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**Abstract**

A variety of instruments have been developed to assess different dimensions of playing videogames and its effects on cognitions, affect, and behaviors. The present study examined the psychometric properties of the Game Transfer Phenomena Scale (GTPS) that assesses non-volitional phenomena experienced after playing videogames (i.e., altered perceptions, automatic mental processes, and involuntary behaviors). A total of 1,736 gamers participated in an online survey used as the basis for the analysis. Confirmatory factor analysis (CFA) was performed to confirm the factorial structure of the GTPS. The five-factor structure using the 20 indicators based on the analysis of gamers' self-reports fitted the data well. Population cross-validity was also achieved and the positive associations between the session length and overall scores indicate the GTPS warranted criterion-related validity. Although the understanding of GTP is still in its infancy, the GTPS appears to be a valid and reliable instrument for assessing non-volitional gaming-related phenomena. The GTPS can be used for understanding the phenomenology of post-effects of playing videogames.

**Keywords:** Game Transfer Phenomena, videogame post-effects, non-volitional phenomena, gaming assessment, confirmatory factor analysis

The proliferation of videogames has resulted in an increased interest in investigating their effects[1]. A variety of standardized assessment tools for measuring different dimensions of playing videogames have been developed.[1-3] Current assessment tools can be categorized into two broad types. Firstly, there are instruments that assess in-game behaviors and phenomena experienced while gaming. For example, scales for assessing subjective sense of presence[4], dispositional flow[5], game engagement[6], cyber-sickness or simulator sickness malaise (e.g., fatigue, headache, eyestrain, etc.)[7, 8], motivations for playing[3, 9-11], character attachment[12], and identification with avatars[13]. Secondly, there are instruments or tasks that have been developed to better understand the psychosocial effects of gaming. These have either focused on examining dysfunctional gaming involvement employing modified diagnostic criteria for gambling, substance-induced disorders, and more recently Internet gaming disorder to measure gaming addiction[1, 14-17] or have been to explain the cognitive, affective or behavioral effects of playing violent videogames.

Some of the better known are the homonymous decision task that assesses risk-related cognitions by completing a list of words[18], and the Taylor Competitive Reaction Time task that assesses the level of hostility based on the intensity of the punishment provided to an opponent (e.g., aversive noise blasts, making them eat spicy sauce)[19, 20]. Measures and behavioral tests of aggression have been criticized for the way the results have been interpreted and their lack of external validity[21-23], although some evidence supports the generalization of the results to real-world aggression[24]. Furthermore, the influence of unrealistic depictions of real world in media on the perception of the real world have been assessed[25]. Cultivation effects (i.e., generalized influence on estimates of the probability of events, and judgments that reflect beliefs) have only been found in direct relation to videogame content. In light of the debate about videogame playing and its potential effects on gamers, it is important to develop new psychometrically sound assessment tools for examining the direct outcomes of playing videogames, thus facilitating the examination of causal effects.

Research into Game Transfer Phenomena (GTP) – a multimodal research approach for investigating the transfer of videogame experiences into the real world by examining altered perceptions, spontaneous mental processes, and behaviors and actions experienced mostly after stopping playing[26] – suggests that the effects of videogames tend to be directly related to the content and experiences in the videogame[27-31]. The GTP research approach has explored the relationship between videogame structural characteristics (e.g., visual or aural

features) and in-game activities directly related to gamers' transfer of experiences. The GTP framework makes distinction between the inner and outer manifestation of non-volitional phenomena, and whether they are interpreted as self-generated or not (e.g., inner-speech, auditory hallucinations), and if they occurred voluntarily or involuntarily (e.g., deliberate use of videogame slang for amusement, involuntary verbal outbursts). GTP are divided in three main modalities: altered perceptions, automatic mental processes, and behaviors and actions[26,33].

