THE PSYCHOLOGICAL CORRELATES AND TEMPORAL DEVELOPMENT OF PROBLEMATIC VIDEO-GAME USE

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1. Objectives and background

Video games

Playing video games has become a widespread recreational activity for all age groups, from young to old (Sim, Gentile, Bricolo, Serpelloni, & Gulamoydeen, 2012). Its most accepted definition in videogame ludologist (game studies experts) circles comes from Gonzalo Frasca (2001, 4.) stating the term video game may refer to: „in the broadest possible sense, including any forms of computer-based entertainment software, either textual or image-based, using any electronic platform such as personal computers or consoles and involving one or multiple players in a physical or networked environment”. According to the definition above games running on a range of devices fit this description from simple computers, cell phones, video game consoles (XBOX, Playstation), arcade machines to any platform capable of manipulating digital images (Khan & Kantof, 2007), irrespective of whether they are playable alone or in a group, online or offline.

In studies aimed at playing video games, researchers found that a subset of gamers show intensive gaming related adverse psychosocial traits, similar to psychoactive substance abusers (Caplan, Williams, & Yee, 2009; Demetrovics, Urbán, Nagygyörgy, Farkas, Griffiths, et al., 2012; Wang, Khoo, Liu, & Divaharan, 2008). It is this subset of people to which the notion of video game addiction or problematic game use refers.

Conceptual landscape of problematic gaming

The term video game addiction and the observation and research on problematic video game use (hereinafter “PVG”) dates back 20-30 years (see e.g. Ross, Finestone, & Lavin, 1982; Soper & Miller, 1983), but only recently has it enjoyed greater interest as video games generally started spreading. Nowadays, even in colloquial usage there is more and more talk of video game addiction, but so far there is no disciplinary consensus in psychology regarding the terms diagnostic value, its prevalence (Ferguson, Coulson, & Barnett, 2011), its exact name (Sim et al., 2012), not even its existence (see e.g. Wood, 2008). The question whether PVG is a unique phenomenon also needs further clarification, in other words, is it a primary mental disorder (Gentile et al., 2011), or just an underlying symptom of an already existing mental issue, a possibility raised by many studies (Desai, Krishnan-Sarin, Cavallo, & Potenza, 2010; Wood, 2008). With all these questions in mind, psychology researchers mostly agree that there exists a form of video game playing– however described – that is excessive to such a degree that it is similar to behavioral addiction, problematic and forms a non-adaptive pattern in a psychological sense (Demetrovics, Urbán, Nagygyörgy, Farkas, Griffiths, et al., 2012). The understanding of this phenomenon is assisted by addictology, as the symptomatic similarity of addiction type problems is well documented (Griffiths, 2005; Jacobs, 1986; Kuss, Louws, & Wiers, 2012; Salguero & Morán, 2002). According to Khantzian’s self-medication theory (1985) the use of chemical substances is determined by important etiological factors, such as psychic stress, suffering and mental disorders. Substance abuse thus serves as a coping mechanism for these problems. This mechanism is apparent in non-chemical addictions (Demetrovics & Kun, 2010), and is akin to mood regulation component in the addiction component model (Griffiths, 2005). All the above support the notion that general psychic mechanism may underlie chemical and behavioral addictions (Demetrovics & Kun, 2010; Shaffer et al., 2004; Walther, Morgenstern, & Hanewinkel, 2012). Accordingly just as the dysfunction of self-regulation in people with alcohol problems results in alcohol consumption improving mood and alleviating internal stress, the same can be said about drug addicts and drugs, compulsive shoppers and shopping, bodybuilding addicts and bodybuilding (Demetrovics & Kun, 2010) and PVG gamers and video-gaming (Han et al., 2009; Kardefelt-
By now it seems that certain elements of initial attempts of describing PVG can be rejected (Ferguson et al., 2011; Griffiths, 2005; Young, 2010), while others are gaining weight in light of recent research. During this process PVG related theories have not only burnished, but converging toward one another, thus giving birth to theories that integrate longstanding and corroborated factors. During this process Demetrovics, Urbán, Nagygyörgy, Farkass and Griffiths (2012, 1.) conclude that, in case of PVG „behavior is not just excessive in nature, but video-game use related problems are also present”. This formulation attempts to summarize the essence of the phenomenon, whilst avoiding the term addiction, as an addictology terminology, due to the unclarified diagnostic criteria. The following six factors have been identified and corroborated by factor analysis in view of the above definition: preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal. Thus PVG, with its above mentioned definition and characteristics, has become part of the comprehensive spectrum of addictive type disorders thanks to the work of Zsolt Demetrovics (2013).

On an international level, already there has been a review published with an integrative scope, listing all instruments developed for measuring PVG (King, Haagsma, Delfabbro, Gradisar and Griffiths (2013). According to their results different researchers interpret PVG using different dimensions, nonetheless with respect withdrawal, loss of control and conflict dimensions there seems to be a consensus.

Research shows that in Hungary, the prevalence of problematic videogame users among the Hungarian adult gamer population is around 3% (Demetrovics, Urbán, Nagygyörgy, Farkas, Griffiths, et al., 2012). Similar prevalence rates have been found abroad on nationally representative samples, for example 2.4% in South Korea (Faiola, 2006), and 3% in Germany (Rehbein, Psych, Kleimann, Mediasci, & Mößle, 2010). According to systematic reviews the number of endangered gamers (Kuss & Griffiths, 2012a; Nagygyörgy et al., 2013; Sim et al., 2012) - that are not addicts in a strict addictological sense -, thus an important population with respect to PVG is far greater, 8-15.5% depending on nation and instrument.

The psychological correlates of problematic videogame use
Little or nothing is known of PVG’s relationship with certain psychological variables. What has been shown is that PVG is linked to a number of psychosocial well-being associated factors (e.g.: Kuss & Griffiths, 2012a). Findings from earlier research also suggest PVG’s relationship with numerous sociodemographic factors (e.g. Griffiths, Kuss, & L King, 2012; Gentile, 2009; Kuss & Griffiths, 2012b; Lemola et al., 2011), early-age game use (e.g. 1998), increased playing time (Ferguson et al., 2011), weaker scholastic record (e.g. Gentile et al., 2011), wide variety of playing motivations (e.g. Hsu, Wen, & Wu, 2009), with an emphasis on escapism (e.g. Kwon, Chung, & Lee, 2011), mental health (e.g. Allahverdipour, Bazargan, Farhadinasab, & Moeini, 2010) as well as weaker levels of psychosocial well-being scores (e.g.: Caplan et al., 2009; Kuss & Griffiths, 2012a). As noted in the Appendix of the DSM-5, the biggest weakness of research aimed at studying psychosocial factor underlying PVG is that in most cases they were conducted using Asian gamer samples (American Psychiatric Association, 2013), while few studies have been done with western European samples (e.g.: Griffiths & Hunt, 1998; Lemmens et al., 2011; Rehbein & Baier, 2013) and American ones as well (e.g.: Gentile, 2009; Yee, 2006). The published research on PVG with central European samples (either in English or Hungarian) is sparse, to our knowledge only work done by the research group of Zsolt Demetrovics (2011; 2012; Griffiths, Király, Pontes and Demetrovics,
2014; Griffiths and Mtsai, 2014; Pápay and Mtsai, 2013) and ourselves (Smohai, Mirnics, and Tóth, 2013; Smohai, Mirnics, Vargha, Torma, and Tóth, 2013; Smohai, Tóth, and Mirnics, 2013; Smohai & Vargha, 2014) can be cited here. For this very reason, we consider PVG’s deeper Central-European and Hungarian exploration necessary.

