Impulsivity and Risk-Taking in Adult Video Gamers

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Abstract. Video games are often seen as a reason for numerous psychological changes, both positive and negative, in players. For instance, many authors believe that video games push children and adults towards risky behaviors and impulsivity. The study aimed to analyze both theoretical and empirical evidences of that sort, as well as to investigate parameters of personal and cognitive impulsivity and risk-readiness in adult video gamers. The sample of gamers included 223 participants, all from Russia. Impulsivity and related personal traits were measured with Eysencks' Impulsiveness Scale (I-7) and Kornilova's Personal Risk Factors Questionnaire. Impulsivity as cognitive style was measured by Kagan's MFFT. No evidence of high impulsivity was found, though video game players, who played more than 12 h per week turned out to be more venturesome, compared to less active gamers. Sex-related differences were investigated: female gamers scored lower in empathy, while male gamers showed higher venturesomeness. In a cognitive style study, video gamers were more accurate compared to non-gamers, and thus showed no tendency for impulsivity. The results are contrasted to the published data, when applicable.

Keywords: Video games · Impulsivity · Risk-Readiness · Adult video gamers

1 The Relationship Between Video Games, Risk, and Impulsivity: An Overview

Video games have become an important part of everyday life for many people, especially children, teenagers and young adults. Some authors even suggest that those who were born after the 1980s belong to "the Gamer Generation" (the so-called "gamers" are people, who actively play video games and see them as a hobby) [1]. The authors claim that video games along with modern technologies brought more changes into everyday life, people's behavior and attitudes than anything else that happened throughout the last decades. Although this conclusion seems slightly exaggerated, we can agree that a significant part of the population of many countries grew with some sort of video games experience. In both USA and Russia, an average "gamer" is in in his/her mid-thirties and belongs to an economically and socially active part of the society [1–3]. Thus, psychological specifics of active video game players become an important research area, but also a biased and controversial one. While the main positive and negative consequences

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of video gaming, such as addiction, attention, spatial and logical thinking specifics, emotional changes were pointed out as early as in the mid-80 s (e.g. see [4, 5]), many questions are still unanswered. For example, most contemporary researchers agree that video games can enhance visual-spatial skills in children, adults and elders [6, 7] or that video game addiction, or problematic behavior actually exists, at least in some way, although its criteria are not fully developed yet [8, 9], yet the linkage between violent video games and aggressive behavior still causes a lot of arguments [10–13]. Some commonly shared theories pretend to explain what we actually learn (or unlearn) by playing video games, including problem-solving, critical thinking, imagination [5, 14]. Many authors suggest that video games promote impulsive and risky behavior, especially among youth, that can lead to real life dangers or psychological disorders, such as attention deficit and hyperactivity disorder (ADHD) [10]. In this article, we aim to review such theories and corresponding research in this field as well as to introduce our own empirical study.

1.1 Are Gamers Risky, Impulsive or Both, and Why Should They Be?

The suggestion that video games can promote impulsive behavior is based on several general assumptions. First, to succeed in many video games one needs to be extremely quick. The player does not often have enough time to analyze the situation and while playing it is often more beneficial to be active than to hesitate. Even if the performed action turns wrong most of the mistakes in a video game could be replayed easily, thus the so-called "trial-and-error" behavior is promoted. While the "trial-and-error" strategy is sometimes a good way to learn new things, it can be ineffective or even dangerous in many real-life situations that require critical thinking and reflection [1, 14]. The second assumption, which also underlies the discussion on video game violence states that video gamers transfer their in-game learned behavior into real life.

The resolution of the American Psychological Association (APA), published in 2005 and republished in 2015 despite many critical views, supports this notion by claiming that violent video game exposure can increase "aggressive behavior, aggressive affect, aggressive cognitions" and decrease "prosocial behavior, empathy, and moral engagement" [15]. This statement is based on the works of C. Anderson and his colleagues, whose general aggression model (GAM) framework is based on A. Bandura's social learning theory, L.R. Huesmann's script theory and several other psychological theories of learning, based on the stimuli-reaction paradigm which leaves little freedom to human conscience and will. Briefly, Anderson and his group promote the idea that children, teenagers, and young adults learn behavioral patterns from the mass media they observe and violent video games they play and copy them in their real-life behavior [16]. While GAM predominantly describes aggressive behavior, the same argumentation is often used to explain video gamers' predicted impulsivity.

