

Behavior of Adolescents with Problematic Use of Videogames and Evaluation of Impairments in Cognitive Performance

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ABSTRACT

It was in the 1990s that researchers became more interested in identifying possible problems related to the excessive use of the games and addiction. The major discussion about video game playing focuses on whether or not potentially capable of causing addiction. It was due to the lack of well-validated criteria for the diagnosis of addiction. It was according to this that Tejero and Moran presented a scale for the measurement of problem video game playing (PVP) adapted from DSM-IV. Considering that in Brazil there is little information about problematic use video games and addiction we proposed develop a valid and reliable PVP scale. Furthermore, considering the speculations that associate the low performance of cognitive abilities with videogame playing, we decided to propose the combination of two instruments, the PVP scale and the Battery of reasoning test-5 (BPR-5). This study included the participation of 253 adolescents, aged 16 to 17 years old, all males. For validation of PVP scale the exploratory factor analyses was performed via oblimin with Kaiser normalization. Cronbach's alpha coefficient was computed to examine the internal consistency of the PVP scale. Was applied the form B from BPR-5. The first factor or item observed in our PVP scale validation study presented 49,1% of the variance. In this way the nine items on the scale allow to measure a single dimension. We obtained good psychometric properties, considering that the Kaiser-Meyer-Olkin test. The value of 0,9 indicate an adequate factor analysis. The low performance of the mechanical reasoning test in PVP adolescents it may be related to the reduced practical knowledge of mechanics and physics. The complexity of the figures in the spatial reasoning test and the amount of information that must be manager to get correct answer seem to be more difficult for PVP adolescents for the same reasons cited above that are important for cognitive development. This study should contribute to predict future behavioral problems and extend comparative research the factors that best related to the problematic games or addiction.

Keywords

Behavior, Adolescents, Videogames, Addiction.

Introduction

Videogames gained prominence in the 1970s and 1980s when large-scale equipment were produced. However, it was 1990s that researches became more interested in identifying possible problems related to the excessive use of the games and the emergence of addiction [1]. The major discussion about video game playing focuses on whether or not potentially capable of causing addiction. It was due to the lack of well-validated criteria for the diagnosis of addiction that some studies in the 90s started to use criteria adapted for de diagnosis of pathological gambling [1]. Griffs et al., adapted Diagnostic and Statistical Manual of Psychic Disorders (DSM) III a set of criteria considered important

to define videogame dependence but different results were found in many studies [2]. Similarly, Fischer et al., adapted the criteria for pathological gambling in the DSM-IV to provide a screening measure of addictive use of videogames. This study showed psychometric properties but the scale was used only arcade videogame [3].

Tejero et al., created a scale also derived from DSM IV and was able to allow several symptoms of addiction to be associated with increasing commitment, measure of tolerance, withdrawal, preoccupation and family/school disruption. On the other hand in this study no cut-off point was proposed and no psychometric properties were reported for the scale [4]. Griffiths and Fisher have suggest that problematic use of video game is a characteristic of addiction but other diagnosis should not be reject. In line with this

and insufficient research to support the existence of game addiction that Tejero and Moran presented a scale for the measurement of problem video game playing (PVP) adapted from DSM-IV [5].

Considering that in Brazil there is little information about problematic use video games or addiction and recent studies that investigated this issue, using the PVP scale even though it had not been validated and targeted adults [6,7], we propose to present validity evidence for the PVP scale in adolescents in order to produce a reliable instrument that identifies problematic use of video games. The adaptation and validity of psychological instruments is a complex task that demands planning and rigorous standards with respect to their content, psychometric characteristics and validity for the target population [8]. Numerous steps are required for a psychological instrument to be considered valid [9]. One study suggested that a large amount of evidence increases reliability and proposed that this evidence should also be evaluated by other researchers, and not restricted to the authors of the instrument [9]. In our study, we present aspects related to the internal structure of the instrument, as well as confirmatory factor analysis, following certain general validation guidelines for psychological instruments in different cultures. Furthermore considering the speculations that associate the low performance of cognitive abilities with videogame playing, we decided to propose the combination of two instruments, the PVP scale and the Battery of reasoning test-5 (BPR-5), so we aim to identify those adolescents with probable problematic use of video game and your levels of performance in reasoning tests.