The first goal of the dissertation will be the examination of unknown (e.g.: life goals, parenting style) and lesser-known (attachment style, mental health) psychosocial factors’ relationship to PVG, so that we may come to know this phenomena from multiple sides in culture markedly different than that of America and Asia.

The temporal development of problematic video-game use

To this day numerous reviews (Ferguson et al., 2011; King, Haagsma, et al., 2013), academic papers (Festl, Scharkow, & Quandt, 2013; King, Delfabbro, & Griffiths, 2010; Rehbein & Baier, 2013) and clinical research studies (Zenses, Mößle, Rehbein, Fischer, & Möller, 2014) draw attention to the importance of conducting future longitudinal studies on video-game use. The understanding of the temporal development of video-game use, with an emphasis on its relationship to PVG is consequently an urgent and gap-filler task.

Sparse research examining the temporal stability of intense video-game use showed relative stability with results of moderate correlation, and small-scale changes, from which they concluded that PVG is a relatively stable phenomenon, that may last for many years (Gentile et al., 2011; Jackson, Von Eye, Witt, Zhao, & Fitzgerald, 2011; Lemmens et al., 2011; Van Rooij, Schoenmakers, Vermulst, Van Den Eijnden, & Van De Mheen, 2011), although there are findings that show the contrary (King, Delfabbro, & Griffiths, 2013; Rehbein & Baier, 2013). The limit of the studies above is that by examining only correlations and changes in sample means, they were unable to grasp the important and marked temporal patterns. Let us imagine the following: a correlational coefficient, as a stability indicator will reach its maximum value (=1) even if, for example each participant spends one hour less during the second wave than in the first wave; not to mention that we may very well get weak, close to zero correlation in case of minimal changes when determining relationships between two waves in such a way. Similar biases may arise when conclusions are reached regarding changes in games, on the basis of playing time, or changes in mean scores of PVG, as in a hypothetical scenario when half of the examined group manages to decrease its game time by 3 hours for the second wave, while the other half increased its time by the same amount, the group average does not change, even though there is significant change in the playing time overall. The examination of PVG’s temporal stability provides the possibility of extending the psychological context resulting from PVG’s cross sectional analysis and also tests them from a temporal perspective, thus examining the context of PVG’s changes. In doing so, we may move forward in discovering contact points between motivations underlying gaming and PVG, as highlighted by Zsolt Demetrovics (Demetrovics, 2013, o. 222.):

The second goal of the thesis is twofold: (2.a) the examination of temporal development and stability of gaming habits as well as (2.b) the processes and phenomena linked to it, to get a better picture of why teenagers’ PVG level changes or stagnates after a year’s time without any particular intervention.

In the literature of PVG, methodologically correct causal conclusion (using longitudinal methods, as well as controlling for initial PVG-level), to our knowledge, were only reached by two studies (Gentile et al., 2011; Lemmens et al., 2011), presumably due to the complex nature and high cost of these endeavors. The value of such studies is on one hand present in their ability to help design effective preventive and intervention measures by taking into account longitudinal cross-sectional research identified protection and risk factors, on the other hand by providing empirical support for answering timely and - in a addictological
respect - important questions (Gentile et al., 2011): what is the direction of causality in the case of the negative relationship between PVG and psychosocial well-being, of course if there is more to it than simple correlation caused by a common underlying mental issue (Wood, 2008). This last question is critical with respect to clarifying definitional uncertainties, as “significant decrease in quality of life is a compulsory criteria of addiction in a clinical sense” (Demetrovics, 2007, o. 34.), thus in such a way shed light on definition of video game addiction and doubts regarding the problems primary and secondary nature. Longitudinal studies thus provide us with temporally constant yardsticks for psychological practices aimed at PVG prevention and intervention, as well as informing us about PVG’s appropriate discussion in an addictological framework. This may well be the reason behind the notice in DSM-5’s appendix urging more studies in the topic of online video-game addiction (American Psychiatric Association, 2013).

2. Research presented in the dissertation
A total of four studies are described in the current dissertation. The first two are cross-sectional questionnaire studies. The third study reviews all of published longitudinal research on video-game use. The fourth is a follow-up study on the second questionnaire study. Detailed description of the four studies can be read below.

Study 1 – Typical flow experience patterns of video gamers
The original goal of the research that served as an example for the first study was the exploration of the psychological workings (personality, coping, flow) of Hungarian teen-age video-gamers (Smohai, Tóth, et al., 2013). In the current dissertation the during the examination of typical in game – in school – at home flow patterns we tried to answer the question, why increased level of flow experienced during videogame use correlated highly with scholarly and at home flow levels among a certain gamer groups, while in other groups it correlated weakly, whether flow patterns correlate with a kind of negative psychosocial functionality. (Smohai, Mirnics, Vargha, et al., 2013).

Study 2 – Investigation of PVG in a Hungarian teenage sample
The aim of the study was to examine some possible, yet not or just partly explored predictors of PVG in a comprehensive regression model (Smohai & Vargha, 2014). Therefore, predictive power of different factors on PVG were tested, like sociodemographic (e.g. gender, age, level of education of the parents), video gaming usage (e.g. age when started to play, motivations) and psychosocial well-being (e.g. social support, attachment style, mental health) factors.

Study 3 – Scoping review of longitudinal studies on video-game use
The dual goals of scoping review were the following: (1) collect all rare research results which investigate or contain the temporal development of video-game use and (2) review the proposed explanations of the experienced changes so far.

Study 4 – Predictors, causes and consequences of changes in PVG
The fourth study is intended to examine the temporal perspective of PVG, through four aims. First, it aimed to test psychometrically the usage of POGQ questionnaire (which
measures PVG) in a longitudinal study, thus prove the longitudinal measure invariance of the questionnaire. Second, it also aimed to determine the stability of PVG in a one year perspective. Third, it aimed to investigate the factors in connection with PVG changes, so answer such questions like: how do changing in playing motivations or personality traits relate to changes in PVG. The fourth and emphasized aim was to test the causes and consequences of PVG with the method of cross-lagged panel analyses (Lemmens et. al, 2011) which are frequently used to test causal relationship.

