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CONSCIENTIOUSNESS, IMMERSION, AND GAME CHANCE TYPE: PROBLEMATIC VIDEOGAMES USE PREDICTORS AMONG PROFESSIONAL ONLINE BOARD GAMERS

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Several reports on the potential relationship between immersion experienced by gamers and problematic videogames use (PVG) have recently appeared in the literature but their results often vary. This discrepancy may be due to the fact that games can be chance-dependent (CDG) or chance-independent (CIG). This may also be due to the nature of the relationship between immersion and PVG with a personality trait (conscientiousness), which is an antecedent of both variables. We decided to check whether conscientiousness and PVG relationship will be mediated by immersion and whether this relationship is dependent on the game type. The survey was addressed to board game club members who represented professional players, based on the time spent playing games as well as the ranking criterion. Ninety-four CDG and CIG players responded to the survey. The model proposed in this pilot study showed that conscientiousness explains PVG directly in CIG players, whereas in CDG players this mechanism is mediated by the immersion they experience. This discovery sheds new light on the potential motivational causes of PVG, which depend on both immersion and the chance type of game.

Keywords: problematic videogames use (PVG); immersion; conscientiousness; online board games; moderated mediation analysis.

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Games are "a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are negotiable" (Juul, 2005, p. 34). The classic examples are board games where the board and a set of strict and clear rules are common attributes (Gobet et al., 2004). Playing board games is a common form of spending free time in some countries. In 2018, 68% of American families played board games at least several times a month (Statista, 2020a). Forecasts predict an even greater growth of the board games global market in the future year (Statista, 2020b; Technavio, 2020). Current total revenue from board games grow by 10.58% annually (Statista, 2022).

It should be noted that technological development has led to digitizing traditional board games and online board gaming has also become possible. In this study board games are treated as a special case of videogames. A videogame is characterized as "a mode of interaction between a player, a machine with an electronic visual display, and possibly other players, that is mediated by a meaningful fictional context, and sustained by an emotional attachment between the player and the outcomes of her actions within this fictional context" (Bergonse, 2017, p. 244). It may be assumed that digital board games meet the conditions for being videogames.

Board games are characterized by a higher (chance-independent game, CIG) or lower (chance-dependent game, CDG) chance-dependency rate. In the case of CIGs, the gamer has to rely only on their skills (like in chess). However, in CDGs randomness also has a significant impact. Randomness can be forced by game rules, such as throwing dice, drawing letters (as in Scrabble), or indicating the order of players. In the context of board CIGs, researchers have been interested in studying cognitive skills, i.e., decision making, memory, and attention (Sala & Gobet, 2016), whereas in the case of CDGs, research issues have included the exploration of problematic videogame use (PVG), gambling, and decision making under conditions of uncertainty (James et al., 2016). Since the core of game definition is the same for both types of games, little is known about PVG in the case of CIG players or benefits as a result of playing CDGs. However, it seems intuitively correct that any activity can bring benefits and negative consequences. This type of relationship occurs for CDGs and CIGs where players experience immersion, which seems to be positive in itself but also has been proven to be a predictor of PVG. Besides the features of the game and immersion, the gamers' conscientiousness is also an important predictor of PVG (Şalvarlı & Griffiths, 2019).

With this study we aim to verify and illustrate the theoretical PVG development mechanism associated with personality, immersion, and board game specificity. We resolved to check whether the conscientiousness and PVG relationship will be

mediated by immersion and whether this relationship is dependent on the type of game (CDG or CIG).

Problematic Videogame Use

The 11th revision of the International Classification of Diseases (ICD-11) includes PVG criteria and defines it as being "characterized by a pattern of persistent or recurrent gaming behavior […] manifested by: 1) impaired control over gaming […]; 2) increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities; and 3) continuation or escalation of gaming despite the occurrence of negative consequences" (WHO, 2018, p. 87). Additionally, the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) also includes PVG as "Internet Gaming Disorder" (APA, 2013). However, it should be noted that Griffiths (Griffiths, 1996, 2005, 2019) indicates six symptoms—salience, mood modification, tolerance, withdrawal, conflict, and relapse—which must occur to be considered gaming as an addiction. However, problematic behavior may still be present if only some of these consequences occur.

