

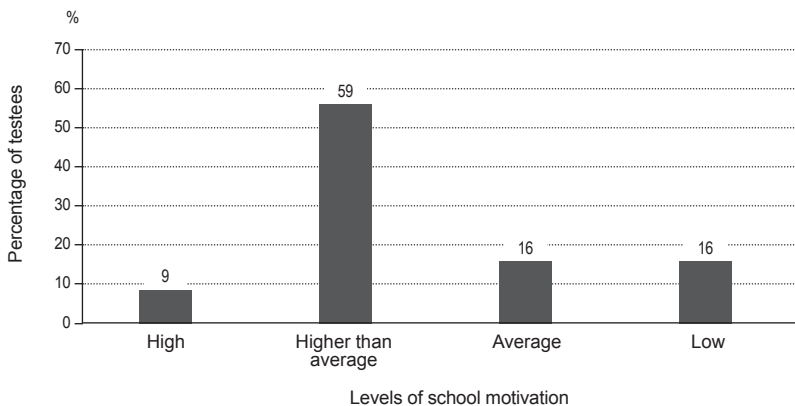


Figure 1. Distribution of testees by levels of school motivation

The level of school motivation of most of the children (59%) was higher than average. In general, these are children who successfully cope with educational activities. In their pictures on a school topic, they depict learning situations, and

when answering questions, they show less dependence on stringent requirements and norms. This level is an average norm.

The level of school motivation of 16% of the children was at the average level. These children feel good enough at school, but they often go to school in order to communicate with their friends and teachers. They like to feel like schoolchildren, to have a beautiful briefcase, pens, and notebooks. The cognitive motives of such children are formed to a lesser extent than those of children at higher levels, and the learning process does not attract them very much. In their pictures on a school topic, such children usually depict school, but not educational situations.

Low levels of school motivation were detected in 16% of the children. These children go to school reluctantly; they prefer to miss classes. During lessons, they are often involved in unrelated matters and games. They experience serious difficulties in learning. They are in a state of unstable adaptation to school. In their pictures on a school topic, such children depict game stories, although they are only indirectly connected with school.

In connection with the results of the method of “Focus on a mark” (E. P. Ilyin, N. A. Kurdyukova), 16% of the children were focused on a mark at a high level — that is, they considered a mark assigned by a teacher to be the main result of learning activities (Figure 2).

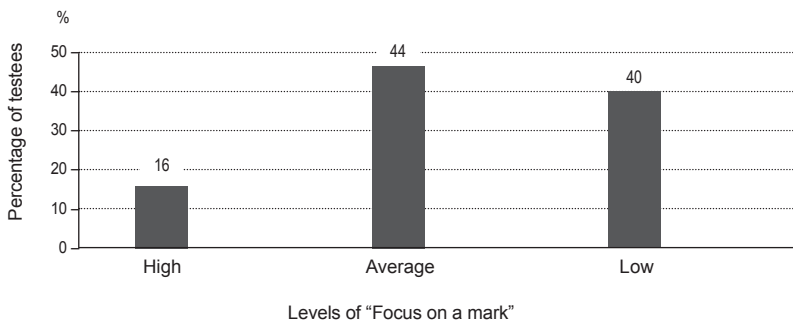


Figure 2. Distribution of testees by levels of “Focus on a mark”

Using the multivariate personality questionnaire by R. B. Cattell (children’s version), we studied the personality characteristics of the younger schoolchildren (extraversion, emotional excitability, self-control) (Figure 3). On the scale of extraversion, 9% of the children showed a low degree of expressiveness of this feature. Such children often manifest distrust, resentment, and inability to hide their negative emotions and to build relations with other people on a positive basis. Egocentrism and stubbornness are often a part of their behavior. On the scale of emotional excitability, this feature was strongly marked in 47% of the pupils. These children show hyperexcitability, hyperactivity, and instability of attention. On the scale of self-control, 15% of the children showed a high value on this factor, which indicates their good social adaptation and successful mastery of the requirements of social norms. On the other end of the scale, 16% of the children showed a low value on this factor, which indicates inability to control their behavior in relation to social norms and poor organization.

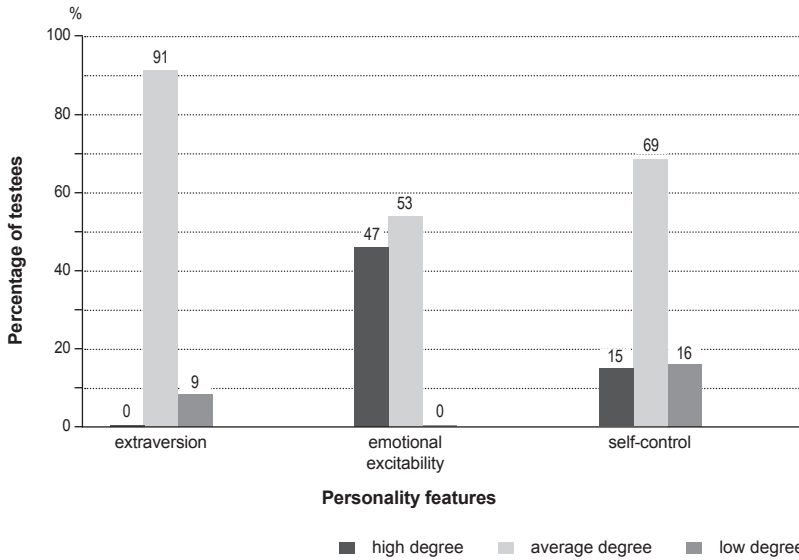


Figure 3. Distribution of testees by degree of expressiveness of personality features

As part of our pilot study, we analyzed the class registers of the pupils under consideration to determine their level of school performance and interest in a particular school subject (Table 2).