3. Methods

3.1. Study 1. Video-gamers typical flow experience patterns

3.1.1 Participants and Procedure
In our first study, participants were elementary and high school students. Recruitment of the sample was assisted by high school teachers. In total 350 teachers were contacted over the Internet, without the aim of representativeness, of which 95 had decided to collaborate from various parts of the country. All teachers received information material regarding the study. After establishing contact they directed their student on an agreed internet address (szjatekok.extra.hu), mostly during school hours. An online survey of the original study included the completion of 2715 participants, of who 1368 played video-games regularly. We considered regular gamers those who played at least half an hour a day.

3.1.2 Materials
Our study consisted of administering questionnaires and tests.
We questioned the following with use of a custom questionnaire: sociodemographic data (gender, age, level of parental education), grade point average, average daily playtime, name of favorite game, as well as the amount of time spent with specific games.

Situation-specific Flow questionnaire – For measuring the daily rate of flow, as a perfect experience, as well as antiflow experience (anxiety, boredom, apathy) we used a short version (9 items per situation) a flow questionnaire developed by Attila Oláh (2005). In the original study participants answered questions regarding the daily rate of experienced flow, boredom and anxiety in three life situations (school, family, video-games) with the use of three scales (flow, boredom, anxiety), each being a five point Likert scale. Considering that in the original study the rate of flow experiences showed negative relationship with experienced boredom and anxiety in the current study we only measured the rate of experienced flow. In conclusion we worked with only three experience-variables: experienced flow in school, at home and during video-gaming.

Big Five Inventory – BFI questionnaire – in accordance with the Big Five paradigm – five basic dimensions of personality (openness, conscientiousness, extraversion, agreeableness, and neuroticism) using a subscale of 44 questions for each, each question a five point scale itself (Benet-Martínez & John, 1998). Its Hungarian adaptation was completed by Rózsa and colleagues (Rózsa, Kő, & Oláh, 2006).

Coping Style Preference Questionnaire – Attila Oláh (2005) had identified eight, statistically separate coping style factors by examining 12-18 olds. The CSPQ is comprised of 51 items, each is a four point rating scale. The measured coping styles are the following: problem-centered reaction, support seeking, tension control, distraction of attention, emotion focus, emotion emptying, self-punishment and deference.

3.1.3 Sociodemographic characteristics of the participants
Participants in this study were 11-17 year old students (M= 14.9; SD = 2.2), with a higher percentage of males (60.2%). Majority of them were raised in two-parent households (71.2%), while almost every fourth child lived in single-parent households (23.7%). Considering their family structure 21.5% of them live as an only child, while the rest have respectively one or two siblings (49.2%, 20.9%). We divided the participants in four groups according to their average daily playtime: the ones that play around half an hour (n=189, 13.8%), 1 or 2 hours (n=555, 40.6%), 2 to 4 hours (n=291, 21.3%) and the more than 4 hours group (n=333, 24.3%).

3.2 Study 2 – Investigation of PVG in a Hungarian teenage sample

3.2.1 Participants and procedure
The theoretical population was comprised of Hungarian teenagers of whom the sampling frame included high school students. The teenagers were reached with the help of their IT teachers over the Internet, without the aim of representativeness. In total 3652 acceptable survey responses arrived, of which 2978 were from teenagers that at least casually played video games, casually here referring to playing at least once every few months. The responses came from 33 municipalities with the following distribution: 25% from Budapest, 29.8% from county towns, 45.2% from other cities and 0% from villages.

3.2.2 Materials
1. Sociodemographic data
   These were sociodemographic questions such as gender, age, level of parental education coupled with questions aimed at family structure, grade point average, drug use and psychiatric or psychological treatment history.

2. Problematic video-game use (PVG)
The Problematic Online Gaming Questionnaire (POGQ) developed by Zsolt Demetrovics and colleagues (2012) by way of interview and factor analyses is considered both conceptually and psychometrically accurate for the purpose of measuring the problematic extent of playing with online video-games. It consists of eighteen items, with each item referring to aspects PVG. The instrument measures all six factors of PVG via the following six subscales (item format is five point Likert scale): preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal.

3. Motives for online gaming
   Demetrovics and colleagues developed by way of interview and factor analysis the Motives for Online Gaming Questionnaire considered conceptually and psychometrically accurate which aimed to explore the motivational background of online gaming. It consists of 27 statements that respondents can answer on a 5 point Likert scale according to how often the given motivation characterizes him. The seven dimensions identified by the instrument are escape, fantasy, skill development, coping, recreation, competition, and social motives.

4. Video-game related media habits
   Gentile, Lynch, Linder and Walsh (2004) used questionnaire titled „General Media Habits Questionnaire – Child Version” in their research to explore media (TV, computer) use habits. We implemented this instrument in our own study without any severe modification, restricting it on video-games, resulting in 16 questions aimed at gaming habits (e.g.: playing time, preferred game genre, starting age of gaming).
5. Social support
We choose the Social Support questionnaire for measuring social support. The Support Dimension Scale developed by Caldwell, Pearson, and Chin (1987) was adapted to Hungarian by Mária Kopp and Mónika Kovács (Kopp & Kovács, 2006) and during their numerous national studies showed its reliability and validity. The seven items that were applied from the original 14 aimed at social support, were the ones we considered most relevant for the teenage population: parent, grandparent, distant relatives, friend, schoolmate, other.

6. Life goals
Shortened Aspiration Index. 14 item, Likert scale type instrument, devised for measuring general goals, focusing on intrinsic (development, relationship, community engagement), extrinsic (wealth, fame and physical attraction) as well as health related motivations. The original 35 item questionnaire was developed and published by Kasser and Ryan (1996). The reliability and validity of the shortened version was verified and assessed by Martos, Szabó and Rózsa (2006, o. 171) suggesting that by using the Aspiration Index “one may explore general, personal relationships to frequently occurring goals that influence everyday behavior and thus physical and mental health.”

7. Early parental rearing style
Memories of upbringing, shortened version (S-EMBU) (Arrindell et al., 1999). Consists of 23 items pulled out of the original 81 items of the Swedish Enga Minnen Betræffende Uppfostran instrument developed by Perris, Jacobsson, Lindström, Knorring, and Perris (1980). The Hungarian version is the work of Kállai and Gaszner (1999). The curiosity of the instrument is that it captures memories of parental rearing through the respondents’ perception over three factors – separately for mother and father – rejection, emotional warmth and overprotection.

8. Attachment styles
Relationship Questionnaire (RQ) (Bartholomew & Horowitz, 1991). 4+1 item instrument aimed at assessing attachment styles, shortened version of the Relationship Scale Questionnaire. It contains descriptions regarding four different prototypical attachments: secure, fearful, preoccupied and avoidant. Positive nature of both attitudes are present in secure, negative nature of both are reflected in the fearful-avoidant attachment style. The Hungarian version of the instrument has yet to be validated on a large sample, thus its psychometric indicators are unknown.