**Altered perceptions** are understood as perceptions and/or sensations related to the videogame when not playing and can take place in all the sensory modalities, across modalities or be multisensory. Altered perceptions related to playing videogames have been identified in the following dimensions[27-32]:

- *Altered visual perceptions* include mind visualizations, pseudo-hallucinatory experiences (e.g., seeing game icons above people's heads), visual adaptations (e.g., perceiving objects or environments distorted), and visual misperceptions (e.g., confuse physical objects with those in the game)[28, 31].
- *Body and other altered perceptions experiences* include prioperception (e.g., sensations of body or limb movement), tactile perception (e.g., pushing buttons of gamepad) and cronoceptive perception (e.g., feeling time slow down)[28].
- *Altered auditory perceptions* include auditory involuntary imagery (e.g., hearing auditory cues in the head), auditory hallucinations (e.g., hearing sounds coming from objects), inner-speech (e.g., hearing one's own thoughts preserving features from videogame character's voices), and auditory misperceptions (e.g., confusing physical sounds with those from the game)[29].

**Automatic mental processes** manifest as thoughts, urges, and automatic mental actions. These range from thoughts about the game (e.g., thinking continuously about the game) to cognitive biases (e.g., experiencing attention bias toward game-related cues, jumping to conclusions bias), and source monitoring errors (e.g., confusing what an in-game character said with what a person said)[27, 31, 32].

**Behaviors and actions** can range from experiencing involuntary motor activations (e.g., involuntary movements of limbs) to performing actions inspired by the videogame or changes in behavior influenced by the videogame (e.g., avoiding specific places, mimicking videogame characters, having verbal outburst)[27, 31, 32].

Given the aforementioned theoretical underpinnings of GTP, the aim of the present study was to examine the psychometric properties of the Game Transfer Phenomena Scale (GTPS), the first ever theory-driven scale developed for measuring non-volitional phenomena such as altered perceptions (i.e., visual, bodily, and auditory), automatic mental processes, and behaviors and actions experienced after playing videogames and understanding the underlying mechanisms of videogame effects.

## Method

### *Participants and Procedure*

A total of 1,736 gamers were recruited online and split into two groups for the purposes of factor analysis (i.e., Sample 1 [S1], n = 1,078; Sample 2 [S2], n = 658) using opportunity sampling and an online survey methodology. Participants were recruited via online gaming forums, *Facebook,* and meetup.com groups. Ethical approval for the study was granted by the research team's University Ethics Committee.

### *Measures*

*Socio-demographics*: The survey included questions regarding participants' gender, age, and occupation.

*Gaming profile*: Included questions about typical videogame session length and frequency of videogame playing, as well as gamer type (i.e., newbie, causal, hard-core, or professional).

*Game Transfer Phenomena Scale (GTPS)*: The GTPS included 20 items comprising five different dimensions: altered visual perceptions, altered body perceptions, altered auditory perceptions, automatic mental processes, and behaviors and actions. These were derived based on a theoretical framework concerning GTP developed from previous analyses of over 1,600 gamers' self-reports[26-31]. The participants' responses are rated on a 5-point Likert scale: 1 ("never"), 2 ("once"), 3 ("sometimes"), 4 ("many times"), or 5 ("all the time"). Examples of items included: "seen videogame images with eyes open when not playing", "experienced bodily sensations of movement as in a videogame", "heard game music when not playing", "wanted or felt the urge to do something in real life after seeing something that reminded of the videogame", "acted differently in real life situation because an experience in a videogame" (The final version of the GTPS can be obtained by contacting the first author). The following modalities were assessed in the GTPS via five first-order latent variables:

The altered perceptions modality assesses (i) *visual experiences* (visualizing or seeing images, visual pseudo-hallucinations, distorted perceptions and misperceptions of physical objects and environments), (ii) *auditory experiences* (auditory involuntary imagery, auditory/verbal hallucinations or inner-speech and auditory misperceptions, and (iii) *body-related experiences* (motion sickness, tactile hallucinations, other body-related altered perceptions/sensations, and altered perception of time). The mental processes modality assesses automatic mental processes such as (i) perseverative mental actions after playing, (ii) thoughts and urges either about wanting to use videogame elements in a real life context or performing something from the game in physical contexts, and (iii) source monitoring errors between videogame and real life events. The behaviors and actions modality assesses (i) involuntary movements of limbs elicited by automatic associations, (ii) verbal outbursts, (iii) performing behaviors influenced by a videogame, and (iv) change of behavior due to previous videogame experiences.

