Adaptation of the Game Transfer Phenomena Scale into Spanish: Sensory-Perceptual Changes, Intrusive Thoughts, and Involuntary Behaviors in Mexican Video Game Players

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ABSTRACT

Introduction: research on game transfer phenomena (GTP) is focused on understanding the impact of video game features and experiences on sensory perception, thoughts, and behaviors rather than on excessive/uncontrollable playing regardless of negative consequences. However, studies have shown a relationship between GTP and gaming disorder, and there is a resemblance between some forms of GTP and the perceptual disturbances that result as side effects of hallucinogens. Video game players have reported experiencing sensory perception changes (e.g., perceptual distortions of objects or environments and visual, auditory, or tactile hallucinations from games), intrusive thoughts, involuntary actions, and behaviors (e.g., the movement of fingers when interacting with game elements or a keyboard) . **Objective:** first, to adapt and validate the Game Transfer Phenomena Scale (GTPS) in Spanish with a Mexican sample. Second, to examine the adequacy of the frequency rating scale used in the GTPS. **Method:** cross-sectional survey with 607 players; most were males between 18 and 27 years old. **Results:** the higher-order factor model showed acceptable results. The prevalence of GTP was 96%. The number of game genres played and session length was correlated with all GTPS subscales, confirming the criterion validity. The examination of the frequency rating scale via the item response theory showed that selecting the second level of the scale "once" should be treated with caution. **Discussion and conclusions:** confirmatory factor analysis showed that the GTPS adapted into Spanish and tested in the Mexican sample was valid and reliable. Experiencing GTP more than once may be more meaningful for establishing the prevalence of GTP.

Keywords: Game Transfer Phenomena, Mexicans, Spanish language, video games, video game effects.

RESUMEN

Introducción: la investigación de los game transfer phenomena (GTP) se centra en el impacto de las características de los videojuegos y las experiencias de juego en la sensopercepción, pensamientos y comportamientos, en lugar de en el juego excesivo/incontrolable, independientemente de las consecuencias negativas. Sin embargo, estudios muestran correlaciones entre GTP y el trastorno de videojuegos, observándose semejanzas entre GTP y alteraciones sensoperceptivas como efectos secundarios del uso de alucinógenos. Jugadores han reportado cambios sensoperceptivos (distorsiones de objetos/ambientes, alucinaciones auditivas, visuales o táctiles con contenido de los videojuegos), pensamientos intrusivos, comportamientos y acciones involuntarias (movimiento de los dedos como al interactuar en el juego o el teclado). **Objetivo:** primero, adaptar y validar la escala de los game transfer phenomena (GTPS) en mexicanos. Segundo, examinar la escala de respuesta utilizada en la GTPS. **Método:** estudio transversal con 607 videojugadores, la mayoría varones entre 18 y 27 años de edad. **Resultados:** el factor de orden superior mostró resultados aceptables. La prevalencia de GTP fue del 96%. El número de géneros de videojuegos y la duración de la sesión de juego fue correlacionada con las subescalas de GTPS, confirmando la validez del criterio. El análisis de la escala de respuesta usando la teoría de respuesta al ítem mostró que seleccionar el segundo nivel de la escala "una vez" debe tratarse con precaución. **Discusión y conclusiones:** el análisis factorial confirmatorio mostró que la GTPS es válida y confiable para evaluar el GTP en mexicanos. Experimentar GTP más de una vez quizás representa mejor la prevalencia de los GTP.

Palabras clave: Game Transfer Phenomena, mexicanos, lenguaje español, video juegos, efectos de video juegos.

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INTRODUCTION

Understanding the impact of playing video games has become important among the scientific community with the popularization of the activity. Research on game transfer phenomena (GTP) focuses on understanding the impact of video game features and experiences on sensory perception, thoughts, and behaviors rather than on uncontrollable and escalating playing regardless of negative consequences, which are symptoms of gaming disorder (GD).