The Reasoning Test Battery 5 (BPR-5), consisting of 5 subtests that identify the performance of different reasoning skills (verbal, numerical, spatial, abstract and mechanical) [10,11]. BPR-5 comprises inductive and deductive reasoning tasks that require a person to analyze a relationship between a set of stimuli to find their organizational rules and then apply it in a similar situation to find the correct answer to a problem [10,11].

In studies on psychometrics it is possible to identify many researchers who differ on intelligence measures. Some researchers argue that intelligence has a simple structure, other researchers argue that intelligence is a multifaceted process. Thus, one side conceives of intelligence as a unique cognitive ability (factor g) and the other side that conceives of intelligence as a group of cognitive factors that have different levels of independence [10,11]. The authors used the CHC model [12-14], as well as cognitive psychology [15,16], to interpret what the BPR-5 is measuring, argue that the test assesses the intelligence of the fluid, which is strongly associated with the g factor, as well as some specific factors at the subtest content level.

The abstract reasoning subtest is associated with fluid intelligence, which is defined as the ability to reason in new situations to create concepts and understand implications. Verbal reasoning is associated with fluid intelligence and also knowledge-comprehension, which is defined as the extent and depth of verbal knowledge and vocabulary. Numerical reasoning is supposed to

measure fluid intelligence, but also quantitative reasoning and quantitative knowledge that can be defined as understanding basic quantitative concepts such as addition, subtraction, multiplication, and division, as well as the manipulation of numerical symbols. Spatial reasoning measures visual processing, which is the ability to represent and manipulate mental images, but it is also associated with fluid intelligence. Mechanical reasoning is related to fluid intelligence, mechanical knowledge, visual processing and reading comprehension, because problems are presented in terms of visual schemes and explanatory text [11].

Evidence based on factor analysis of the internal structure in the level of sub-tests supports the existence of a general factor explaining the common variance between the scales [11]. Moreover, correlation coefficients with other tests measuring similar or related constructs [11] and criterion measures, such as school achievement, age, and job performance support the interpretation of general and specific factors associated with each sub-test [11,17].

Materials and Methods

Sample

The research is in accordance with the National Health Council and was approved by the Ethics Committee and certified. This study included the participation of 253 adolescents from three public schools in Rio de Janeiro city, aged 16 to 17 years old, all males and low social class. After explaining the research and the participants voluntarily accepted to respond the items of the questionnaire, the PVP scale and the BPR-5, a consent form was sent to their parents or guardians to be signed.

The questionnaire, PVP scale and BPR-5 were applied in the school library, where groups of students completed the instruments at a scheduled time between classes or when their teachers were absent. Before application, the adolescents were instructed on how to fill each instrument which took from 10 to 20 minutes. The questionnaire was used to characterization of behavior of adolescents gamers which included five questions about time spent to play, the periods of the day spent, the game genre, the environment it is played and motivations to play.

PVP scale

The PVP scale is a self-reporting tool that contains nine dichotomous questions (yes or no). Each question address one of the nine factors: preoccupation, tolerance, addiction, aggression, scape, persistence, concealment, loss of responsibility an loss of activities. According to the scale a score of five or more positive responses indicate problematic use of video games [5]. For validation the exploratory factor analyses was performed via oblimin with Kaiser normalization. The Kaiser-Meyer-Olkin (KMO) coefficient was performed to find out whether the PVP scale is appropriate for principal components analysis. Furthermore Cronbach's alpha coefficient was computed to examine the internal consistency of the PVP scale [5,18].

BPR-5

The Battery of Reasoning Tests 5 (BPR-5) aims to assess the

reasoning ability of individuals, using sub-tests with different formats and contents that require basic processes of inductive and deductive reasoning for their resolution. The BPR-5 consist of two form (A and B), with five subtests of reasoning: abstract, verbal, spatial, numerical and mechanical. Was applied the form B which is the form to students in the high school and undergraduate students [6,18].