***Statistical Analysis and Analytical Strategy***

Statistical analysis comprised (i) descriptive statistics of the main sample's characteristics and (ii) a psychometric examination of the GTPS. In order to assess the scale's psychometric properties, validity (i.e., construct, criterion-related, and population cross-validity) and reliability (i.e., internal consistency and factor determinacy) were scrutinized. Moreover, construct validity was investigated by performing a confirmatory factor analysis (CFA) on the GTPS in S1; criterion-related validity was assessed by examining the bootstrapped correlation coefficients with Bias-corrected accelerated 95% confidence intervals (i.e., Pearson product-moment correlation coefficients) between the GTPS overall scores and participants' self-reported videogame session length across both samples; and population cross-validity was further investigated by performing an additional CFA for replication purposes on S2. Finally, reliability analysis comprised an in-depth examination of the Cronbach's alpha of the GTPS instrument as a whole and also across the five subscales in both samples, while factor score determinacies for each latent variable were also computed. All the aforementioned analyses were performed on both MPLUS 7.2[33] and IBM SPSS Statistics Version 20[34]

## Results

*Descriptive Statistics*

Table 1 summarizes the samples' main socio-demographic characteristics. Most participants were male (92.7% in S1 and 80.9% in S2) and were aged 'between 18 to 22 years' (52.9% in S1 and 42.1% in S2). Additionally, most participants reported being a 'student' (54.8% in S1 and 38.8% in S2). In regards to participants' gaming-related habits and behaviors, the majority were 'hardcore' players (65% in S1 and 55.8% in S2), played videogames mostly 'between 3 to 6 hours' (41.2% S1 and 43.2% S2) and reported a weekly gaming frequency of '2 to 4 days a week' (42.6% in S1 and 28.3% in S2). However, in S2, 40.3% (n = 265) reported playing videogames 'everyday' (see Table 1).

*Construct Validity*

In order to address the construct validity of the GTPS and also further verify the suitability of the five theoretical factors proposed, a CFA with maximum likelihood with robust standard errors estimation method (MLR) was performed on S1 (n = 1.078) on the 20 GTPS indicators. Because there is no consensus on the fit indices for evaluating structural equation modelssee [35, 36, 37], the goodness of fit was based on several fit indices using the following thresholds: $\chi^2$/df [1;4], Root Mean Square Error of Approximation (RMSEA) [.05;.08], RMSEA 90% confidence interval with its lower limit close to 0 and the upper limit below .08, *p-close* > .05, Standardized Root Mean Square Residual (SRMR) [.05;.08], Comparative Fit Index (CFI) and Tucker-Lewis Fit Index (TLI) [.90;.95]. In light of the aforementioned assumptions, all 20 indicators were entered into a five first-order factorial solution (see Figure 1). As a result, the analysis of the first-order five factors model provided an acceptable model fit for the GTPS with acceptable item loadings (i.e., ≥ .50). More specifically, $\chi^2$[160] = 628.4, $\chi^2$/df = 3.9; RMSEA = .052 (90% CI: [.048–.056]), *p-close* = .203; SRMR = .040, CFI = .94; TLI = .93 (see Table 2 and Figure 1).

*Criterion-related Validity*

Recent empirical findings suggested that GTP experiences are heightened by greater videogame session length[38]. Therefore, an observed positive association between participants' session length and the overall score obtained in the GTPS would be indicative of the scale's criterion-related validity since these variables are expected to co-vary both at the theoretical and empirical level. As shown in Table 3, positive statistically significant

associations between videogame session length and the overall GTP scores were found both in S1 and S2 (see Table 3).