The first study on GTP consisted of an interview study with young Swedish video game players (Ortiz de Gortari et al., 2011). In this study, Ortiz de Gortari coined the term Game Transfer Phenomena (GTP) to refer to players' experience transfer from the game world to real life contexts.

Manifestations of GTP are common among video game players, with a prevalence between 75% and 96% (Cudo et al., 2022; Dindar & Ortiz de Gortari, 2017; Ortiz de Gortari & Gackenbach, 2021; Ortiz de Gortari & Griffiths, 2016; Ortiz de Gortari & Panagiotidi, 2023), while only a small number of players fulfill the criteria for GD, which has been recognized as a disorder in the International Classification of Disease (ICD-11) by the World Health Organization (2019). Gaming disorder occurs when players suffer significant impairment in some area of functioning (e.g., personal, family, social, or educational) for at least 12 months. The latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) also included internet gaming disorder in the section of conditions that require further investigation (*Diagnostic and Statistical Manual of Mental Disorders DSM-5*, 2013).

The majority of those who experience GTP do not have a mental disorder or have used drugs (Ortiz de Gortari & Diseth, 2022; Ortiz de Gortari & Griffiths, 2015; Ortiz de Gortari & Panagiotidi, 2023). Some studies have found that psychopathological traits, such as positive schizotypal personality traits and impulsivity, ADHD (Ortiz de Gortari & Panagiotidi, 2023), anxiety, and depression (Jones-Rincon et al., 2021) are associated with GTP. However, those with a mental disorder are more likely to experience GTP frequently and in several forms (Ortiz de Gortari et al., 2016).

Some of the manifestation forms of GTP resemble the perceptual disturbances that occur as a side effect of hallucinogen and alcohol withdrawal, and the relationship between GTP and GD has been established in clinical (Ortiz de Gortari & Basche, 2021; 2022) and nonclinical samples (Jones-Rincon et al., 2021; Llamas-Alonso et al., 2021; Ortiz de Gortari & Gackenbach, 2021; Ortiz de Gortari & Panagiotidi, 2023).

Some video game players have reported experiencing sensory perception changes (e.g., perceptual distortions of objects or environments and auditory or visual hallucinations of games), intrusive thoughts (e.g., thoughts about using game elements), and involuntary actions and behaviors (e.g., the movement of fingers when interacting with game elements or a keyboard; Ortiz de Gortari, 2016; 2019).

Negative consequences due to GTP are not usually reported (Ortiz de Gortari & Griffiths, 2016); however, distress has been associated with GTP when it has manifested externally, such as by seeing images overlaying objects or hearing sounds coming from nowhere (Ortiz de Gortari & Diseth, 2022), or when GTP has occurred very frequently and in a variety of forms (Ortiz de Gortari et al., 2016).

Most studies have shown no significant difference in gender concerning GTP (Dindar & Ortiz de Gortari, 2017; Ortiz de Gortari, 2017; Ortiz de Gortari & Griffiths, 2015), although a latent GTP score analysis has shown that male subjects have a higher GTP latent than female subjects (Cudo et al., 2022). A study conducted mainly with female subjects in an augmented reality mobile game showed that they were more likely to experience GTP than male subjects (Sifonis, 2018). Minors tend to report higher GTP scores compared to adults; however, significant differences have only been found in GTP manifesting as behaviors and body sensations (Dindar & Ortiz de Gortari, 2017).

GTP has been assessed via the GTP scale (GTPS), which consists of 20 items classifying players' experiences according to sensory channels of manifestation (e.g., visual, auditory), thoughts, and behaviors. The GTPS has been validated with a heterogenous (Ortiz de Gortari et al., 2015), a Turkish (Dindar & Ortiz de Gortari, 2017), and a Polish sample (Cudo et al., 2022).

This study aimed firstly to validate and adapt the GTPS with a Mexican sample. Previous studies have shown that players often reported experiencing GTP a few times rather than once or all the time. Therefore, the second aim of this study was to examine the adequacy of the frequency scale used in the GTPS. The criterion-related validity was examined by testing the relationship between the GTPS scores, playing time, and the number of game genres played.