Results

According to the derived data of the factorial analysis or method of extraction of the main and oblimin components was verified a single dimension with eigenvalue of 4,4, demonstrating 49% of variance (Table 1; Graph 1). The value of the KMO index found was 0,91 and reveals that the proposed factorial analysis is appropriate (Table 2). According to criteria presented by KMO the factor analysis is appropriate when it demonstrate values between 0,6-1. Cronback's alpha coefficients 0,86 was found. It was considered a good predictive value of PVP reliability because it is about alpha 0,6 (Table 3).

Total Variance Explained						
Factor	Initial Eigenvalues			Equare load extraction		
	Total	% of variance	% cumulative	Total	% de variance	% cumulative
1	4,419	49,102	49,102	3,898	43,306	43,306
2	,793	8,809	57,911	,245	2,725	46,030
3	,703	7,806	65,718			
4	,676	7,511	73,229			
5	,593	6,584	79,813			
6	,544	6,040	85,853			
7	,496	5,510	91,362			
8	,440	4,890	96,252			
9	,337	3,748	100,000			

Extraction Method: Fatoração Alfa.

Table 1: Method of extraction of the main components and oblimin.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		,912
Bartlett's Test of Sphericity	Approx. Cui-Square	679,384
	df	36
	Sig.	,000

Table 2: Data derived from the KMO and Bartlett's test.

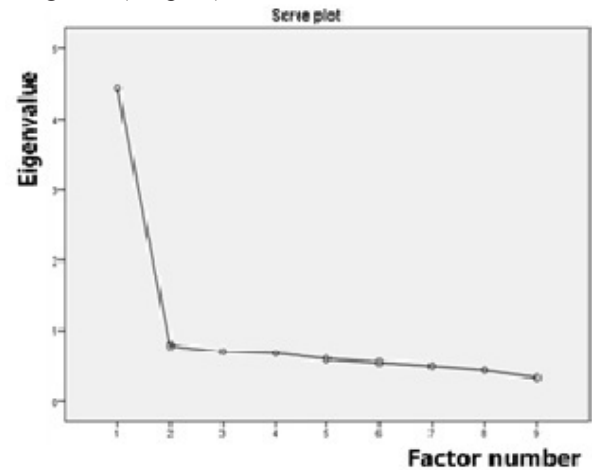
Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha (based on all Items)	N of items
,868	,868	9

Table 3: Cronbach alpha coefficient and reliability statistics.

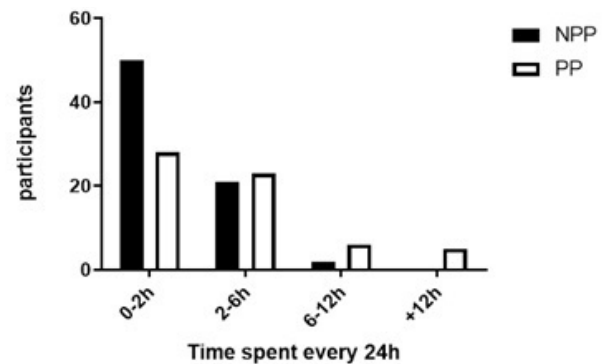
Was observed the number of hours spent by adolescents no problematic videogame players (N-PVP) and problematic videogame players (PVP) every 24h and plus N-PVP adolescents

spent 0-2h playing while the PVP adolescents are more distributed, spending more time playing (Graph 2). It is possible to observe that more number of N-PVP adolescents play in the period of the night while for PVP adolescents they play all periods (Graph 3).