*Population Cross-validity*

Population cross-validity was assessed by examining if the results obtained in one sample (i.e., S1) of a population could also be replicated in another sample (i.e., S2) drawn from the same populatione.g., [39, 40]. Therefore, in order to obtain evidence for population cross-validity, a second CFA was performed on another sample recruited from the same population (i.e., S2, n = 658) to test the initially underlying conceptual assumptions (i.e., first-order model with five latent variables) verified in the first CFA. Moreover, the results obtained in S2 ($\chi^2$ [160] = 492.7, $\chi^2$/df = 3.1; RMSEA = .056, 90% CI: [.051–.062]; *p-close* = .140; SRMR = .047; CFI = .93; TLI = .92) were highly consistent and comparable with the results previously found in S1, providing further empirical evidence that the five-factor model fits the data well, thus warranting population cross-validity.

*Reliability*

As shown in Table 4, the GTPS internal consistency as measured by the Cronbach's alpha was satisfactory (i.e., ≥ .60) at several levels. In most occasions, internal consistency could not be improved by excluding any items and inter-item correlations were relatively high (i.e., ≥ .30) in general. In regards to the GTPS factor determinacy, this coefficient reflects the degree of the correlation among the indicators and their respective factors, with values of ≥ .80 being indicative of a strong correlation[33, 41, 42]. Accordingly, factor determinacies in the present study ranged from .93 (i.e., Factor 1) to .95 (i.e., Factor 3) (see Table 2), further supporting the GTPS reliability (see Table 4).

**Discussion**

The purpose of the present study was to examine the psychometric properties of the first ever instrument developed for measuring non-volitional phenomena (i.e., altered visual perceptions, body and other altered perceptions, altered auditory perceptions, automatic mental processes, and behaviors and actions) related to videogame playing. Accordingly, the first-order model including the five dimensions proposed for the GTPS was confirmed given the results obtained from the CFA in both samples yielded acceptable fit indices and factor loadings. Additionally, the validity of the GTPS at the construct, criterion-related, and population cross-validity level was warranted and its internal consistency was adequate.

As suggested by previous research[43], game-biased perceptions and associations with videogame content comprise physical objects (i.e., gaming memories triggered by objects or people), sounds and music (i.e., gaming memories triggered by auditory cues or cravings for playing), vocabulary and expressions (i.e., use of slang, abbreviations and expressions from a game), daydreams (i.e., fantasies and thoughts with game contents that pop up), and night dreams (i.e., dreams about the game or insertion of videogame elements into dreams). In the present study, the five dimensions of the GTPS were found to be comparable to a certain degree to those related to the concept of game-biased perceptions. Studies examining GTP have demonstrated that game-related cues not simply elicit memories of the game but they also trigger for example altered perceptions (e.g., seeing menus while in a conversation because gamers expect to see them as in the game)[26, 28].

The present findings relating to the GTPS are still preliminary in nature and therefore additional rigorous psychometric testing of the GTPS is paramount. A first descriptive analysis using the GTPS showed very high prevalence of GTP (97%) when using the criteria to endorse at least one of the 20 GTPS items, and most participants endorsed six to ten different types of GTP (95%)[44]. When interpreting the GTPS' scores it is recommended that researchers take into consideration the frequency of the number of GTP experiences for assessing the level of GTP strength, as well as correlating with variables that assess distress or impairment in areas of functioning for understanding the effects of videogames. In addition, the prevalence of GTP should be investigated using more representative samples of gamers.

GTP appear to be a temporal and are relatively common phenomena among gamers. Analysis of gamers' self-reports has shown that gamers can perceive GTP as something both positive and/or negative.[26-29] In a survey of over 2,300 gamers, GTP were perceived as more pleasant than unpleasant and some gamers even wanted the experiences to re-occur. However, one in five (20%) reported that they had experienced distress and/or impairment in important areas of functioning at some point as a consequence of GTP. It has been suggested that the content of the game, the frequency of GTP and the circumstances where GTP were experienced play a role in the consequences of GTP[26,44]. Further research should be undertaken to better understand why some gamers experience distress due to GTP experiences while others do not". Moreover, the majority of the gamers surveyed that reported having experienced GTP, were from a non-clinical population and had never used drugs[38] (or were under the influence of them) when GTP occurred[44] . However, GTP have

been significantly associated with medical conditions, and a small number of those that have experienced GTP (3.5%) consider they are problem gamers or suffer from gaming addiction[38]. Gamers that have experienced GTP reported playing excessively but playing excessively is not a requisite for experiencing GTP. Future studies should assess the associations between GTP as measured by the GTPS and other measurable gaming-related phenomena (e.g., immersion, game engagement, gaming addiction, etc.).