Research on PVG has already been devoted to many game genres: Massively Multiplayer Online Role Playing Games, and First Person Shooters games (Lemmens & Hendriks, 2016; Sferra, 2016), as well as role-playing games, action adventures or gambling games (Elliot et al., 2012). However, there are few studies on the PVG and board games relationship. Because the activity of board CIG and CDG players has been mostly transferred to the online reality, it is important to verify whether PVG has also affected this type of games. It is likely that (in addition to the widely described experience of immersion by board game players) they also can experience the negative consequences of playing, which may result in PVG.

PVG and Immersion Relationship

Immersion is an experience in one moment in time and graded. Immersion as a result of "good gaming experience" implies a lack of time and real-world awareness, involvement, and a sense of being in the task environment (Brown & Cairns, 2004). Some previous research (Csikszentmihalyi et al., 2018) has postulated that immersion and flow are almost identical conditions. Furthermore, in a situation of a proportionately difficult task execution by an expert, differences between them seem to disappear completely.

There is some evidence of the presence of immersion (Jennett et al., 2008; Nordin et al., 2013; Reichenbach, 2017) and flow (Andrade & Pontes, 2017; Khang

et al., 2013; Michailidis et al., 2018) when playing games. Although both states undoubtedly have positive aspects and impact on well-being, some researchers emphasize that the immersion and flow may also generate potentially negative experiences or behaviors (Andrade & Pontes, 2017; Trivedi & Teichert, 2017; Wu et al., 2013; Yang et al., 2014). So far, there have been few attempts to explore this issue. Some of them emphasize that immersion and flow are associated with PVG in the case of videogames (Andrade & Pontes, 2017; Wan & Chiou, 2006). A more complex approach is also present in the literature, which takes into account personality as a primary cause, especially its motivational factor—conscientiousness (Khang et al., 2013; King et al., 2017). In this project, conscientiousness has been incorporated into the model and treated as the antecedent for the immersion and PVG relationship.

PVG and Conscientiousness Relationship

High conscientiousness is a disposition to be reliable, persistent, self-disciplined, achievement-oriented, and able to delay gratification (Müller et al., 2014; Roberts et al., 2009). So, it is crucial in situations where the result of the activities undertaken (i.e., playing games) is important.

Braun with colleagues (2016) revealed that non-gamers have higher conscientiousness than regular gamers and gaming addicts have the lowest conscientiousness (Braun et al., 2016). However, Huh and Bowman (2008) find a very weak correlation between online games addiction and conscientiousness (Huh & Bowman, 2008); there is mostly general consent that gamers characterized by high PVG are less conscientious than other gamers (Braun et al., 2016; Dieris-Hirche et al., 2020; Kaur, 2020; López-Fernández et al., 2020; Müller et al., 2014; Peters & Malesky, 2008; Wang et al., 2015; Wiguna et al., 2020). Moreover, in comparison with other personality traits of the Big Five model, conscientiousness, in particular, is characteristic of PVG, as shown by correlation coefficient values (Kayis et al., 2016; Müller et al., 2014; Şalvarlı & Griffiths, 2019; Wiguna et al., 2020). Low conscientiousness may play the role of the PVG risk factor, while high conscientiousness may protect against PVG development (Şalvarlı & Griffiths, 2019; Wiguna et al., 2020). However, it is worth noting that Dieris-Hirche with colleagues (2020) postulate the possibility of bidirectional causality between conscientiousness and PVG (Dieris-Hirche et al., 2020).

As in the field of online or traditional board games there has been no research taking problematic use into account, knowledge about the relations between conscientiousness and problematic board gaming is none. So far, conscientiousness has

been taken into account in board games research only as a potential factor differentiating between players and non-players (Bilalić et al., 2007) or explaining players' skills (Grabner et al., 2007).

Current Study

Immersion can be experienced by both CDG and CIG players. However, as the mechanism accompanying both games is different, it can be suspected that slightly different factors may induce the immersion state in each game genre. For example, the risk factor that seems to be higher in CDGs correlates with an increased attention level and seems to be strongly linked to engagement. On the other hand, a situation of CIG where the player has to rely solely on their competence is likely to attract even more attention and induce deeper engagement, greater than with other factors (e.g., randomness/chance). Therefore, it seems likely that CIG players will have a deeper immersion compared to CDG players.