METHOD

Participants

The sample included 688 video game players, of which 81 were removed due to missing data, leading to a final sample of 607. They were recruited via online social networks such as Facebook and Twitter, and through collaboration with stakeholders in Mexican game arenas such as online

forums and game magazines. Most (93.25%) were male, and four out of five (79.91%) were 27 years old or younger. The study was conducted in accordance with the ethical statutes of the Declaration of Helsinki. Participants supplied their consent before they answered the survey, and they were informed that they could quit the survey at any moment without further consequences. No personal identifiers were collected.

Measures

The questionnaire included sociodemographic questions (age, gender), frequency of playing per week (less than once per week, once per week, 2–4 times per week, 5–6 times per week, every day), and playing time (less than 1 hour to 6 hours or more). The video game genre (e.g., action, adventure, first-person shooter, racing, fighting, puzzle, music, educational, massively multiplayer online role-playing game [MMORPG], role-playing game [RPG], simulation, and sports) most played was asked about using yes/no questions.

The GTPS (Ortiz de Gortari et al., 2015) has 20 items that are used to assess the frequency of GTP (never, once, sometimes, many times, all the time) in five subscales: (1) altered sensorial perceptions subdivided into (a) altered visual perception (e.g., seeing video game images with my eyes open), (b) altered auditory perception (e.g., hearing music from a game), and (c) altered body perception (e.g., perceiving time and/or feeling different in my body after playing a game); (2) automatic mental processes (e.g., still being in the mindset of a game); and (3) actions and behaviors (e.g., acting differently in real-life situations because of something experienced in a video game). Players were invited to report their GTP when not under the influence of substances or psychoactive drugs and when not playing (for more details on the GTPS items, see Ortiz de Gortari et al., 2015). For the purpose of the current study, the scale was translated into Spanish using the back translation method (Maneesriwongul & Dixon, 2004).

Statistical Analysis

The descriptive statistics (mean, standard deviation, skewness, kurtosis) were calculated for all items, subscales, and total scores. Additionally, the Spearman correlation coefficient was applied to calculate relationships between GTP and the variables of interest, and the total overall scores in the GTP subscales were obtained via the SPSS 27 software. The R-Studio software with the Lavaan package (Rosseel, 2012) and semTools package (Jorgensen et al., 2021) were used for the CFA analysis and reliability analysis. The Stata 14 software was used for the item response theory analysis.

The first-order model of GTPS with five latent factors proposed by Ortiz de Gortari et al. (2015) did not achieve discriminant validity in a more recent validation of the GTPS with a Polish sample by Cudo et al. (2022).

Cudo et al. (2022) postulated a higher-order factor, including a general tendency to transfer experiences from the game into the real-life context. Consequently, the discriminant validity analysis for the original, first-order model of GTPS (Ortiz de Gortari et al., 2015) was applied using the Fornell-Larcker criterion (1981), which implies that discriminant validity is present when the latent construct's average variance extracted (AVE) is higher than its squared correlations with other latent constructs in the model.

In order to verify the GTPS structure in the Mexican sample, confirmatory factor analysis (CFA) was used. The CFA was calculated using the maximum likelihood method with the Satorra-Bentler adjusted (1994). The Satorra-Bentler adjusted was used because there was a violation of the multivariate normality assumption in the Mexican (Doornik-Hansen test; $\chi^2_{(df=40)} = 1166.60$; $p < 0.001$) sample. The χ^2 root means square error of approximation (RMSEA), standardized root means squared residual (SRMR), comparative fit index (CFI), the Tucker-Lewis index (TLI) was applied to measure the CFA model fit (Kline, 2011). In this context, RMSEA and SRMR lower than 0.08 indicate an acceptable model fit. CFI and TLI values higher than 0.90 also indicate an acceptable model fit (Hu & Bentler, 1999; Kline, 2011).