*Limitations:* The present study has a number of limitations. Currently, there are no similar measures to further assess the GTPS validity (e.g., concurrent validity). Additionally, it is necessary to ascertain the invariance of GTPS to determine if its psychometric properties hold across both genders and different cultural contexts. Only one indicator was used to assess criterion validity (i.e., length of gaming session). However, this is the only factor that has been consistently been found to be associated with GTP in previously published empirical studies. Further criterion testing could be done once other associated factors found in future empirical GTP studies have been carried out. The present study was based on retrospective self-report data and is therefore prone to well know biases (e.g., recall bias, social desirability bias). Future studies could perhaps assess to what extent GTP experiences may be related to normal or abnormal functioning and gaming-related behaviors. The development of the GTPS provides a psychometric framework for further exploratory and empirical research into GTP and associated behaviors.

*Conclusion:* The findings of the present study demonstrate that GTP as measured by the GTPS represents a validly and reliably approach at several levels. The GTPS is the first instrument developed that assesses a broad variety of post-play gaming-related sensorial perceptions, cognitions, and behaviors. The GTPS may be an additional useful instrument to use in studies examining the underlying mechanism of problematic gaming or gaming addiction, and may help to differentiate between non-volitional phenomena induced by gaming and symptoms of psychopathology.

**References**

1. Pontes H, Király O, Demetrovics Z, Griffiths MD. The conceptualisation and measuramente of DSM-5 Internet Gaming Disorder: The development of the IGD-20 test PloS ONE 2014; 10:e110137.

2. Sprong M, Buono F, Bordieri J, Mui N, Upton T. Establishing the Behavioral Function of Video Game Use: Development of the Video Game Functional Assessment. Journal of Addictive Behaviors, Therapy & Rehabilitation. 2014; 6:2-6.
3. Yee N. Motivations for play in online games. Cyberpsychology & Behavior. 2006; 9:772-5.
4. Witmer BG, Singer MJ. Measuring presence in virtual environments: A presence questionnaire. Presence. 1998; 7:225-40.
5. Wang CKJ, Liu WC, Khoo A. The Psychometric Properties of Dispositional Flow Scale-2 in Internet Gaming. Current Psychology. 2009; 28:194-201.
6. Brockmyer JH, Fox CM, Curtiss KA, McBroom E, Burkhart KM, Pidruzny JN. The development of the Game Engagement Questionnaire: A measure of engagement in video game-playing. Journal of Experimental Social Psychology. 2009; 45:624-34.
7. Bouchard S, Robillard G, Renaud P. Revising the factor structure of the Simulator Sickness Questionnaire. Annual Review of CyberTherapy and Telemedicine. 2007; 5:128-37.
8. Kennedy RS, Lane NE, Berbaum KS, Lilienthal MG. Simulator Sickness Questionnaire: An Enhanced Method for Quantifying Simulator Sickness. The International Journal of Aviation Psychology. 1993; 3:203-20.
9. Yee N, Ducheneaut N, Nelson L. Online gaming motivations scale: development and validation. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: ACM; 2012. p. 2803-6.
10. Lafrenière M-AK, Verner-Filion J, Vallerand RJ. Development and validation of the Gaming Motivation Scale (GAMS). Personality and Individual Differences. 2012; 53:827-31.
11. Sprong M, Buono F, Bordieri J, Mui N, Upton T. Establishing the Behavioral Function of Video Game Use: Development of the Video Game Functional Assessment. Addictive Behaviors, Therapy & Rehabilitation. 3: 4. of. 2014; 6:2.
12. Lewis ML, Weber R, Bowman ND. “They May Be Pixels, But They're MY Pixels:” Developing a Metric of Character Attachment in Role-Playing Video Games. Cyberpsychology & Behavior. 2008; 11:515-8.
13. Li DD, Liau AK, Khoo A. Player–Avatar Identification in video gaming: Concept and measurement. Computers in Human Behavior. 2013; 29:257-63.
14. Demetrovics Z, Urbán R, Nagygyörgy K, et al. The Development of the Problematic Online Gaming Questionnaire (POGQ). PloS one. 2012; 7:e36417.