Anderson's theory strongly implies that video gamers either knowingly or unconsciously fail to distinguish fake reality of video games from the real world. While this notion is often used in mass media to explain mass shootings, suicides, crimes and other unwanted or dangerous behaviors, often blamed to be connected with violent video games, it is also flawed. A thorough research, performed by Sh. Olson and L. Kutner, found that even 10–11 years old teenagers are well aware of the differences between

video games and real life. The teenaged boys also pointed out that in a video game they often do things that they could not or would not do in real life because of obvious danger or moral unacceptability [13]. This could mean that the transfer of the in-game behavioral patterns into the real life is actually limited, especially if seen as ineffective or dangerous. On the other hand, discussing cognitive development through video games, for example, when looking for a way to prevent cognitive decline in elders [e.g. 17], the researchers relate to repeated training and subconscious transfer, and not to the deliberate choice of new strategies. Therefore, the question is, whether impulsivity is chosen or unwillingly developed. To answer this question we need to define impulsivity as well as some other related terms.

In psychology, impulsivity (or impulsiveness) is seen as a tendency to act on a whim, with no reflection or consequences consideration, under the spur of the moment, to make random decisions with little or no forethought. This means that impulsive actions are often risky or inappropriate and can lead to unexpected or undesired consequences [18]. In clinical psychology and psychiatry, impulsivity is seen as a symptom of several clinical conditions, including ADHD, kleptomania, gambling, etc. and is often the prime target of therapy [19]. In this meaning, impulsivity is the lack of some cognitive control functions, such as action inhibition, and is not a personality trait and is caused by different reasons [18, 20].

Outside the clinic, impulsivity can be referred to either in cognitive or in personality dimension. For J. Kagan impulsivity is a part of an impulsive-reflective cognitive style. Cognitive styles are stable individual ways to perceive, process and store information [22]. J. Kagan's impulsive-reflective style describes people with different cognitive tempo and accuracy, where impulsivity means quick and inaccurate answers in the situation of uncertainty. Impulsiveness is opposed to reflexivity, which is characterized by slow and accurate answers [21]. Although cognitive styles are stable and highly automatic ways to process information, they can be altered to a certain degree with the use of higher cognitive processes, if proven useless in a current situation.

Impulsivity as a personal trait is rarely connected with its cognitive dimension. In the works of H. Eysenck and S. Eysenck, impulsivity was introduced as a component of extraversion and then turned into a separate measure. Currently, impulsivity scale includes basic impulsivity as the lack of momentary impulse control, venturesome-ness as the willingness to take risks and try out new exciting things and empathy as the readiness to share other people's feelings [23]. S. Dickman pointed that impulsivity can be both "good" and "bad". He describes functional impulsivity as the tendency to act with relatively little forethought for optimal results and the dysfunctional impulsivity that leads to more challenges and difficulties instead. Those tendencies, in fact, indicate separate factors intercorrelated rather moderately and variating in relations to other personality traits, such as venturesomeness or orderliness [24].

While risky behavior is often mentioned in the connection with the impulsivity trait, it is important to notice that they are not synonyms. We have already mentioned venturesomeness as an aspect of Eysencks' impulsiveness scale. However, it is obvious that skydiving, mountain climbing and other activities preferred by venturesome people require something more than the lack of impulse control. While in everyday life, we are more likely to describe risk in terms of loss or harm, it also refers to any situation when the outcomes are uncertain. In this case, a personal ability to accept risks or willingness

to averse them is seen as a separate dimension, not necessarily related to the impulsivity. In many cases, risky behavior is the result of a deliberate personal choice, not thoughtlessness [25].

Since in psychological research of video games and gamers, both empirical and theoretical, different terms and definitions are often used to discuss risky or impulsive behavior, we tried to gather the most common definitions and terms, related to this problem, to make the further discussion more accurate and concrete.

1.2 Empirical Studies Analysis

While most theories agree that video games can make people impulsive, the empirical research results are rather diverse.