The Cronbach's alpha, composite reliability (Raykov, 1997), McDonald's omega (McDonald, 1999), and omega higher order (Flora, 2020) coefficients were used for internal consistency verification. The criterion-related validity was investigated by testing the relationship between the GTPS scores, gaming frequency, and gaming session length.

Additionally, criterion-related validity was also investigated by testing the relationship between the GTPS scores and the number of game genres played by the participants. Considering that the gaming frequency and gaming session length were assessed on an ordinal scale, these relationships were verified by Spearman's Rho correlation coefficient. Also, based on previous research (Ortiz de Gortari et al., 2016), criterion-related validity was investigated by testing the difference between video game players who played different game genres (e.g., action games, adventure games, first-person shooters, racing games, fighting games, puzzle game, music games, educational games, MMORPG, RPG, simulation games, strategy games, sports games, other games) in the GTPS scores and total score. Considering the dichotomous response pattern (yes/no) to questions about playing different game genres and the non-normal distribution of some

variables, the Mann-Whitney U test was used to assess these differences. The effect size was calculated using η^2 (Fritz et al., 2012). There were 55 missing data on game genres. Consequently, the sample for these analyses was of 552 video game players.

Considering confirmatory factor analyses do not constitute an exhaustive analysis at the item level, the item response theory (IRT) analysis concerned with the development of test items and accurate test scoring was used. It should be noted that IRT analysis reflects more precisely the relationship between the underlying psychological construct being measured and the measurement process (Hambleton & Swaminathan, 2013). IRT analyses were carried out for the GTPS subscales using the graded response model (GRM). In this model, ordinal responses and rating scales are analyzed, and each response option level is compared to all response options above that level (Samejima, 1997). More precisely, GTPS had a 5-point response scale (from 1 to 5), so there were four comparisons between levels for each scale. Each comparison was described by threshold (β), which indicated the location on theta (θ) at which individuals would be equally likely to indicate above and below comparison response levels. In this context, the theta reflected a latent trait being assessed by GTPS subscales. Theta had a mean of 0 and a standard deviation of 1, with an arbitrary range covering the latent trait measured by these subscales and the whole GTPS (Hambleton & Swaminathan, 2013; Yang & Kao, 2014). The item discrimination parameter (α) reflects how well items identify individuals at different latent trait levels. This parameter has a theoretical range from -∞ to +∞. However, items with negative values of α and lower than 1 may be considered problematic, and consideration should be given to removing them from the scale (Hambleton & Swaminathan, 2013; Yang & Kao, 2014).

For a more thorough analysis of the items in the GTPS subscales, a category characteristic curve (CCC) of the item responses was used.

The CCC presents the probability of a response option being selected in a given item as a function of the latent trait. In this context, when the response curves are peaked and dispersed across all latent trait levels, the item is better at discriminating between individuals (see Embretson & Reise, 2000; Hambleton & Swaminathan, 2013; Jean-Pierre et al., 2014).

RESULTS

Almost half of the video game players (45.63%) played two to four times a week, and a half (51.07%) played sessions shorter than 3 hours. Only 8% played a session of 6 hours or more. The prevalence of GTP in the sample based on those who answered yes to at least one of the 20 items on the scale was 96%. The descriptive statistic and correlation coefficients among the GTP items were presented respectively in Table 1 and Table 2.

The original, first-order model of GTPS with five latent factors (see Ortiz de Gortari et al., 2015) was well fitted to the data in this Mexican sample $\chi 2$ (df = 160) = 412.03, $p < 0.001$, RMSEA = 0.055, SRMR = 0.044, CFI = 0.949, TLI = 0.939. All standardized factor loadings were statistically significant ($p < 0.001$). The factor loadings were from 0.570 to 0.870 (see Figure 1). In this context, it should be noted that the Fornell-Larcker (1981) criterion was not met because the discriminant validity analysis showed that AVE for almost every latent subscale was lower than its squared correlations between this latent construct and other latent constructs in the original, first-order model of GTPS with five latent factors according to the GTP model framework (Ortiz de Gortari, 2016; 2019; see Table 3). Specifically, the latent GTPS subscale probably explained less of the variance associated with items than the variance associated with the other latent GTPS subscale within the model (see Farrell, 2010; Fornell & Larcker, 1981). Similar results were found by Cudo et al. (2022) when validating the GTPS in a Polish sample; therefore, the GTPS structure model was conducted with a higher-order factor.