Recent research, which in addition to the chance factor is accompanied by the possibility of receiving a monetary reward in a winning situation, provides evidence that the experienced flow of players correlates with their tendency to addiction (Trivedi & Teichert, 2017). However, that specific study concerned gambling. There is still no knowledge about whether there is a similar relationship between immersion and PVG in the case of games without financial gratification or with a purely chance-based setup. Rather, the positive influence of playing board games on the development of specific abilities has been emphasised (games such as Scrabble, for linguistic abilities, or chess, for analytical thinking). As CDG players are theoretically closer to gamblers, it can be assumed that the correlation between immersion and PVG will be stronger for them, compared to CIG players.

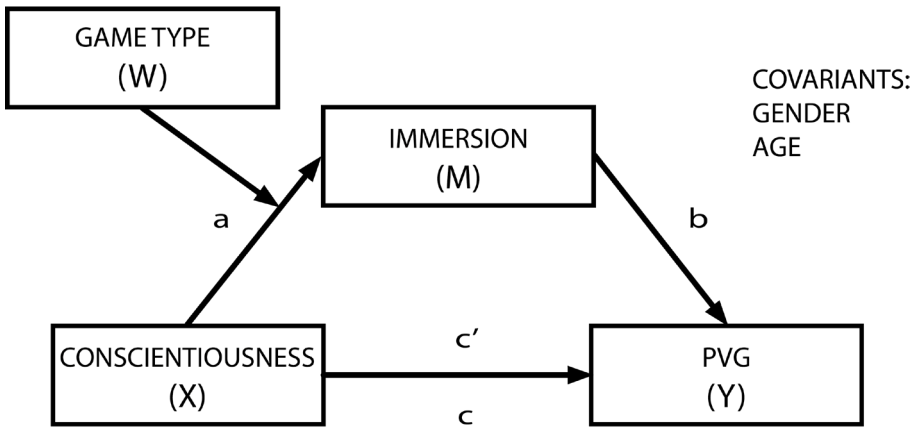
For both types of games, CDGs and CIGs, expertness seems to have an important role. This can be characterized by the experience gained during many years of training. The playing time and achieved ranking allows for a deeper reflection on one's processes, both those related to immersion and those experiences that may indicate a tendency to addiction.

A review of the literature has provided evidence that immersion is most often regarded as a predictor of PVG (Andrade & Pontes, 2017; Trivedi & Teichert, 2017; Wu et al., 2013; Yang et al., 2014). Moreover, some scientists have proved that the whole relationship is more complex because of the motivational processes that act as antecedents for the relation between immersion and PVG (Khang et al., 2013). As the current pilot study takes personality factors into account, conscientiousness has

been included in the proposed model as a motivational factor.[1] Therefore, conscientiousness is the main predictor in the analysis, while immersion has been used as a mediator of the conscientiousness and PVG relationship. Also, we tested whether this type of mediation is moderated by the game type (see Figure 1).

Figure 1

Visualization of the Model Predicting PVG With Game Type as a Moderator and Immersion as the Mediator Between Conscientiousness and PVG



The following hypotheses were put forward in the study:

Hypothesis 1: *CIG players will have a higher immersion level compared to those playing CDGs.*

Hypothesis 2: *Players of CIGs will have a lower PVG level compared to those playing CDGs.*

Hypothesis 3: *The relationship between immersion and PVG will have a significantly higher correlation in CDG players compared to CIG players.*

Hypothesis 4: *The relationship between conscientiousness and PVG will be mediated by immersion.*

Hypothesis 5: *The type of game will moderate the conscientiousness and immersion relationship.*

[1] Moderated mediation analyses were also performed for the other personality traits (exploratory), but all were found to be statistically insignificant.

METHOD

Participants

An online survey was addressed to 608 professional board gamers—they had played board games for at least a year and were members of the registered board game clubs in Poland. Of these individuals, 106 board gamers responded to the survey; 12 of them did not provide complete data, therefore 94 respondents (63 men, M_{age} = 38.40; SD_{age} = 14.33) were included in the analyses. The CDG players group consisted mainly of Scrabble players. In the case of CIG players, on the other hand, chess, Go, and Gomoku players prevailed. Thirty-eight participants were CDG players (20 men, M_{age} = 36.84; SD_{age} = 12.58) and 56 were CIG players (43 men, M_{age} = 39.46; SD_{age} = 15.42). The average time of game experience of all participants was M = 18.35 years (SD = 14.52). Since the respondents played online games on different websites, they often claimed an average online-obtained ranking. The way the ranking was calculated was based on FIDE, a widely used chess system. As a result, the ranking given by the players was comparable between them. The average rating in the study sample was M = 1844.73; SD = 264.14.