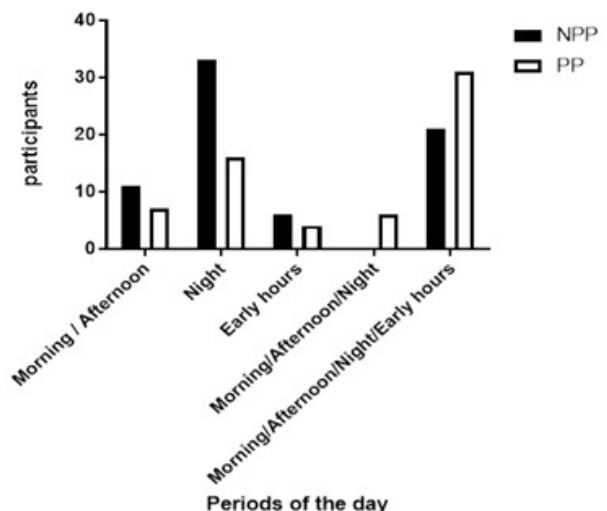
Lastly to results of the BPR-5 test N-PVP adolescents shows higher performance in all tests when compared PVP adolescents. This difference was more pronounced for the spatial and mechanical reasoning tests (Graph 4).



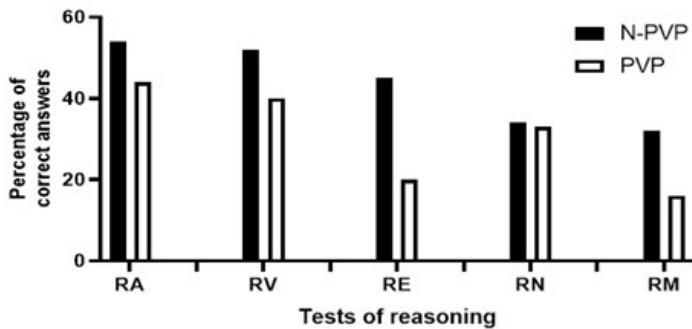
Graph 1: Method of extraction of the main and oblimin components and a single dimension with eigenvalue.



Graph 2: Number of participants that spend different periods of time with the practice of games.



Graph 3: Number of participants playing games in different sets of periods of the day.



Graph 4: Percentage of correct answers for each reasoning test in N-PVP and PVP.

Discussion

Studies demonstrated that male adolescents play more often than female adolescents and for this reason we choose to carry out the present research only among male adolescents [5,19].

The first factor or item observed in PVP scale validation study presented 49,1% of the variance, which is close to the Carmines and Zeller criteria and exceeds of Reckase criteria [20]. In this way the nine items on the scale allow to measure a single dimension.

The psychometric properties were found considering the Kaiser-Meyer-Olkin test. The value of 0,9 indicate an adequate factor analysis [21]. The reliability of the instrument calculated by Cronbach's alpha coefficient was [21].

Item I highest result in PVP scale may be demonstrating that the increasing involvement of the individual with games. The Items 8 and 9 of the PVP scale presented a factorial load below desirable value 0.3. However, it was decided not to remove any items to avoid changes in the test internal structure.

We use the same version of the first validation of the PVP scale. Our results showed similarities and some differences in Cronbach's alpha results [4,5]. Possibly these differences in internal consistency and in variance of the scale, were due to the nature of the samples. In our study only included adolescents' males and 16 or 17 years old.

The participants adolescents PVP's confirm problems associated with use excessive of games. It is one of the criteria used to identify pathological dependence of the game [1,4,5,18]. When comparing the two-population defined by PVP scale, it was verified that adolescents PVP play games more frequently during the day and at dawn. The use of electronic games came to be included as a daily activity. They are reports that the amount of time spent on a single activity may limit devote to other activities important for cognitive development. The reason that can explain a lot of dedication time is in the specific features of on line games, such as to be a social game with virtual interaction space, to have chats that promote social bonds, to have immersive properties and

promote conditioning [22,23].

The low performance of the mechanical reasoning test in PVP adolescents it may be related to the reduced practical knowledge of mechanics and physics. A greater amount of time dedicated to playing games should be reducing the acquisition of knowledge though other experiences and integration of information necessary to descriptive figure of the situation/problem in the test.

The complexity of the figures in the spatial reasoning test and the amount of information that must be manager to get correct answer seem to be more difficult for PVP adolescents for the same reasons cited above that are important for cognitive development. In addition, changes in behavior in PVP adolescents such as increased of preoccupation and loss control may interfere with the process of attention required for good performance in these tests.

Conclusion

This study should contribute to predict future behavioral problems and extend comparative research the factors that best related to the problematic games or addiction.

Acknowledgment

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