Table 2. Distribution of subjects by average level of grades and level of school performance

School subject	Average level of grades	Level of school performance	Number of pupils (%)
Informatics	4.3	High	21 (66%)
Literature	4.2	High	
Russian language	3.9	Average	11 (34%)
Mathematics	3.4	Average	

Note. Gradation of levels of school performance: low (≤ 3.0); average (3.1 to 4.0); high (≥ 4.1).

Table 3. Correlation of time spent on computer games and school performance (percentage of testees)

Indicator of school performance	Time spent on computer games			
	< 30 minutes	1–2 hours	> 2 hours	Half a day
Low level (≤ 3.0)	0	0	0	0
Average level (3.1–4.0)	0	0	22%	13%
High level (≤ 4.1)	16%	47%	3%	0

The analysis of school registers allowed us to obtain an average grade for each of the pupils. Comparing school performance with the amount of time spent by the testees on computer games (from our questionnaire on passion for computer games), we identified a correlation between these indicators. Table 3 summarizes the information by two indicators: the time spent by testees daily on computer games and school performance.

In order to identify the correlation between the genres of computer games and school performance, we combined the children in groups by genres and then calculated the average rate of performance of each group (Table 4).

Table 4. Influence of computer-game genres on school performance

Computer-game genre	Indicator of school performance by groups	Level of school performance
Arcades	4.3	High
Eye teasers	4.2	High
Strategies	4.1	High
Quests	4.0	Average
Role-playing games	3.8	Average

In order to establish the correlation between a passion for computer games and the school performance of younger schoolchildren, as well as to determine the effect of a passion for computer games on the personal qualities of the children, the coefficient of pair correlation (*r*-Pearson) was calculated for time spent on computer games, level of school performance, extraversion, emotional excitability, and self-control; this calculation was performed using the program package Statistica. According to the statistical processing, the results were as follows:

First, there was an inverse relationship between criterion **T** (time spent on computer games) and criterion **L** (level of school performance) — namely, the more time the children devoted to computer games, the lower their level of school performance. The correlation coefficient in this case was $r = -0.821$, at significance level $\alpha = 0.05$, standard error of the mean $SEM = 0.19$, bilateral confidence interval $CI = (0.79; 1.53)$, which indicates a strong correlation.

Second, there was an inverse relationship between criterion **T** and criteria **E** (extraversion) ($r = -0.722$ at $\alpha = 0.05$, $SEM = 0.19$, $CI = 0.54; 1.28$) and **Sc** (self-control) ($r = -0.69$ at $\alpha = 0.05$, $SEM = 0.19$, $CI = 0.48; 1.22$) — namely, the more time the children devoted to computer games, the lower the manifestation rate of such personality traits as extroversion, self-confidence, honesty, and self-control. We consider expressiveness of these personality traits as criteria for successful school performance; hence, computer games indirectly negatively affected the children's school performance.

Third, there was a direct relationship between criterion **T** and criterion **Ee** (emotional excitability) — namely, the more time the children devoted to computer games, the higher their emotional excitability. The correlation coefficient in this case was $r = 0.76$ at $\alpha = 0.05$, $SEM = 0.19$, $CI = (0.64; 1.38)$, which indicates a strong correlation.

Fourth, there was an inverse relationship between criterion **L** and criterion **Ee** (emotional excitability). The correlation coefficient in this case was $r = -0.73$ at $\alpha = 0.05$, $SEM = 0.19$, $CI = (0.56; 1.3)$.

The correlation for each possible pair of measurable criteria is presented in a correlation matrix in Figure 4.

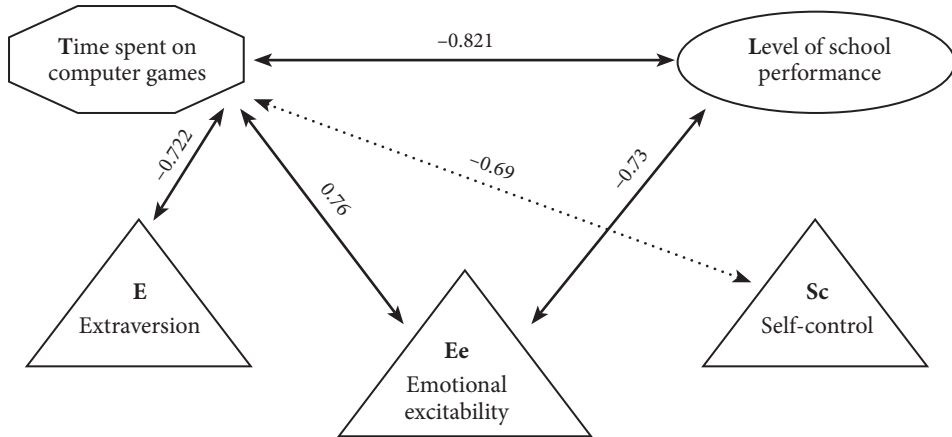


Figure 4. Correlation between a passion for computer games and the school performance of younger schoolchildren

Conclusion

Analysis of the results of our study reveals these correlations:

- There is a correlation between computer-game genre and the school performance of younger schoolchildren.
- A passion for role-playing computer games adversely affects the school performance of younger schoolchildren.
- The time period for younger schoolchildren to play a single game determines the level of the personality traits necessary to maintain educational motivation and interest in an academic subject.

The problems connected to the correlation between a passion for computer games and the school performance of younger schoolchildren considered in this article do not exhaust the problems facing the psychology of computer games but do reveal the need for a comprehensive study of the psychological ramifications of computer-gaming activities and for a holistic consideration of this phenomenon. In addition we are now facing the problem of the safe use of information technologies in the process of formal and informal education and also the creation of new opportunities for the harmonious cognitive, social, and personal development of children.

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