Measures

The Internet Gaming Disorder Scale—Short Form

The Internet Gaming Disorder Scale—Short Form (IGDS9-SF) was used to assess PVG. The IGDS9-SF is a psychometric tool to access Internet Gaming Disorder and it was developed by Pontes and Griffiths (2015). It is a unidimensional (in accordance with DSM-5 standards) method that consists of 9 items on a scale of 1 to 5. The current study's scale reliability is good (Cronbach's α = .82). Example items of this scale include "Do you systematically fail when trying to control or cease your gaming activity?"

The Immersion Questionnaire

A Polish adaptation of the Immersion Questionnaire (Strojny & Strojny, 2014) has been used to assess immersion. The authors of the original method are Jennett et al. (2008). It is a scale measuring videogame engagement and verifying gaming absorption. It consists of 27 items measured on a scale ranging from 1 to 5. The

current study's questionnaire reliability is good (Cronbach's α = .84). Among the items forming the method are "I did not feel any emotional attachment to the game."

The Ten Item Personality Inventory

The Ten Item Personality Inventory (Gosling et al., 2003) was used to assess personality traits with the Polish adaptation of the method (Sorokowska et al., 2014). This method consists of 10 items measured on a scale ranging from 1 to 7 and has 5 dimensions (emotional stability, extraversion, conscientiousness, openness to experience, and agreeableness). We were interested in the conscientiousness dimension, the reliability of which is in line with results obtained by Sorokowska et al. (2014) (Cronbach's α = .63). The items used to measure conscientiousness were "I see myself as: Dependable, self-disciplined."

Statistical Analysis

Before starting the analyses, the goodness-of-fit criteria for the use of parametric statistics (like the ratio of skewness to its standard error) were tested and found acceptable. The Pearson's r correlation coefficients matrix was calculated for the following variables: PVG, immersion, conscientiousness, age, time experience, ranking experience, and gender (as a point-biserial correlation coefficient). Additionally, the z test was used to assess the differences between correlation coefficients. To assess the differences between the two groups, CIG and CDG players, independent *t*-tests were performed. The assumptions of variance homogeneity were fulfilled.

The moderated mediation analysis was carried out using the macro PROCESS v3.5 by Andrew F. Hayes (Model 7, 5,000 bootstrap samples). All variables were standardized prior to the moderated mediation analysis.

Since only the age and gender of the respondents correlated with one of the three main variables, it was decided to include them in later analyses as a covariant (time experience and ranking experience were omitted as insignificant).

RESULTS

There was a negative relationship between conscientiousness and PVG, as well as between conscientiousness and immersion. Additionally, immersion was positively related to PVG. Detailed results are shown in Table 1.

Table 1

Pearson's r Correlations Coefficients Between Variables z-Scores

	1	2	3	4	5	6	7
Conscientiousness	–						
Immersion	–.26*	–					
PVG	–.36*	.54**	–				
Age	.08	–.25*	–.04	–			
Time experience	.06	–.04	.04	.70**	–		
Ranking experience	.05	–.06	.17	.04	.13	–	
Gender	.11	–.23*	–.11	–.10	–.30**	–.25*	–

*$p < .05$, **$p < .01$.

The immersion level was much higher in the case of CIG players compared to CDG players. Also, the CIG players showed a higher PVG level compared to CDG players (for both analyses see Table 2).

Table 2

Differences in Immersion and PVG Scores Between CDG Players and CIG Players (N = 94)

Measure	CDG players *M* (*SD*)	CIG players *M* (*SD*)	*t*-statistics	*df*	*p*-value	Mean differences	CI lower	CI upper	Cohen's *d*	Glass' δ	Hedges' *g*
CON	10.11 (2.86)	10.61 (2.59)	8.83	92	.380	–0.50	–1.63	0.63	0.18	0.17	0.19
IMM	81.58 (15.46)	90.13 (11.60)	3.06	92	.003	–8.55	–14.09	–3.00	0.63	0.55	0.64
PVG	15.84 (6.32)	19.66 (6.11)	2.93	92	.004	–3.81	–6.41	–1.23	0.61	0.60	0.62

Note. CON = conscientiousness, IMM = immersion.