D. Gentile, a member of C. Anderson's group, presented a 3-year longitude study, in which he not only linked adolescents' violent video game playing with impulsivity and attention deficit but also claimed to show bi-direct causalities [10]. According to this study, violent video games are harmful as they prevent normal cognitive control function in children, which among all can lead to ADHD. Another research supports the linkage between video game use and ADHD, as well as other psychiatric disorders, but only in the context of problematic or addictive gaming behavior. Furthermore, the disorders are viewed as risk factors for gaming addiction development, not vice versa [26]. Finally, there are special video games developed to treat children with diagnosed ADHD [27]. While such products require more controlled trials and independent research, the general idea to influence cognitive control (and cognitive impulsivity) through playing video games seems to be proven worthy [17, 28]. To summarize, cognitive aspects of impulsivity, including ADHD symptoms, show some linkage with regular video game playing, especially in younger gamers. However, it is important to notice that the linkage is mediated by a video game type and by the presence of video game addiction. Controlled use of specially designed video games can be beneficial for cognitive control training and prevention of impulsivity.

There is other evidences that pathological gaming and certain video game genres are related towards higher personality impulsivity and cognitive control deficit. People who play first-person shooter video games (a genre that implies running through an artificial environment and shooting computer or player operated enemies) are more likely to be impulsive and to make risky decisions in simulated gambling situation [29, 30]. The video game addiction also contributes to high personal impulsivity, unlike a different game genre such as strategy games, which demand a slower pace and more thoughtful gaming experience. It is also worth noticing that both shooters and strategies can be designed with more or less graphical violence involved, though this aspect was not a variable. Another popular game type, such as massive multiplayer online role-playing games (MMORPG), known to be an addictive video game genre [31], is on the opposite related to low impulsivity [8]. While non-addicted gamers showed no significant personality specifics, addicted gamers were found less impulsive, both in functional and dysfunctional impulsivity scales. They also received lower scores in self-regulation, which means that both high and low impulsivity can be the result of regulation problems. The study supports the idea that video games of different genres either require

different personality characteristics to be played successfully or develop different psychological specifics in their loyal fans, or both.

Numerous studies suggest that video games of certain genres promote risky behavior and even glorify it. A recent longitudinal study claims that teens who excessively play mature-rated video games are more likely, than other teens, to get involved in all types of risky behaviors including smoking, alcohol drinking, fighting or having unprotected sex. The gamers who play mature video games "sometimes" or "once in a while" do not show any difference from those who do not play video games at all [32]. While the strong linkage was found, it is important to notice that mature video games are marked as suitable for ages 17 and up. Playing such games at the age of 14 is rebellious from the beginning, which probably indicates a predisposition for risky behavior or venturesomeness. Nevertheless, this research supports the necessity to follow recommended age restrictions when introducing children to video games and other media. Research also shows that racing simulators can lead to risky driving, but only if such behavior is rewarded throughout the game [33, 34]. As for positive aspects of risk-taking, they are rarely discussed in cyberpsychology. However, J. Beck and M. Wade [1] argue that risk-readiness and risk-taking are the key features of adult gamers, which prove them successful in business. According to them, gamers are not only risky – they also are ready to take responsibilities for those risks. In Russian research of adult online gamers, conducted by A. Avetisova [35], gamers scored higher in both rationality (searching for more information before making a decision) and risk-readiness, which supports this notion. Cognitive studies done by D. Bavelier's research group [36] show that in visual demanding tasks video gamers perform with an increased speed. The gamers do not make more mistakes in stimuli recognition than the control group, which means that the increased performance is risk-taking rather than simply impulsive.

To summarize, there are strong but somewhat controversial empirical evidence that video game experience is linked to (possibly – can alter) impulsive and risky tendencies in children and adults. Negative outcomes are perceived for people with preexisting psychological disorders, including issues with control and self-regulation. People with video game addiction are also in the risk group, and the fans of violent video games, especially shooters require the most attention. On the other hand, participating in other types of video games and for a rational amount of time can be beneficial, as faster decision-making and enhanced readiness for risky decisions are useful for the everyday life.