The CFA conducted with higher-order factor showed that the GTPS structure was good fitted to the data: $\chi 2$ (df = 165) = 431.27, $p < 0.001$, RMSEA = 0.056, SRMR = 0.045, CFI = 0.945, TLI = 0.937. All standardized factor loadings were statistically significant ($p < 0.001$). Additionally, factor loadings were from 0.568 to 0.869 (see Figure 2).

The reliability analyses showed that the Cronbach's alphas were from 0.731 to 0.853 for the GTP subscales (see Table 4), which were above the recommended threshold of 0.70 (Nunnally & Bernstein, 1994). The reliability measured by McDonald's omega (McDonald, 1999) was from 0.741 to 0.869 (see Table 4), above the recommended threshold of 0.70. Additionally, the higher-order omega equaled 0.899. Additionally, composite reliability (Raykov, 1997) was from 0.738 to 0.860, above the recommended threshold of 0.70. Consequently, these results (see Table 4) suggest that the Mexican version of GTPS presented a good internal consistency level.

The criterion-related validity analysis showed a positive relationship between gaming session length and GTPS scores. A relationship was also found between the number of game genres played by the participants and GTPS scores. There were also positive correlations between gaming frequency and GTPS scores, except for the altered auditory perceptions sub-modality and actions and behaviors modality (see Table 5).

Table 1
The descriptive statistic between items subscale scores, and total score among Mexican video game players.

Items	*M*	*SD*	Skewness	Kurtosis
[1] Item 1	2.55	1.24	-0.06	-1.37
[2] Item 2	1.73	1.09	1.13	-0.17
[3] Item 3	1.91	1.17	0.86	-0.63
[4] Item 4	2.16	1.32	0.62	-1.05
[5] Item 5	2.18	1.26	0.48	-1.25
[6] Item 6	1.97	1.22	0.78	-0.88
[7] Item 7	2.25	1.34	0.48	-1.22
[8] Item 8	1.54	1.05	1.83	2.08
[9] Item 9	3.13	1.27	-0.48	-0.84
[10] Item 10	2.67	1.35	-0.03	-1.38
[11] Item 11	2.16	1.29	0.59	-1.03
[12] Item 12	2.70	1.31	-0.08	-1.32
[13] Item 13	2.94	1.38	-0.23	-1.25
[14] Item 14	2.14	1.30	0.59	-1.11
[15] Item 15	2.85	1.39	-0.10	-1.30
[16] Item 16	2.16	1.35	0.63	-1.06
[17] Item 17	2.93	1.33	-0.26	-1.17
[18] Item 18	2.12	1.27	0.58	-1.11
[19] Item 19	2.00	1.24	0.77	-0.82
[20] Item 20	2.59	1.42	0.15	-1.39
[21] Subscale VP	8.35	3.60	0.58	-0.54
[22] Subscale BP	7.94	3.75	0.80	-0.27
[23] Subscale AP	10.66	4.35	0.10	-1.00
[24] Subscale AMP	10.10	4.37	0.24	-0.92
[25] Subscale AB	9.64	4.11	0.39	-0.86
[26] Total score	46.68	17.16	0.40	-0.75

Note: for all correlation coefficients $p \leq 0.001$; Subscale VP: altered visual perceptions sub-modality; Subscale BP: altered body perceptions sub-modality; Subscale AP: altered auditory perceptions sub-modality; Subscale AMP: automatic mental processes modality; Subscale AB: actions and behaviors modality.