In the next step we analysed the difference between correlation coefficient analysis, which aimed to compare the correlation coefficients between PVG and immersion in both groups: CDG and CIG players. There was a significant difference between both correlation coefficients $z = 2.16$; $p < .05$. In the case of CDG players, there was a high, positive correlation ($r = .68$; $p < .001$). In the case of CIG players, there was a moderate, positive correlation ($r = .34$; $p < .05$). Consequently, the cor-

relation between PVG and immersion was significantly stronger in the CDG group compared to CIG players.

The last step of the analysis was to verify the proposed probable mechanism explaining the PVG in board game players (see Figure 1). First, we verified whether the mediator was statistically significantly explained by predictor (conscientiousness), moderator (game type), and covariance variables (age and gender of respondents; see Table 3).

Table 3

Moderated Mediation Model With PVG as the Outcome

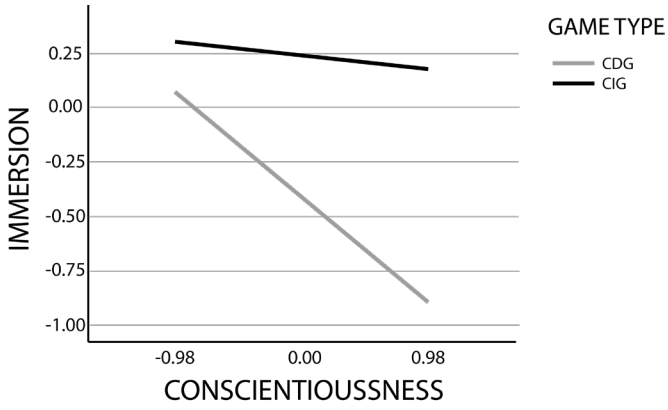
	β	*SE*	LLCI	ULCI
Mediator variable model (immersion)				
Constant	–0.30	0.17	–0.64	0.04
Conscientiousness	–0.50	0.14	–0.77	–0.22
Game type	0.65	0.19	0.27	1.03
Conscientiousness x Game type	0.43	0.19	0.06	0.81
Age	–0.29	0.09	–0.47	–0.11
Gender	–0.36	0.20	–0.76	0.05
Dependent variable model (PVG)				
Constant	–0.08	0.10	–0.28	0.11
Constientiousness	–0.22	0.08	–0.39	–0.06
Immersion	0.48	0.09	0.31	0.65
Age	0.11	0.08	–0.06	0.28
Gender	0.10	0.18	–0.24	0.45
Conditional effects of the predictor on the mediator at values of the moderator	*B*	*SE*	LLCI	ULCI
Moderator				
CDG	–0.50	0.14	–0.77	–0.22
CIG	–0.07	0.13	–0.32	0.19
Conditional indirect effects of the predictor on the outcome at values of the moderator	*B*	Boot *SE*	Boot LLCI	Boot ULCI
Moderator				
CDG	–0.24	0.08	–0.42	–0.10
CIG	–0.03	0.06	–0.13	0.09

Note. Standardized coefficients not available for models with moderators. PVG = problematic videogame use, bootstrap sample size = 5000. LL = low limit, CI = confidence interval, UL = upper limit.

The analysis confirmed that the model was statistically significant. Conscientiousness, game type, the interaction between them, and age proved to be statistically significant to explain immersion. However, gender was statistically insignificant. The next step was to verify whether the observed effect was moderated by the game type (see Figure 2). It turned out that conscientiousness explains the immersion, but only in people who play CDGs.

Figure 2

Effect of Interaction Between Conscientiousness and Game Chance Type in Explaining Immersion



In the last step, we verified whether the variables conscientiousness and immersion explained the dependent variable (PVG; see Table 3). Both conscientiousness and immersion proved to be significant predictors for IGD. Potential covariates (age, gender) were statistically insignificant. The direct effect of conscientiousness on PVG was statistically significant. In the case of indirect effect, it was statistically significant only in the case of CDG players.