Research Questions. Most of the video game studies target children, adolescents, or young adults (college students), but only rarely consider older people. Thus, the mean age of a video gamer in Russia (as well as in many other countries) exceeds 30 years old. In our study, we aimed to fill this age gap and to investigate both cognitive and personal impulsivity, as well as different aspects of risk-taking attitudes including venturesomeness and risk-readiness as the ability to make decisions and act in ambiguous or uncertain situations. The main research question was whether the adult gamers in Russia share the specific patterns of impulsivity, which were shown in previous studies? The second question was whether the decision-making specifics of video gamers refer to cognitive or personal impulsivity or risk-readiness, or all of them, as the same behavior can actually root from different personal and cognitive specifics.

2 Empirical Study of Adult Video Gamers' Impulsivity and Risk

2.1 Methods

Participants. Totally 223 participants, 91 males, and 132 females, aged from 18 to 35 years old from Moscow, Russia were recruited via video games forums, social networks, advertising among students and through snowball sampling method. The participation was voluntary and was not rewarded in any material way, although the participants were able to ask any questions about current research or video games studies in psychology in general after they completed all the tasks and thereby received brief lectures in this field if they wanted to.

All the participants were interviewed with demographics (age, educational level, current occupation, marital status) and video game related questions, such as "Do you play video games?", "How much time a week do you spend playing video games?", "What video games genres do you prefer and why?", "Why do you think you keep playing video games?", etc.

All the participants took the same test battery despite their answers, but later they were divided into groups and subgroups accordingly

The control group ("The Non-Video Game Players", the nVGP group) consisted of the participants who self-reported to have little to no video games experience in general, and not interested in playing video games. Those of them who used to play video games earlier in their lives did not play for at least 3 years or longer hitherto.

The comparison group ("The Video Game Players", the VGP group) consisted of those who reported to have significant video game experience (several years of more or less active gaming hitherto) and to be interested in video games playing. They were also playing video games regularly for at least 1 h a week at the time the research was conducted (and most of them played for 3–5 h a week or more).

The whole sample characteristics are presented in Table 1.

Table 1. Sample groups and subgroups characteristics (Study 1)

VGP Group 133 participants: 63 men, 70 women Age: M = 23.6, SD = 4.5		**nVGP Group** 90 participants: 28 men, 62 women Age: M = 23.7, SD = 4.9
High-VGP subgroup 78 participants: 40 men, 38 women Age: M = 23.6, SD = 4.4	**Low-VGP subgroup** 55 participants: 23 men, 32 women Age: M = 23.7, SD = 4.6	

Table 1 shows that the participants in both groups were approximately of the same age. As for the sex ratio in both groups, the differences were obvious, but justified from the general population perspective. According to the official statistics [2], 52% of

modern Russian gamers are males while 48% are females. However, females prevail among those who have no or very little video game experience while the most males show at least some interest in this field. Female gamers all over the world are also slightly older than male gamers and thus could have fallen out our sample [2, 3].

Additionally, the participants in the VGP group were subdivided into subgroups with a different regular intensity of video game playing. Gamers who regularly played for more than 12 h per week formed the high-VGP sub-group, while those who played less than 12 h per week formed the low-VGP sub-group.

All the participants took part in the Study 1 (personality questionnaires). From the initial sample, only 150 participants volunteered to take part in the Study 2 (cognitive style task). The characteristics of that second sample are presented in the Table 2.

Table 2. Sample groups and subgroups characteristics (Study 2)

VGP Group 90 participants: 45 men, 45 women Age: M = 24.0, SD = 4.6		**nVGP Group** 60 participants: 20 men, 40 women Age: M = 24.5, SD = 4.6
High-VGP subgroup 60 participants: 33 men, 27 women Age: M = 23.9, SD = 4.6	**Low-VGP subgroup** 30 participants: 12 men, 18 women Age: M = 24.3, SD = 4.7	

All the participants completed all the tests tasks separately, in classical paper-and-pencil variants.