9. Mental health
For measuring mental health we used the „General Health Questionnaire” (GHQ-12) (Goldberg, 1972), a self-report scale for identifying mental health disorders. In the current thesis we use Likert type rating format (0-1-2-3), all items reversed, thus a higher total score indicates less mental and emotional disorder and healthier mental functioning.

10. Negative life events
Life events questionnaire. We used the questionnaire developed by Paykel, Prusoff, and Uhlenhuth (1971), previously tested on a Hungarian sample by Judit Nagy (2004).

11. Personality traits
Personality traits were measured – in accordance with the Big Five paradigm – modified version a TIP (Ten Item Personality Inventory) (Gosling, Rentfrow, & Swann Jr,
Respondents rate TIPIs ten items on a 7 point Likert scale. TIPIs validity was shown in multiple studies (Gosling et al., 2003; Jonason, Teicher, & Schmitt, 2011). In our current sample however only extroversion and emotional stability scales internal consistency proved adequate, consequently the current thesis will be only further discussing these two traits.

3.2.3 Sociodemographic characteristics of the participants

Participants in the study were 12-25 year old high school students (M=16.01; SD=1.52), a small percentage of whom were aged 20, high school graduated participants studying in vocational training. The percentage of males substantially surpasses that of the females in the sample (65.4% vs. 34.6%).

3.3. Study 3 - Scoping review of longitudinal studies on video-game use

The comprehensive literature review contains studies published before 29 October 2013, which attempts to – at least partially – answer one of the following three questions: (1) Are there any typical changes involved in video-game use? (2) How can one describe these, what is their direction? (3) How could one explain possible changes? What are the valid predictors of these changes and is there any significantly influential factor?

The detailed, but rather global review of the literature should suffice in reaching the proposed goals above, without the need for more specific, concrete questions. Thus this work may rather be considered a scoping review than a systematic review (see: Petticrew & Roberts, 2006). Scoping reviews are also systematic in method, overviewing and filtering all results from specified queries on specified search interfaces, but aimed at thorough orientation rather than searching for answers to specific clinical questions (Centre for Reviews and Dissertations, 2009).

3.3.1 Search interfaces and queries

Comprehensive search on four relevant search interfaces (Web of Knowledge, Science Direct, PubMed, PsychInfo), as well as in the grey literature according to guidance of Petticrew and Roberts (2006) was realized, and in this case included potential examination of documents not registered in the databases above, e.g.: papers in the reference list of papers found.

Further building on the video-game related study of Sim and colleagues (2012) as well as the systematic review of longitudinal studies by Anderson, de Bruijn, Angus, Gordon, and Hastings (2009) we used the following queries: „video game”, „online game”, „computer game”, „digital game”, „console game” and their derivatives (...gaming), as well as „longitudinal”, „cohort”, „prospective”.

3.3.2 Inclusion criteria

The inclusion criteria were the following: (1) longitudinal, empirical data, with a minimum 6 month follow up, (2) video-game use measurement (time, frequency, problematic/addictive use), separated from TV and other activities!, (3) at least one group did not receive intervention or care (4) published before 29 October 2013 (5) also available in English, (6) available for current authors. The results were separately coded by two individuals and compared and agreed upon in all cases.

After completing the literature research, of the resulting 662 hits 32 fit all the inclusion criteria (see Figure 1) The filtering of articles went accordingly to the generally accepted and practiced PRISMA flowchart (Moher, 2009). The list of included and reviewed publications, and the results obtained conclusions reached are presented in the full text of the dissertation.
3.4. Study 4 - Predictors, causes and consequences of changes in PVG

3.4.1. Participants and Procedure
In the second questionnaire study we enrolled high school students similarly as in the first study and repeated the data collection 12 months later. Out of the 3652 participants from the first data collection we managed to fill out the questionnaire pack - and thus match the individuals’ data - with 472 participants. The distorting effect of high drop-out rate (87%) is moderated by the fact that second data collection occurred similarly during IT class, thus besides the unsuccessful matching of individuals the cause of the drop-out is due the factor independent of students (curriculum, graduation ceremony, change in teacher status).

In both cases survey completion happened online, during 45 minutes IT class, after school and teacher gave their consent, parents their passive informed consent. No parent refused their child’s participation. Of the 472 matched participant 115 (24.4%) never play video-games (69.7% female). In sum there were 353 participants (52.4%) who played video-games at least once. Analysis was conducted on this very sample.
3.4.2 Materials
See: Subchapter 3.2.2

4. Results and Discussion

**Goal 1. Psychological associations of PVG**

We inferred the psychological correlates to PVG indirectly from the results of study 1, where we measured experienced flow patterns in three different situations (during video-game play, in school, at home). After completing the configuration analysis we found that combinations of experienced flow during video-game play, in school and at home cluster into two typical, larger configurations: people who experience a lot in all three situations, and those who experience very little. This result did not confirm the theory according to which experienced flow during gaming is correlated with video-game addiction (Chou & Ting, 2003), which would have predicted frequently experienced flow during gaming and diminishing flow in school and at home (Cash & McDaniel, 2008). The group of people experiencing high rate of flow in all three situations can be considered as the equivalent of the groups displaying a harmonic profile in Wang and colleagues (2008) study, whose video-game use adaptively fits into their life and everyday activities. This is consistent with the further results of our study, according to which this group is more mature, has personality more fit for social integration (higher openness, conscientiousness and agreeableness) and are better at coping than the groups who rarely experience flow in all three domains. Thus the hypothesis regarding the correlation between experienced flow during game play and PVG was not supported.

Study 2 elaborated of the psychological correlates to PVG in more detail, in more direct manner. Our results indicate that gaming motivation, life goals, parental rearing style, social support, negative life events, mental health, personality and recreation activities all significantly, but to a different degree show correlation with PVG. These construct explain a notable percentage – 44% – of PVG’s variance (see Table 1). There are the aforementioned regressions below in detail.
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<td>-0,105**</td>
<td>0,152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Importance of extrinsic goals</td>
<td>0,02</td>
<td>0,494</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aspiration index</td>
<td>-0,096**</td>
<td>-0,165</td>
<td></td>
</tr>
<tr>
<td>Age when started to play</td>
<td>Age what age did you start playing video-games&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>-0,189**</td>
<td>-0,228</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Since when do you play video-games&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,170**</td>
<td>0,024</td>
<td></td>
</tr>
<tr>
<td>MOGQ</td>
<td>Social motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,350**</td>
<td>0,171</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Escape motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,396**</td>
<td>0,196</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competition motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,308**</td>
<td>0,094</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coping motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,391**</td>
<td>0,121</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skill development motivation</td>
<td>0,307**</td>
<td>-0,001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fantasy motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,400**</td>
<td>0,191</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recreation motivation&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,269**</td>
<td>0,023</td>
<td></td>
</tr>
<tr>
<td>S-EMBU</td>
<td>Father’s rejection</td>
<td>0,166**</td>
<td>0,122</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Father’s emotional warmth</td>
<td>-0,057**</td>
<td>-0,001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Father’s overprotection</td>
<td>0,089**</td>
<td>0,053</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother’s rejection&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,166**</td>
<td>0,131</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother’s emotional warmth</td>
<td>-0,066**</td>
<td>-0,095</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother’s overprotection</td>
<td>0,100**</td>
<td>0,028</td>
<td></td>
</tr>
<tr>
<td>RQ</td>
<td>Secure attachment style&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>-0,039*</td>
<td>-0,053</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fearful attachment style</td>
<td>0,01</td>
<td>-0,054</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preoccupied attachment style&lt;sup&gt;MLR&lt;/sup&gt;</td>
<td>0,166**</td>
<td>0,227</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dismissing attachment style</td>
<td>0,099**</td>
<td>0,124</td>
<td></td>
</tr>
<tr>
<td>Social support Questionnaire</td>
<td>Social support - parents</td>
<td>-0,092**</td>
<td>-0,272</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support - grandparents</td>
<td>-0,042*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social support - siblings</td>
<td>-0,102**</td>
<td>-0,110</td>
<td></td>
</tr>
</tbody>
</table>
### Table