DISCUSSION

The aim of the present study was to verify the theoretical PVG model including conscientiousness, immersion, and board games specificity (CIG and CDG) among board game players. Additionally, differences in the level of PVG and immersion between CIG and CDG players were verified.

As hypothesized, the results of this study showed that CIG players had a higher immersion level compared to CDG players (Hypothesis 1). The higher immersion level for the CIG players is in line with previous reports about the long term importance of engagement to be involved in those types of games (Grabner et al., 2007). Engagement is considered as the first of the three-levels model of immersion (Brown & Cairns, 2004; Jennett et al., 2008).

The results showed that CIG players had a higher level of PVG compared to CDG players, which was opposite to Hypothesis 2. It seems probable that some other factors, which were not taken into account in this study, could have an impact on these observations. For example, time spent playing (frequency) is positively related to PVG (Columb et al., 2019; Griffiths, 2010; Kuss & Griffiths, 2012; Mihara & Higuchi, 2017). This variable was not controlled in the present study, and it is possible that the compared groups differed in the frequency of playing. Another important factor that could result in the higher level PVG in the CIG group could be players' strategy of copying with stress. There is some evidence that treating videogames as a tool for reducing stress can result in negative consequences like PVG (Yau et al., 2012). Thus, it is possible that CIG players used gaming to reduce stress more frequently than did CDG players.

In this context, the significant difference in correlation coefficients between PVG and immersion in both groups allows us to identify some causes of the above observations. Although CIG players have higher results, both in PVG and immersion, the correlation between them is higher in the CDG group (see Hypothesis 3). It is possible that variables like conscientiousness, immersion, and PVG, when treated as unidimensional variables do not reveal the real complexity of their relationship but simplify it. It seems probable that some other models of those theoretical constructs (for conscientiousness, see Costa & McCrae, 1985; for immersion, see Hartung et al., 2016) could be more appropriate.

The moderated mediation analysis (see Figure 1) showed that the board game characteristics (CDG and CIG) significantly differentiated the relationship between conscientiousness and PVG. More specifically, this relationship was mediated by immersion only in the CDG players. Consequently, these results supported Hypothesis 5, partially supported Hypothesis 4, and confirmed the approach emphasizing the role of motivational processes underlying the relationship between immersion and PVG (Khang et al., 2013).

In light of the above observations, it seems reasonable to include in future studies some other methods that contain immersion or PVG subscales to check whether they all correlate similarly, or whether such a surprising result is generated precisely by the fact that immersion or PVG is not a homogeneous construct, which is consistent with some reports (for immersion, see Jennett et al., 2008; for PVG, see Topor et al.,

2011). On the other hand, different game-feature subfactors can induce immersion in both groups—perhaps CDG players are more sensitive to risk, and randomness is more likely to attract attention—and this can result in such a high correlation coefficient, with relatively lower scores compared to CIG players.

Some limitations could be raised in respect to the current study. First, there was a small sample of respondents, related to a specific target group as well as the pilot nature of the study. Second, the study was addressed only to online board game players, and thus it is necessary to check if similar effects can be obtained for individuals who play traditional board game versions. Also, the gender and age of the respondents were used as covariate variables, because of the novel character of the proposed model, which might be considered to be too simplified. Another aspect that limits the interpretability of the results is the proposed treatment of board games as a specific class of videogames. While several definitional common features were found, the Immersion Questionnaire method used in the study was mainly directed toward classic videogames. However, in addition to content validity, the reliability analysis was another way of assessing appropriateness of the methods being used.

The results presented in this study raising awareness about specific role of the motivational factor (conscientiousness) as influencing PVG in both indirect and direct ways (Khang et al., 2013; Şalvarlı & Griffiths, 2019). The crucial role of the chance factor in games as an important moderator conditioning the size of the effects observed in PVG research was also confirmed. In particular, the indirect effect of conscientiousness on PVG mediated by immersion is especially likely to occur in the group of CDG players.

CRediT Author Statement

Marcin Wojtasiński (70%): conceptualization, methodology, formal analysis, resources, writing (original draft), supervision, writing (review and editing).

Przemysław Tużnik (15%): formal analysis, resources, writing (original draft, review and editing).

Andrzej Cudo (15%): supervision, writing (original draft, review and editing).

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