Procedure

Study 1. In this study, the participants filled two personality questionnaires, aimed to measure personal impulsivity and attitudes towards risk in the following order:

1. ***I-7 Impulsiveness and Venturesomeness Questionnaire***. The original questionnaire was developed by Hans and Sibylla Eysenck and had a total of 54 items, subdivided into three subscales: *Impulsiveness*, *Venturesomeness*, and *Empathy* [23]. The scales were discussed earlier in this paper, so we won't repeat their definition. T. Kornilova and A. Dolnykova [37] introduced the Russian shortened adaptation of the I-7 scale, consisting of 28 questions but following the same structure, and including the same scales as the original.
2. ***Personal Risk Factors Questionnaire-21 (PRF-21).*** The original scale was developed by T.V. Kornilova, loosely based on the EQS Questionnaire by H. Wolfram (in German) [25]. The PRF-21 questionnaire includes 21 item, subdivided into two scales: *Risk-readiness* and *Rationality.* Risk-readiness describes personal ability to take risks when deciding how to proceed in situations with uncertain outcomes. Rationality indicates personal preferences to look for more information to decrease uncertainty before making the decision. The subscales correlate negatively but do not directly oppose each other, as one can prefer informational seeking, but be ready to take risks after all.

Study 2. The participants (see Table 2) completed ***Kagan's Matching Familiar Figures Test*** *(MFFT),* measuring cognitive style "impulsivity – reflexivity". In this test, the participant is shown a picture of a familiar object ("a standard") and eight similar variants with one and only one of them being the same as the standard. The participant is required to find the identical to the standard variant as fast and accurate as possible [21]. The number of mistakes and the cognitive tempo (time needed to give the first answer) were used to determine *impulsive* (many mistakes, fast answers) or *reflexive* (few mistakes, slow answers) cognitive style.

2.2 Results

Note: The results of ***I-7 Questionnaire*** and ***MFFT*** showed abnormal distribution, so methods of non-parametric statistics were used. At the same time, we used parametric statistics for ***PRF-21*** questionnaire results, as the scores were distributed normally.

VGP and nVGP Comparison

I-7 Questionnaire. Impulsivity, venturesomeness and empathy as personal traits are known to have strong and consistent sex-based specifics. To compensate our sample's inequality, we compared the results with the results in the whole sample and found that females in general scored higher in impulsivity (Mann-Whitney U = 2554.0; p = 0.000; M = 3.1, SD = 4.8 (women); M = −2.1, SD = 4.4 (men)) and empathy (U = 4057.5; p = 0.000; M = 5.2, SD = 3.4 (women); M = 3.4, SD = 3.5 (men)), but lower in venturesomeness (U = 4248.0; p = 0.000; M = 0.5, SD = 4.3 (women); M = 2.6, SD = 3.5 (men)). Thus, separate comparisons were made for female and male gamers as well. The results of the comparison for all the scales are shown in Tables 3, 4 and 5.

Table 3. I-7. Impulsivity

	Mann-Whitney U	p	Mean score	SD
VGP Group (all)	5938.5	0.921	1.0	5.3
nVGP Group (all)			1.0	5.4
Female VGP	1872.0	0.170	3.7	4.3
Female nVGP			2.4	5.3
Male VGP	867.0	0.896	−2.0	4.5
Male nVGP			−2.2	4.2

Table 4. I-7. Venturesomeness

	Mann-Whitney U	p	Mean score	SD
VGP Group (all)	5108.5	0.061	1.8	4.2
nVGP Group (all)			0.7	4.1
Female VGP	2120.5	0.820	0.5	4.4
Female nVGP			0.4	4.3
Male VGP	647.0	0.04	3.1	3.5
Male nVGP			1.5	3.5

Table 5. I-7. Empathy

	Mann-Whitney U	p	Mean score	SD
VGP Group (all)	4242.0	0.000	3.8	3.6
nVGP Group (all)			5.5	3.2
Female VGP	1498.0	0.002	4.4	3.6
Female nVGP			6.2	2.7
Male VGP	747.5	0.239	3.1	3.5
Male nVGP			3.9	3.5

The results showed that there are no differences in impulsivity in both VGP and nVGP groups. While men and women have different levels of personal impulsivity, there are also differences between female VGPs and female nVGPs, as well as between their male counterparts. As for venturesomeness, we did not receive differences between VGP and nVGP groups in general, but further comparison suggests that there are actually significant differences between male VGPs and male nVGPs, and male gamers were found more venturesome then male non-gamers. The empathy scale, on the contrary, showed significant differences in the female subgroup only, with female VGPs less empathetic than female nVGPs are.