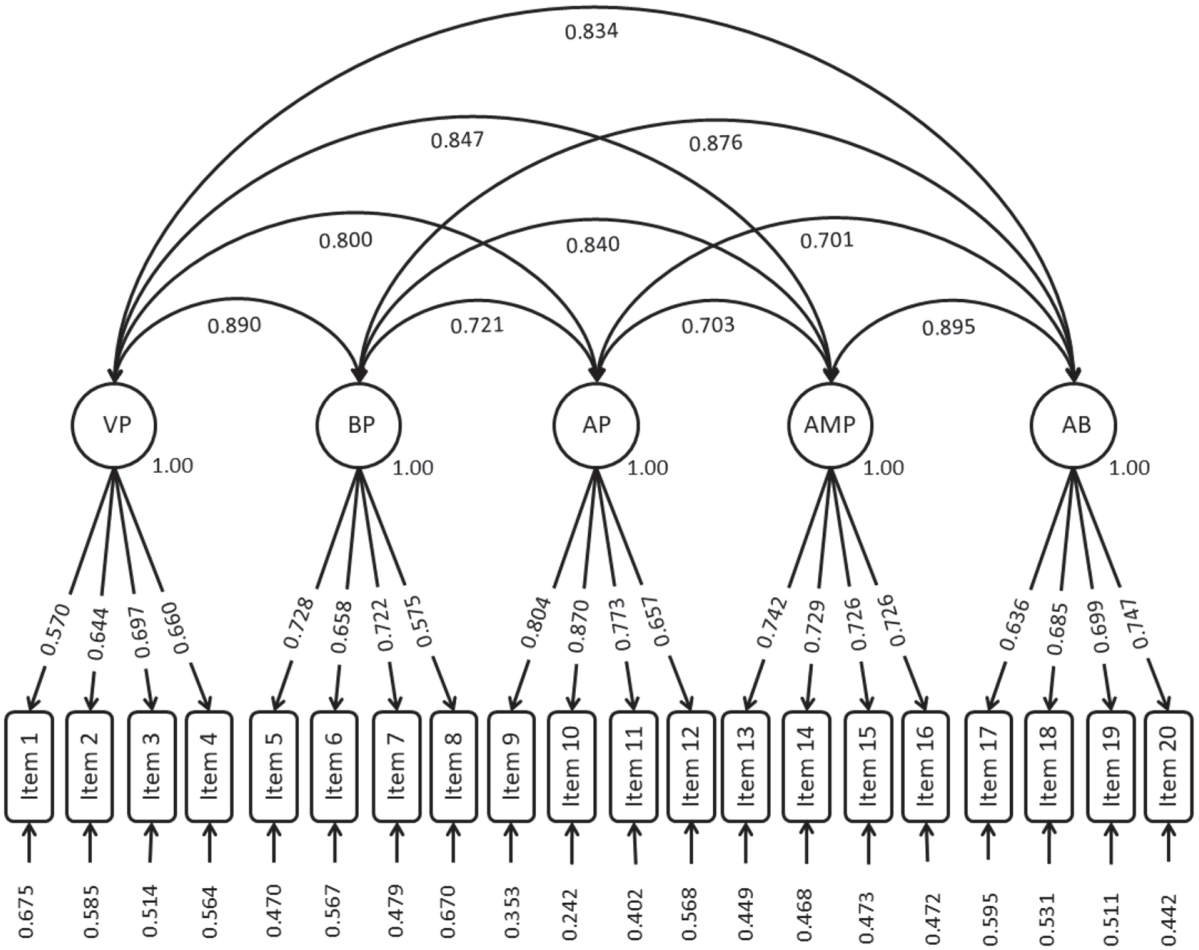
Table 2

The correlations between items subscale scores, and total score among Mexican video game players (N = 607).