<table>
<thead>
<tr>
<th>Social support – distant relative</th>
<th>-0,02</th>
<th>0,072</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social support - schoolmate</td>
<td>-0,043**</td>
<td>0,073</td>
</tr>
<tr>
<td>Social support - friend</td>
<td>-0,126**</td>
<td>-0,307</td>
</tr>
<tr>
<td>Social support - other</td>
<td>-0,132**</td>
<td>-0,024</td>
</tr>
<tr>
<td>Average of different social supports</td>
<td>-0,102**</td>
<td>0,275</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHQ</th>
<th>Mental health&lt;sup&gt;MLR&lt;/sup&gt;</th>
<th>-0,108**</th>
<th>0,159</th>
<th>0,025</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIPI</td>
<td>Extroversion</td>
<td>-0,170**</td>
<td>-0,182</td>
<td>0,073</td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
<td>0,085**</td>
<td>0,018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aggregate R&lt;sup&gt;2&lt;/sup&gt; (multiple linear regression)</td>
<td></td>
<td></td>
<td>0,44</td>
</tr>
</tbody>
</table>

Notation: *: p<0,05; **: p<0,01; ***: p<0,001

The variables with TLR upper index are the ones that were included in the stepwise multiple linear regression model (the „gender” variable was purposefully not included in the final model due to its documented masking effect of other effects).

**Playing motivations**

Different playing motivations proved by far the strongest predictors of PVG, specifically the ones that refer to withdrawal and isolation from life: escapism, fantasy, coping. The strong correlation of escapism with PVG has been confirmed by many studies (e.g.: Billieux et al., 2013; Zanetta Dauriat et al., 2011). The reason that in our model fantasy and coping are also included is probably because, in the motivational questionnaire that we used (MOGQ) the tendency to refuse to accept reality is potentially present in all three factors. This phenomenon is in accordance with the result of Wan and Chiu (2006), that shows that excessive use of online video games rather stems from the need to ease unpleasant feelings related to one’s life, than from the pursuit of pleasure and satisfaction through gaming. According to our results, however, the strength of motivations considered independent of real life’s discomforts (social experience, coping, and recreation) is positively correlated to problematic gaming, similarly to results by Hsu and colleagues (2009), as well as Billieux and colleagues (2013). We may thus conclude, any excessive playing motivation may facilitate PVG, or its corollary, but particularly motivations related to refusing to accept reality contain greater addictive dangers. This result is awareness-raising for parent and intervention specialists for its shows that different playing motivations contribute to PVG to a different degree.

**Age when started to play**

Our results indicate that starting age of video-game playing significantly influences later PVG. The sooner one starts playing, the bigger the chance of developing PVG. This patterns resembles that of tobacco (Fava, Velicer, & Prochaska, 1995), drug (Winick, 1964) and alcohol (Bischof, Rumpf, Hapke, Meyer, & John, 2003) addiction related findings, as well as video-game use related results is (Allahverdipour et al., 2010; Mark D. Griffiths & Hunt, 1998). Which starting age is the most ideal with long term effects in mind, from a psychological perspective remains an open question.

**Social functions (parental rearing style, attachment, social support, personality)**

According to our results PVG, to smaller is extent, is predicted by parental rearing styles, attachment styles, social support and extroversion trait. Results showing that participants with a secure style of attachment are less problematic in their game use are in accordance with results by Lidia Suárez and colleagues (2012). In the life of participants with
secure attachment style games might be present less of gap filler and much more as entertaining activity, and as a result addictive, obsessive use becomes less likely: they play until the game process is entertaining and enjoyable and after that easily switch to a new enjoyable activity. High scores on insecure attachment style come with higher scores of PVG, as in these cases gaming fills a sort of relationship gap, as stated by Kowert and colleagues (2014). According to the theory of Bartholomew and Horowitz (1991) people with secure attachment style view others and themselves positively and this enables them to create contact with their environment more easily. Sociability and trust towards other might function as a protective factor against PVG. Our results show that of all the attachment styles, people with preoccupied style are the most endangered from a PVG perspective. Bartholomew and Horowitz (1991) proposed that their relationships are determined by negative view of themselves and positive view of their peers. This negative relationship basepattern is exhaustive for their social environment, thus might be unsuitable for establishing real world contacts, from a social integration perspective. The relationship needs of this group thus remain unfulfilled, as they seek „substitute” relationship in the virtual world (Peters & Malesky Jr, 2008).

According to the results obtained through Big Five the presence of social integration promoting traits – reflecting a more mature personality – as extraversion and emotional stability, all predict – although weakly – an unproblematic game use. These result are consistent with our earlier findings (Smohai, Tóth, et al., 2013) and due to the tenfold sample size complement Collins and colleagues (2013; 2012) observation that only agreeableness is significantly related (negatively) with problematic game use. If we compare our results with previous findings regarding playtime and personality traits we can state that out of the two contradicting results by Collins et al. (2012), as well as Teng (2008) our results support the prior, according to which more intensively playing people are more probably introverts.

Perceived parental rearing styles likely play a small role in the development of teenage PVG, in any case we can state that its rather that negative parental manifestations (rejection, overprotection) that promote it, while in contrast positive manifestations (emotional warmth, acceptance) promote the development of unproblematic game use. Along with perceived parental rearing style similar or even increased effect can be recognized in the case of friendly relations, successful or unsuccessful integration into a social structure during teenage years. This is confirmed by results obtained through the social support measure, according to which – weakly tough – social support from friends, other sources (especially relationships) and from siblings, compared to that of the parents, strongly correlate with small PVG scores. This is consistent with results by Padilla-Walker and colleagues (2010) regarding female participants. With respect to paternal rearing style we may conclude that the number of good quality supportive relationships may have jointly protective effect in avoiding PVG. Parents are also part of this protective system, as is the friend and the sibling. Not one positive relationship determines whether PVG develops or not, but the perceived support and acceptance on behalf of the child’s social environment.