PRF-21 Questionnaire. We did not find any sex-related specifics for risk-readiness (Student's t = $t = -1.184$; $p = 0.238$), while female participants did show significantly lower results in the rationality subscale ($t = -3.846$; $p = 0.000$; M = 2.1, SD = 4.0 (women); M = 4.1, SD = 3.6 (men)). There were also no significant differences between all the groups: VGPs were not different from nVGPs ($t = 0.284$; $p = 0.777$ for risk-readiness; $t = -0.312$; $p = 0.755$ for rationality); female VGPs were not different from female nVGPs ($t = 0.627$; $p = 0.532$ for risk-readiness; $t = -0.678$; $p = 0.499$ for rationality) and finally, male VGPs were not different from male nVGPs ($t = -0.681$; $p = 0.498$ for risk-readiness; $t = -0.696$; $p = 0.488$ for rationality). This means that we failed to show any differences between adult video game players and non-video game players at all.

Kagan's MFFT. No significant differences between female and male participants were found in both cognitive tempo ($U = 2655.5$; $p = 0.685$) and amount of the mistakes ($U = 2263.5$; $p = 0.057$), so we did not compare females and males subgroups further. The whole VGP groups performed the test slightly slower than the nVGP group (M = 60.9 s, SD = 28.3 s versus M = 54.6 s, SD = 27.9 s respectively), but the Mann–Whitney U test showed that the difference is insignificant ($U = 2332.5$, $p = 0.159$). Although, the VGP group made significantly fewer mistakes than the nVGP group ($U = 2155.0$, $p = 0.036$; M = 5.3, SD = 4.7 for the VGPs; M = 7.5, SD = 6.0 for the nVGPs).

According to these results, we cannot conclude that any of the groups score higher in cognitive impulsivity, since impulsivity as a cognitive style is described by both quick answers and many mistakes. But the results we got mean that VGPs are more accurate than nVGPs and thus cannot be described as "more impulsive" in J. Kagan's terms.

High-VGPs, Low-VGPs and Non-VGPs Comparison

I-7 Questionnaire. The Kruskal-Wallis one-way analysis of variance showed no significant differences between the groups in *impulsivity* (Chi-square = 0.236; p = 0.889), but did found differences in both *venturesomeness* (Chi-square = 7.485; p = 0.024) and *empathy* (Chi-square = 20.029; p = 0.000). Table 6 include mean scores and standard deviations for all the groups.

Table 6. High, low and nonVGPs mean scores in I-7 questionnaire

	Impulsivity	Venturesomeness	Empathy
High-VGP group	M = 1.2, SD = 5.2	M = 2.5, SD = 4.0	M = 3.2, SD = 3.7
Low-VGP group	M = 0.8, SD = 5.4	M = 0.7, SD = 4.2	M = 4.6, SD = 3.4
NVGP group	M = 1.0, SD = 5.4	M = 0.7, SD = 4.1	M = 5.5, SD = 3.2

Pairwise comparison of the subgroups showed the following results: high-VGPs scored significantly higher in venturesomeness then both low-VGPs (U = 1705.0; p = 0.042) and nVGPs (U = 2714.5; p = 0.011), while the latter showed almost equal scores (U = 2394.0; p = 0.738). High-VGPs showed the lowest empathy scores, which differed significantly from both low-VGP (U = 1638.0; p = 0.019) and nVGP groups (U = 2117.5; p = 0.000). Those groups also had no significant differences from each other (U = 2124.5; p = 0.144). Thus, according to I-7 questionnaire, high-VGPs showed the most distinct personality specifics, namely – higher venturesomeness and lower empathy, while low-VGPs did not differ from the nVGPs.