15. Vadlin S, Åslund C, Nilsson KW. Development and content validity of a screening instrument for gaming addiction in adolescents: The Gaming Addiction Identification Test (GAIT). Scandinavian Journal of Psychology. 2015:n/a-n/a.
16. Pontes HM, Griffiths MD. Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. Computers in Human Behavior. 2015; 45:137-43.
17. Lemmens JS, Valkenburg PM, Gentile DA. The Internet Gaming Disorder Scale. 2015:n/a-n/a.
18. Fischer P, Greitemeyer T, Morton T, et al. The racing-game effect: Why do video racing games increase risk-taking inclinations? Personality and Social Psychology Bulletin. 2009; 35:1395-409.
19. Barlett C, Branch O, Rodeheffer C, Harris R. How long do the short-term violent video game effects last? Aggressive Behavior. 2009; 35:225-36.
20. Hasan Y, Bègue L, Bushman BJ. Viewing the world through "blood-red tinted glasses": The hostile expectation bias mediates the link between violent video game exposure and aggression. Journal of Experimental Social Psychology. 2012; 48:953-6.
21. Ferguson CJ. Evidence for publication bias in video game violence effects literature: A meta-analytic review. Aggression and Violent Behavior. 2007; 12:470-82.
22. Ritter D, Eslea M. Hot sauce, toy guns, and graffiti: A critical account of current laboratory aggression paradigms. Aggressive Behavior. 2005; 31:407-19.
23. Ferguson CJ, Rueda SM. Examining the validity of the modified Taylor competitive reaction time test of aggression. Journal of Experimental Criminology. 2009; 5:121-37.
24. Anderson CA, Bushman BJ. External validity of" trivial" experiments: The case of laboratory aggression. Review of General Psychology. 1997; 1:19.
25. Potter JW. (2012) *Media Effects*. Santa Barbara: Sage Publication, Inc.
26. Ortiz de Gortari AB. Exploring Game Transfer Phenomena: A multimodal research approach for investigating video games' effects (Unpublished doctoral dissertation). Nottingham, UK: Nottingham Trent University; 2015.
27. Ortiz de Gortari AB, Griffiths MD. Automatic mental processes, automatic actions and behaviours in Game Transfer Phenomena: An empirical self-report study using online forum data. International Journal of Mental Health and Addiction. 2014; 12:1-21.
28. Ortiz de Gortari AB, Griffiths MD. Altered visual perception in Game Transfer Phenomena: An empirical self-report study. International Journal of Human-Computer Interaction. 2014; 30:95-105.

29. Ortiz de Gortari AB, Griffiths MD. Auditory experiences in Game Transfer Phenomena: An empirical self-report study. International Journal of Cyber Behavior, Psychology and Learning. 2014; 4:59-75.

30. Ortiz de Gortari AB, Aronsson K, Griffiths MD. (2013) Game Transfer Phenomena in video game Playing: A qualitative interview study. In: Zheng R, ed. *Evolving Psychological and Educational Perspectives on Cyber Behavior*. Pennsylvania: IGI Global; 2013.

31. Ortiz de Gortari AB, Aronsson K, Griffiths MD. Game Transfer Phenomena in video game playing: A qualitative interview study. International Journal of Cyber Behavior, Psychology and Learning. 2011; 1:15-33.

32. Ortiz de Gortari AB. Targeting the Real life Impact of Virtual interactions: The Game Transfer Phenomenon 42 video games players' experiences (Unpublished Master disertation). Stockholm: Stockholm University; 2010.