These results reflect upon the new preventive and intervention possibilities with respect to PVG. In helping problematic gamers overall facilitation of social resources –in the form of consulting or psychotherapy - in every segment of life are key.

**Life goals, mental health, recreational activities**

Life goals and mental health proved to be weak predictors of PVG, so we can only make careful assumptions. Consistent with Nicholson and colleagues (1994), as well as Smith, Piek, and Saunders (2003) our finding that intrinsic (development, relationship, community goals) and mental health related goals are negatively correlated with PVG, might provide the basis of a promising research program. This topic is worth examining more
deeply, and with other methods, e.g.: identity crisis (Marcia, 1966) or in the context of meaning of life, existence-analysis (Frankl, 2006).

With respect to mental health, consistent with relevant literature (Caplan et al., 2009) we found that mental health is a weak, negative predictor of PVG. Further exploration is necessary for arriving at a conclusion or informing practical applications, for example, it would be important to explore via a longitudinal study, to what degree is mental health a cause or results of excessive video-game use.

Systematic recreational activities specific PVG’s related results are consistent with Neuman (1988), Huston and colleagues (1999) and displacement theory corroborated by others: gamers who systematical practice recreational activities are less problematic in their playing than those from whom only video-games serve as recreational activity. In light of the above, one might view teenage absenteeism from his regular activities as a warning sign, as Rehbein and colleagues (2010) have shown the absence of participation in recreational activities, as well as the lack of sense of achievement play a large role in the development of PVG. With respect to our results consistent with this theory, it is important to note even one regular complementary activity besides video-game use may reduce level of PVG, or the likelihood of its development, be it sports, tutorials, religious or spiritual activities or offline programs with friends.

Limitations

Limitation of this research is that although the sample is heterogeneous and large, is not representative, as its lacks random sample selection. Furthermore online data collection during high school class as an experimental environment is rather uncontrolled: there is a risk that students influence each other in their response, thus biasing the studies result.

Goal 2a. Temporal changes of PVG

A psychometric criterion of comparing data at different times is that longitudinal measurement invariance meets at least a metrical level (Vandenberg & Lance, 2000). Verification of this criteria was done, under which all the three longitudinal measurement invariance levels of the POGQ questionnaire (measuring PVG) were proven to be good, this way we can compare the PVG results received by the two different data collections in a psychometrically supported way.

During our follow-up research (Study 4) we used Reliable Change index to capture the temporal stability of PVG. With the use of Reliable Change index we can examine the percent of people in the experimental group which has reached reliable change (Jacobson & Truax, 1991). Table 2 shows the frequencies of received PVG and people undergoing reliable change regarding playtime.

<table>
<thead>
<tr>
<th>PVG</th>
<th>Reliable reducers*</th>
<th>No reliable change**</th>
<th>Reliable enhancers***</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>10</td>
<td>332</td>
<td>11</td>
<td>353</td>
</tr>
<tr>
<td>%</td>
<td>2,83</td>
<td>94,05</td>
<td>3,12</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Playtime</th>
<th>Reliable reducers*</th>
<th>No reliable change**</th>
<th>Reliable enhancers***</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>19</td>
<td>302</td>
<td>3</td>
<td>324</td>
</tr>
<tr>
<td>%</td>
<td>5,86</td>
<td>93,21</td>
<td>0,93</td>
<td>100</td>
</tr>
</tbody>
</table>

Reliable change index *:<-1,96; **: [-1,96-1,96]; ***: >1,96
There is a small proportion of those (5.95%), whose PVG index changed reliably either to a positive or a negative direction in the one year between the two data collections (when the absolute value of the Reliable Change index reaches 1.96). Reliable PVG reduce can be detected in 2.83% of the sample (N=10), no reliable change happened by the 94.05% of the sample (N=332), and 11 participant (3.12%) showed reliable enhance. Similar proportion of participants showing no reliable change (93.21%) can be detected with respect to playtime, like in the case of PVG (94.05%). However in the proportion of people increasing playtime reliably and people reducing playtime reliably, a displacement towards reliable reducers can be noticed, instead of a balance (N_{reduct}=19 \text{ vs. } N_{incr}=3; 5.86\% \text{ vs. } 0.93\%). These results don’t contradict previous empirical findings in the literature, but they do differentiate them. Earlier research in many cases has showed relative stability or just slight decreasing trend with descriptive statistics (Gentile et al., 2011; Lemmens et al., 2011; Haagsma et al., 2013; King, 2013), interpreting by some authors as a relative stability (Gentile et al., 2011), and by others as a variability (King et al., 2013). During the present one year investigation although, we succeeded in the operationalization of the magnitude of the change with the Reliable Change index, with a better method than mere PVG score changes, we did not experience radically different stability results than the ones already present in the other studies (encompassing 0.5-2 years).

It is interesting to note that there is significant difference between the proportion of changes in PVG and playtime (Chi^2(2) = 7,556, p = 0,0229), even if with a low effect size (Cramer’s V=0,106). We can therefore conclude that PVG and average daily playtime capture at least partly independent aspects of video-game use. This result confirms the consideration, which states that mere playtime doesn’t substitute information in connection with PVG and is not equivalent with it because it doesn’t necessarily contain problems in connection with gaming according to the definition of PVG (Demetrovics, Urbán, Nagygyörgy, Farkas, Griffiths, et al., 2012; Ferguson et al., 2011). It is then possible that according to the results of our research playtime is possibly reduced by more people than PVG, so regarding decrease playtime seemed to be more instable and regarding increase more stable than PVG. This means that if a teenager substantially reduces playtime, it doesn’t mean that PVG scores are reduced as well, and it is probable that PVG scores can increase without the playing time would change reliably.

Goal 2b: characteristics of PVG changes

Groups were formed according to the measured changes in PVG using the Reliable Change index and groups according to the starting score on PVG during the first data collection measured by the POGQ main scale. Given that our sample did not contain enough cases reducing and increasing PVG reliably, we had to use frequency distribution and form the three so called „PVG trajectory” groups according to reliable PVG changes: reducers, stagnants and enhancers. According to the starting PVG scores by the first data collection we also formed „unproblematic”, „slightly problematic” and „problematic” gamer categories.

Baseline predictors of PVG trajectories

Two-way independent ANOVA was used to test the possible predictors of PVG trajectories (reducers, stagnants, enhancers). Variance analysis was completed by two factors of baseline problematics (unproblematic, slightly problematic and problematic) and PVG trajectories, so the sample was divided into nine groups (unproblematic reducers, slightly problematic reducers, problematic reducers, unproblematic stagnants, etc.). Only small effect size was found between certain PVG trajectories regarding baseline levels of certain dependent variables. According to our results PVG reducers were separated from stagnants

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1 The process was conducted by Vargha András, for which I would like to thank him.
and PVG enhancers regarding the social support coming from schoolmates and high level of emotional warmth of the father. The preceding submission is consistent with findings of Rehbein and Baier (2013), the later submission diverges from it, because on German sample there was no relationship found between emotional warmth of the parents and later PVG score.