PRF-21 Questionnaire. One-way ANOVA showed no significant differences between the groups in both risk-readiness (F = 0.196; p = 0.822) and rationality scale (F = 2.806; p = 0.063). Pairwise post hoc comparison with the Bonferroni method though showed that low-VGPs were slightly more rational then high-VGPs (p = 0.05; M = 3.8, SD = 3.2 (low-VGPs) and M = 2.2, SD = 4.1 (high-VGPs)). NVGPs scored somewhere in between those two groups (M = 3.1, SD = 4.2) and showed no significant differences with both of the VGPs groups.

Kagan's MFFT. The Kruskal-Wallis one-way analysis of variance showed significant differences between the groups in cognitive tempo (Chi-square = 7.060; p = 0.029), but not in the accuracy (Chi-square = 3.184; p = 0.204). Low-VGPs were the least impulsive among all the groups. They have the longest first response mean time (thus, the difference is statistically insignificant with both the high-VGP group (U = 785.5; p = 0.327) and the nVGP group (U = 679.5; p = 0.059) and the least amount of mistakes (significantly less than in the nVGP group (U = 618.0; p = 0.015), but insignificant in compare with the high-VGP group (U = 1537.0; p = 0.166). See Table 7 for the mean scores.

Table 7. High, low and nVGPs mean scores in MFFT

	Mean time of the first response (cognitive tempo), sec	Mistakes
High-VGP group	M = 59.4, SD = 30.5	M = 5.7, SD = 4.3
Low-VGP group	M = 63.9, SD = 23.5	M = 4.5, SD = 5.4
NVGP group	M = 54.6, SD = 27.9	M = 7.5, SD = 6.0

2.3 Discussion

While not many differences were found in the current research, the zero-results are meaningful as well: they show that despite our hypothesis, adult video gamers are not very different in their personal trait, related to impulsivity and risk, from those who have no video game experience.

While we failed to establish a connection of video game experience with personal impulsivity, we found evidence that video gamers are more accurate and thus less cognitively impulsive compared to non-video gamers, though this difference weakens in the subgroup of high VGPs. We suggest, that in general video game playing experience can raise accuracy in certain visual and visual-spatial tasks (like those shown in the D. Bavelier's research [36]) but with higher involvement in video games the risk of video game addiction rises as well. So, while we did not measure video game addiction in our sample (mostly because there are no reliable video game addiction inventory in Russia, and Internet addiction inventories basically do not distinguish gaming from other types of online activities), we can assume that some of our high-VGP participants were video game addicts and their results altered the general performance of this subgroup. This assumption can also be used to explain the greater personal specifics shown by the high VGPs. On the other hand, lower empathy and higher venturesomeness can also be the reason for extensive video game playing, as video games represent a rather cheap and safe way to get some fresh experience, and in the simplified virtual world with a brief and slang-filled communication, the lack of empathy is less important than in face-to-face communication.

While video games are known to reduce gender differences in spatial performance [38], they do not work the same for the personality traits and attitudes. Most inter-sex differences in our research reproduce those from other studies with no video gamers involved. Thus, lower empathy in female gamers is interesting, as it might indicate which women prefer to play computer games. Or else it might show that video games, after all, alter some personality traits, and probably in a negative way as higher empathy is usually seen as an important part of communication.

2.4 Limitations

One of the main problems of any non-experimental study is the problem of causality. While we do not think it is possible to receive significant changes in personality of adults in an experimental setting (such changes probably require a lot of gaming experience and develop for a long time, if develop at all), the future research might involve different age groups as well as some type of a longitudinal study. We also think that though the mix-gender sample of participants in our study is an advantage (as

many video game studies involve single-sex samples), stable gender differences were difficult to control, because we could not recruit enough non-gaming males. Different video game genres references can also alter the results, though most of our participants were unable to choose only one preferable genre.

3 Conclusion

Despite the so-called "common knowledge" marking all gamers to be risky and impulsive, as well as several psychological theories based on different learning models, adult video gamers in Russia, in general, show no significant personal specifics in impulsivity or risk-taking. In the current study the most active (i.e., those who play over 12 h per week) video gamers, especially males, express high interest in new experience and sensation seeking, while active female gamers show significantly low capability of understanding other people's motions; these two findings can be either a predictor or the result of excessive gaming experience.

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