33. Muthén LK, Muthén BO. (2012) *Mplus User's Guide Seventh Edition*. Los Angeles: Muthén & Muthén.

34. IBM Corp. IBM SPSS Statistics for Windows, Version 20.0. New York: IBM Corp; 2011.

35. Bollen KA, Long JS. (1993) Introduction. In: Bollen KA, Long JS, eds. *Testing Structural Equation Models*. Newbury Park: Sage; 1993. pp. 1-9.

36. Boomsma A. Reporting Analyses of Covariance Structures. Structural Equation Modeling: A Multidisciplinary Journal. 2000; 7:461-83.

37. Hoyle RH, Panter AT. (1995) Writing about structural equation models. In: Hoyle RH, ed. *Structural Equation Modeling: Concepts, Issues and Application*. Thousand Oaks, CA: Sage; 1995.

38. Ortiz de Gortari AB, Griffiths MD. Game Transfer Phenomena and its associated factors: An exploratory empirical online survey study. (in press). 2015.

39. Raju NS, Bilgic R, Edwards JE, Fleer PF. Methodology Review: Estimation of Population Validity and Cross-Validity, and the Use of Equal Weights in Prediction. Applied Psychological Measurement. 1997; 21:291-305.

40. Raju NS, Bilgic R, Edwards JE, Fleer PF. Accuracy of population validity and cross-validity estimation: An empirical comparison of formula-based, traditional empirical, and equal weights procedures. Applied Psychological Measurement. 1999; 23:99-115.

41. Mónok K, Berczik K, Urbán R, et al. Psychometric properties and concurrent validity of two exercise addiction measures: A population wide study. Psychology of Sport and Exercise. 2012; 13:739-46.

42. Schembre SM, Geller KS. Psychometric Properties and Construct Validity of the Weight-Related Eating Questionnaire in a Diverse Population. Obesity. 2011; 19:2336-44.
43. Poels K, Ijsselsteijn WA, de Kort Y. World of Warcraft, the aftermath: How game elements transfer into perceptions, associations and (day)dreams in the everyday life of massively multiplayer online role-playing game players. New Media & Society. 2014; 1:1-17.
44. Ortiz de Gortari AB, Griffiths MD. Prevalence and characteristics of Game Transfer Phenomena: A descriptive survey study. (Manuscript under review). 2015.

**Table 1**.

Socio-Demographic Characteristics of Sample 1 and Sample 2

| | *Sample* | |
|---|---|---|
| *Variables* | 1 | 2 |
| N | 1.078 | 658 |
| Gender (male, n, %) | 868(92.7) | 478(80.9) |
| Age group (n, %) | | |
| 18 to 22 years | 472(52.9) | 241(42.1) |
| 23 to 27 years | 231(25.9) | 152(26.5) |
| 28 to 32 years | 130(14.6) | 87(15.2) |
| 33 to 38 years | 54(6) | 45(7.9) |
| 39 to 43 years | 1(0.1) | 29(5.1) |
| 44 to 48 years | 3(0.3) | 12(2.1) |
| 49 to 53 years | 1(0.1) | 2(.3) |
| 54 or older | 1(0.1) | 5(.9) |
| Occupational status (n, %) | | |
| Full-time employment | 217(23) | 198(33.2) |
| Part-time employment | 62(6.6) | 62(10.4) |
| Self-employed | 85(9) | 30(5) |
| Unemployed | 40(4.2) | 49(8.2) |
| Homemaker | 6(.6) | 12(2) |
| Student | 518(54.8) | 231(38.8) |
| Disabled to work | 2(.2) | 1(.2) |
| Other occupations | 15(1.6) | 13(2.2) |
| Self-reported type of player (n, %) | | |
| Newbie | 19(1.8) | 6(.9) |
| Casual | 291(27) | 234(35.7) |
| Hardcore | 700(65) | 366(55.8) |
| Professional | 67(6.2) | 50(7.6) |
| Average videogame session length (n, %) | | |
| Less than 1 hour | 46(4.3) | 19(2.9) |
| 1 to 2:59 hours | 484(44.9) | 271(41.2) |
| 3 to 5:59 hours | 444(41.2) | 284(43.2) |
| 6 to 7:59 hours | 67(6.2) | 42(6.4) |
| More than 8 hours | 36(3.3) | 42(6.4) |
| Video gaming weekly frequency (n, %) | | |
| Less than once | 31(2.9) | 18(2.7) |
| Once | 54(5) | 36(5.5) |
| 2 to 4 | 459(42.6) | 186(28.3) |
| 5 to 6 | 240(22.3) | 153(23.3) |
| Everyday | 293(27.2) | 265(40.3) |