**PVG trajectories specific changes**

Three-way mixed ANOVA’s were used to test PVG trajectories specific changes. The first factor was the PVG trajectory (reducers, stagnants, enhancers), the second was the baseline PVG (unproblematic, slightly problematic, problematic gamer), the third was always the actual within subject measurement. Only the main results are presented below.

Although weakly, emotional instability showed rather increasing trend (significant interaction) among PVG reducers, than stagnants or enhancers regarding PVG changes.

![Figure 2 Changes of average emotional instability scores in PVG trajectory groups](image)

It emerges that emotional instability showed rather an increasing trend among PVG reducers, than the groups of stagnants and enhancers. In accordance with the results of Chappel, Eatough, Davies and Griffiths (2006) we consider it is possible, that restricting or leaving gaming as an ordinary coping method could be a coping and emotional stability challenge. To fill the gap caused by the loss or reduction of gaming as a coping strategy one will need new, more adaptive habits, which are likely to take more than one year. Thus the start on the road of reducing PVG is filled with attention and difficulties. If this process ends with no success, returning to videogames (recidivism in this context would be too intense) will increase and thus the probability of PVG increase would also be higher. However avoiding recidivism and successfully developing new habits can cause emotional balance to become stable again, this way with higher psychosocial wellbeing.

Figure 3 presents the development of recreation motivation of changes regarding PVG trajectories. Level of recreation motivation changes differently in the three PVG trajectories (reducers, stagnants, enhancers): there are no major changes in the group of stagnants and reducing, but in the case of enhancers it increases significantly (confidence intervals are not overlapping). In the case of other motivations (social, escapism, coping, fantasy) that show significant interaction with PVG trajectory, similar trend can be detected, but not as explicitly as in the case of recreation.
For deeper explanation we examined changes in recreation motivation in different baseline PVG groups (unproblematic, slightly problematic, problematic) too. The results are presented in Figure 4.

It emerges that during the first data collection, recreation motivation of unproblematic gamers increases greatly, slightly problematic gamers’ decreases mildly and problematic gamers’ stagnates with a quite high score. According to these results, recreation motivation seems to be the most increasing motivation when unproblematic gaming starts to change into problematic gaming. King and Delfabbro (2009) stated a similar statement with theoretical fundamentals, which received empirical justification by the present research for the first time.

**Goal 3. Causes and effects of PVG**

The testing of PVG correlates mentioned by literature so far as cause-effect relationship was carried out in our longitudinal study. Same experimental design, and cross-legged panel model was performed by Lemmens and colleagues (2011) in their breakthrough study, with the inclusion of similar, yet significantly different variables (confidence, life satisfaction, social competence, loneliness). The cross-lagged panel model is presented in Figure 5, while the results of the analyses. With the help of the cross-lagged panel model we may understand whether the problematic gaming and other psychological factors measured...
the second time can be explained with – besides their own respective level measured the first time – their own joint initial levels, thus possibly revealing cause-effect relationships.

*Figure 5 Cross-lagged panel analyses*
## Table 3 Summary table of PVG-related cause-effect analysis

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;A&quot; path</td>
</tr>
<tr>
<td>MOGQ</td>
<td>Social motivation</td>
</tr>
<tr>
<td></td>
<td>Escape motivation</td>
</tr>
<tr>
<td></td>
<td>Competition motivation</td>
</tr>
<tr>
<td></td>
<td>Coping</td>
</tr>
<tr>
<td></td>
<td>Skill development</td>
</tr>
<tr>
<td></td>
<td>Fantasy</td>
</tr>
<tr>
<td></td>
<td>Recreation</td>
</tr>
<tr>
<td>Playtime</td>
<td>Daily average</td>
</tr>
<tr>
<td></td>
<td>Weekday afternoon</td>
</tr>
<tr>
<td></td>
<td>Weekday evening</td>
</tr>
<tr>
<td></td>
<td>Weekday dawn</td>
</tr>
<tr>
<td></td>
<td>Weekend morning</td>
</tr>
<tr>
<td></td>
<td>Weekend afternoon</td>
</tr>
<tr>
<td></td>
<td>Weekend evening</td>
</tr>
<tr>
<td></td>
<td>Weekend dawn</td>
</tr>
<tr>
<td>Aspiration index</td>
<td>Importance of appearance</td>
</tr>
<tr>
<td></td>
<td>Importance of development</td>
</tr>
<tr>
<td></td>
<td>Importance of relationships</td>
</tr>
<tr>
<td></td>
<td>Importance of community goals</td>
</tr>
<tr>
<td></td>
<td>Intrinsic life goals</td>
</tr>
<tr>
<td></td>
<td>Aspiration index</td>
</tr>
<tr>
<td>Social support</td>
<td>Schoolmate</td>
</tr>
<tr>
<td></td>
<td>Friend</td>
</tr>
<tr>
<td></td>
<td>Grade point average</td>
</tr>
<tr>
<td>GHQ</td>
<td>Mental health</td>
</tr>
<tr>
<td>TIPI</td>
<td>Extraversion</td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
</tr>
</tbody>
</table>

*: p<0.05; **: p<0.01; ***: p<0.001

The table only contains those variables that show at least one significantly longitudinal cross-correlation with PVG.
Table 3 shows that among boys low social support (from schoolmates, friends), poor mental health and introversion (from personality traits) have proved to be psychological factors causing PVG. No involved variable was proven to be an effect of PVG (of course outside of the second data collection of PVG variable itself) among boys. Among girls high fantasy motivation had proved to be a factor causing PVG and the effects of PVG have proved to be high daily average playtime (particularly weekend’s afternoons and dawns) and low skill development motivation.

Only theoretical explanations were found concerning the casual relationship between PVG and playing motivations, according to which PVG develops initially with the growth intrinsic, light, recreational motivations and shift towards escapism (Beranuy, Carbonell, & Griffiths, 2013; King & Delfabbro, 2009; Young, 2010). In the case of girls fantasy motivation was proven to be a predictor and thus a motivational index causing PVG in temporal context, which corresponds with the results of research examining the relationship between PVG and fantasy motivation (Beranuy et al., 2013; Klimmt, Hartmann, & Frey, 2007). Among girls skill development motivation has a causal connection with PVG, but it’s rather an effect than a cause and with reversed sign: PVG among girls resulted in the reduction of skill development motivation. This result is natural in certain respects, because problematic gamers probably don’t play to develop their skills even if initially they were driven by this motivation. It is not clear why this causal relationship was only relevant among girls. A possible explanation can be that initially girls may play with higher skill development purpose than boys. In the case of the other motivation styles (social, coping, competition, recreation) we did not found a marked causal relationship like this, which could indicate that the relationship of temporal changes of motivations and PVG exceeds a one year period and can be potentially captured in longer periods of time.