**Table 2**.

Confirmatory Factor Analysis of the 20 items of the Game Transfer Phenomena Scale[a].

| Items[b] | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| 1 | .57 | | | | |
| 2 | .70 | | | | |
| 3 | .73 | | | | |
| 4 | .63 | | | | |
| 5 | | .71 | | | |
| 6 | | .67 | | | |
| 7 | | .71 | | | |
| 8 | | .59 | | | |
| 9 | | | .81 | | |
| 10 | | | .87 | | |
| 11 | | | .76 | | |
| 12 | | | .67 | | |
| 13 | | | | .71 | |
| 14 | | | | .73 | |
| 15 | | | | .71 | |
| 16 | | | | .74 | |
| 17 | | | | | .68 |
| 18 | | | | | .63 |
| 19 | | | | | .71 |
| 20 | | | | | .76 |
| *Correlation Between Factors* | | | | | |
| *Factors* | 1 | 2 | 3 | 4 | 5 |
| 1 | 1 | | | | |
| 2 | .89 | 1 | | | |
| 3 | .75 | .73 | 1 | | |
| 4 | .83 | .86 | .72 | 1 | |
| 5 | .80 | .87 | .73 | .91 | 1 |
| *Further Psychometric Information* | | | | | |
| Factor determinacies | .93 | .94 | .95 | .94 | .94 |
| Mean | 2,05 | 2,01 | 2.65 | 2.53 | 2.39 |
| SD | 0.90 | 0.95 | 1.10 | 1.10 | 1.03 |

**Note**: All factor loadings are significant at least at $p < .0001$. Factor 1: altered visual perceptions; Factor 2: altered body perceptions; Factor 3: Altered auditory perceptions; Factor 4: Automatic mental processes; Factor 5: Actions and Behaviors.

[a]: **Instructions**: Have you ever experienced any of the following: visual GTP, body sensation GTP, auditory GTP, automatic GTP, behavior GTP.

[b]: Item wording was omitted for the sake of clarity. The final version of the GTPS can be obtained upon author's request.

**Table 3**.

Bootstrapped[1] correlation matrix with bias-corrected accelerated 95% confidence interval between GTPS overall scores and videogame session length (VSL)

| Measure | Sample | GTPS Overall Scores | BCa 95% CI | $R^2$ |
|---|---|---|---|---|
| VSL | 1 | .264* | [.202;.325] | 26.4% |
| VSL | 2 | .249* | [.169;.328] | 24.9% |

1. Bootstrap results are based on 10,000 bootstrap samples

* Correlation is significant at .01

**Table 4**.

Reliability analysis of the GTPS across Sample 1 (n = 1,078) and Sample 2 (n = 658)

| | | Factor | | | | |
|---|---|---|---|---|---|---|
| Sample | Internal Consistency (α)[1] | 1 | 2 | 3 | 4 | 5 |
| 1 | .94 | .74 | .76 | .85 | .81 | .79 |
| 2 | .93 | .71 | .79 | .85 | .82 | .79 |

[1]: The Cronbach's alpha provided relates to all 20 GTPS items (i.e., whole scale).

**Notes**: Cronbach's alpha could not be improved upon exclusion of any item on most occasions. Factor 1: Altered visual perceptions; Factor 2: Altered body perceptions; Factor 3: Altered auditory perceptions; Factor 4: Automatic mental processes; Factor 5: Actions and Behaviors.