The possible casual perspective of the previously researched cross-sectional relationship of PVG and playtime (Choo et al., 2010; Ferguson and et al., 2011) has been assessed. There was no significant temporal relationship found among boys, so PVG and playtime don’t contribute to the explained variance of time-shifted values of each other. However in the case of girls PVG had been proven to be the cause of playtime and not vice versa contrary to the conjectures of previous literature in this topic (Lemmens et al., 2011; Rehbein & Baier, 2013; Sim et al., 2012). Accordingly, our research points out that among girls their problematic gaming starts to increase first, after that, their playtime starts to grow either. In other words, high playtime is preceded by the increased level of PVG among girls however it was not established in the case of boys because it is possible that in their case playtime could grow not influenced by PVG desultory or spontaneously.

According to our results previously found negative relationship between social support and PVG can be put into temporal perspective. In our research absence of social support coming from friends and schoolmates was proven to cause PVG, which corresponds with some research partly (Gentile et al., 2011; Lemmens and et al., 2011) or fully (Rehbein & Baier, 2013). Seay and Kraut (2007) and Lemmens et al. (2011) also indicated the causal nature of PVG on loneliness when examining the construct loneliness which is relatively related to social support. However, only research of Lemmens et al. (2011) confirmed PVG to be the cause and the consequence of loneliness. Social support coming from schoolmates as a cause of PVG (confirmed in our study) corresponds fully with findings of Rehbein et al. (2013) examining the impact of social school incorporation on PVG. This phenomenon confirms the experiments of professionals (Cash & McDaniel, 2008) and the claims of Keith Bakker (who is the director of a Dutch institute which treats PVG) said during an interview, according to which the main problem of 90% of the young people entering is not PVG but the
bleakness of their social life (Maguire, 2008). Another result of our study is closely linked here, accordingly that among boys introversion as a personality trait was confirmed to be a cause of PVG, and so the less social, energetic teenagers at the first data collection were more likely to become problematic gamers. It follows that extraverted personalities are more prevented from developing PVG. Causal relationship between emotional stability and PVG has not been reflected during our research, presumably vulnerability of people being more emotionally instable is reflected and can be measured during a longer period of time than a year.

Placing results of cross-sectional studies revealing PVG related mental health problems in a causal perspective we’ve found that poor mental health among males leads to increased PVG later. This result is partially consistent with that of Gentile and colleagues (2011) according to which there is a circular causality between PVG and anxiety, depression and impulsivity. Our own study did not show the PVG effect of poor mental health, only the causal nature of PVG, and only among males. Similar results include the documented PVG causal nature of self-confidence, a component of mental health (Lemmens et al., 2011). Poor mental health, as a predictor of future PVG refers to PVG’s self-medicative nature (see Khantzian, 1985), namely that these people do not unequivocally play for only the pleasure of gaming, but rather for avoiding negative mood, general discomfort and frustration, for escapism motivated reasons to be short (Fuster, Chamarro, Carbonell, & Vallerand, 2014; Stoeber, Harvey, Ward, & Childs, 2011; Wang et al., 2008). This result, in the debate of harmful mental health effects of video-games, supports the view that PVG is rather a symptom of an already present mental health disorder, than their cause, thus according to our study PVG proved to be rather a secondary, than primary mental problem, at least in a one year timeframe. To this end people with unfavorable psychosocial background are more prone to become problematic game users. For the virtual success and relationships play a gap filling role and become gradually more and more important. Consequently they are more likely to depart from their real world relationships, neglect their social activities, further intensifying their initial isolation (Charlton & Danforth, 2007; Lemmens et al., 2011; Smyth, 2007).

In our study neither one causal direction of PVG on academic performance gained support, similar to results by Rehbein and colleagues (2013). Thereby the possible effect of poor grade point average on PVG was not confirmed by our study (Gentile et al., 2011), but neither was the opposite (Chappell et al., 2006). It is possible that the development of PVG grows too slow for it to produce demonstrably worse grades in a one year timeframe, while the five year period investigated by Rehbein and colleagues (2013) is probably too long to demonstrate such a direct effect, since teenagers are influenced by numerous other effects during five years.

Causal relationship of different life goals with PVG was not supported in neither case, thus in itself the extent of considered importance does not cause lower PVG in one year time and neither does PVG cause measurable change in particular life goals. The possible causal effect of values, life goals on PVG can be likely demonstrated reliably in a timeframe greater than one year and by including more intermediate variables.

Limitations

In discussing the results of our follow-up study we must note the limitations of our current project. The unrepresentative nature, the small sample size and the large drop-out rate are all cautionary. In addition because of general self-report method employed certain participants probably felt the need to make a good impression, or felt defensive regarding the general image of gamers, consequently admitting to fewer problems. The one year timeframe between the two data collection points implies several drawbacks: on one hand the
registration and evaluation of processes slower and faster than one year does not occur, and on the other hand compared to studies with more data collection point it is less reliably and flexible in the employable analysis methods (Rogosa, 1980).
5. Summary

The most important results of the studies presented in the thesis are the following, with the noting the goals (1., 2a., 2b., 3.) with respect to the thesis.

1.1. Flow experienced during video-game use did not show association with decline of experienced flow during other activities.
1.2. Results of gaming habits, motivations and psychosocial factors cross-sectionally linked to PVG obtained on a Hungarian sample are similar to results obtained via American and Asian samples.
1.3. The negative relation of PVG with intrinsic life goals (importance development, relationships, community goals) as well as parental rearing styles (in case of rejection and overprotection we found positive relationship, while in case of emotional warmth a negative one) is novel.

2a.1. The level of PVG during a one year timeframe showed relevant and reliable change in a small percentage of cases, in 5.95% of video-game play involved teenagers.
2a.2. The indicators of PVG and average daily playtime changed significantly and differently of one another.

2b.1. The emotional instability of PVG reducers increased presumably due to the restriction or abandonment or limitation of gaming, as a routine mood enhancing tool, coping strategy.
2b.2. The importance of recreation motivation with respect to PVG was present, not cross-sectionally, but in a longitudinal perspective: initially among the unproblematic, PVG enhancing gamers recreation motivation increased rather significantly, surpassing the degree of increase of every other motivation during in one year’s time.

3.1. Among males introversion, social support on behalf of schoolmates and friend and poor mental health proved to be PVG causing factors.
3.2. The psychosocial well-being harming nature of PVG was not confirmed, so the one year follow up results rather support the notion that PVG is consequence of already present mental problems, a secondary mental disorder by nature, instead of being an independent addictive disorder.
References


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**Publications of the author related to the theme of the PhD dissertation:**