Items	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	VP	BP	AP	AMP	AB
[1]																									
[2]	0.46																								
[3]	0.31	0.51																							
[4]	0.34	0.37	0.47																						
[5]	0.41	0.36	0.44	0.39																					
[6]	0.32	0.36	0.40	0.36	0.48																				
[7]	0.36	0.42	0.47	0.39	0.50	0.46																			
[8]	0.28	0.42	0.43	0.33	0.38	0.37	0.45																		
[9]	0.43	0.40	0.42	0.44	0.44	0.36	0.40	0.34																	
[10]	0.39	0.43	0.44	0.45	0.45	0.37	0.41	0.33	0.74																
[11]	0.37	0.44	0.48	0.40	0.43	0.41	0.44	0.36	0.61	0.68															
[12]	0.30	0.31	0.41	0.49	0.44	0.35	0.42	0.29	0.50	0.56	0.51														
[13]	0.34	0.35	0.38	0.46	0.45	0.35	0.40	0.34	0.38	0.39	0.40	0.44													
[14]	0.39	0.39	0.38	0.45	0.52	0.45	0.47	0.40	0.40	0.44	0.43	0.44	0.52												
[15]	0.35	0.39	0.41	0.42	0.44	0.34	0.40	0.32	0.36	0.43	0.39	0.42	0.61	0.51											
[16]	0.31	0.40	0.46	0.47	0.47	0.38	0.43	0.33	0.40	0.42	0.43	0.49	0.51	0.51	0.52										
[17]	0.32	0.33	0.37	0.43	0.39	0.42	0.38	0.31	0.38	0.41	0.40	0.40	0.42	0.37	0.38	0.40									
[18]	0.36	0.38	0.43	0.39	0.47	0.53	0.46	0.36	0.38	0.37	0.39	0.36	0.40	0.46	0.42	0.46	0.46								
[19]	0.30	0.35	0.34	0.43	0.42	0.37	0.40	0.34	0.37	0.37	0.36	0.42	0.54	0.43	0.42	0.41	0.50	0.46							
[20]	0.38	0.36	0.36	0.46	0.48	0.38	0.46	0.36	0.41	0.43	0.40	0.50	0.57	0.50	0.49	0.52	0.48	0.45	0.56						
VP	0.74	0.73	0.73	0.74	0.53	0.48	0.54	0.46	0.57	0.57	0.55	0.51	0.52	0.53	0.53	0.54	0.49	0.52	0.47	0.53					
BP	0.46	0.49	0.55	0.48	0.79	0.74	0.81	0.62	0.51	0.51	0.53	0.51	0.51	0.59	0.49	0.53	0.49	0.59	0.49	0.55	0.65				
AP	0.44	0.47	0.52	0.53	0.52	0.45	0.50	0.39	0.85	0.89	0.83	0.77	0.48	0.51	0.48	0.52	0.47	0.45	0.45	0.52	0.66	0.62			
AMP	0.44	0.47	0.50	0.56	0.58	0.47	0.52	0.42	0.48	0.53	0.51	0.56	0.83	0.77	0.83	0.77	0.48	0.54	0.56	0.65	0.66	0.66	0.62		
AB	0.43	0.44	0.47	0.54	0.55	0.54	0.54	0.42	0.49	0.50	0.48	0.54	0.61	0.55	0.54	0.57	0.79	0.73	0.78	0.81	0.64	0.67	0.60	0.71	
Total	0.57	0.59	0.64	0.67	0.69	0.62	0.67	0.54	0.69	0.72	0.69	0.69	0.71	0.70	0.69	0.69	0.63	0.66	0.64	0.72	0.83	0.83	0.84	0.87	0.85

Note: for all correlation coefficients $p \leq 0.001$; Subscale VP: altered visual perceptions sub-modality; Subscale BP: altered body perceptions sub-modality; Subscale AP: altered auditory perceptions sub-modality; Subscale AMP: automatic mental processes modality; Subscale AB: actions and behaviors modality.

Figure 1
The original, first-order model of GTPS with five latent factors for the Mexican video game players.



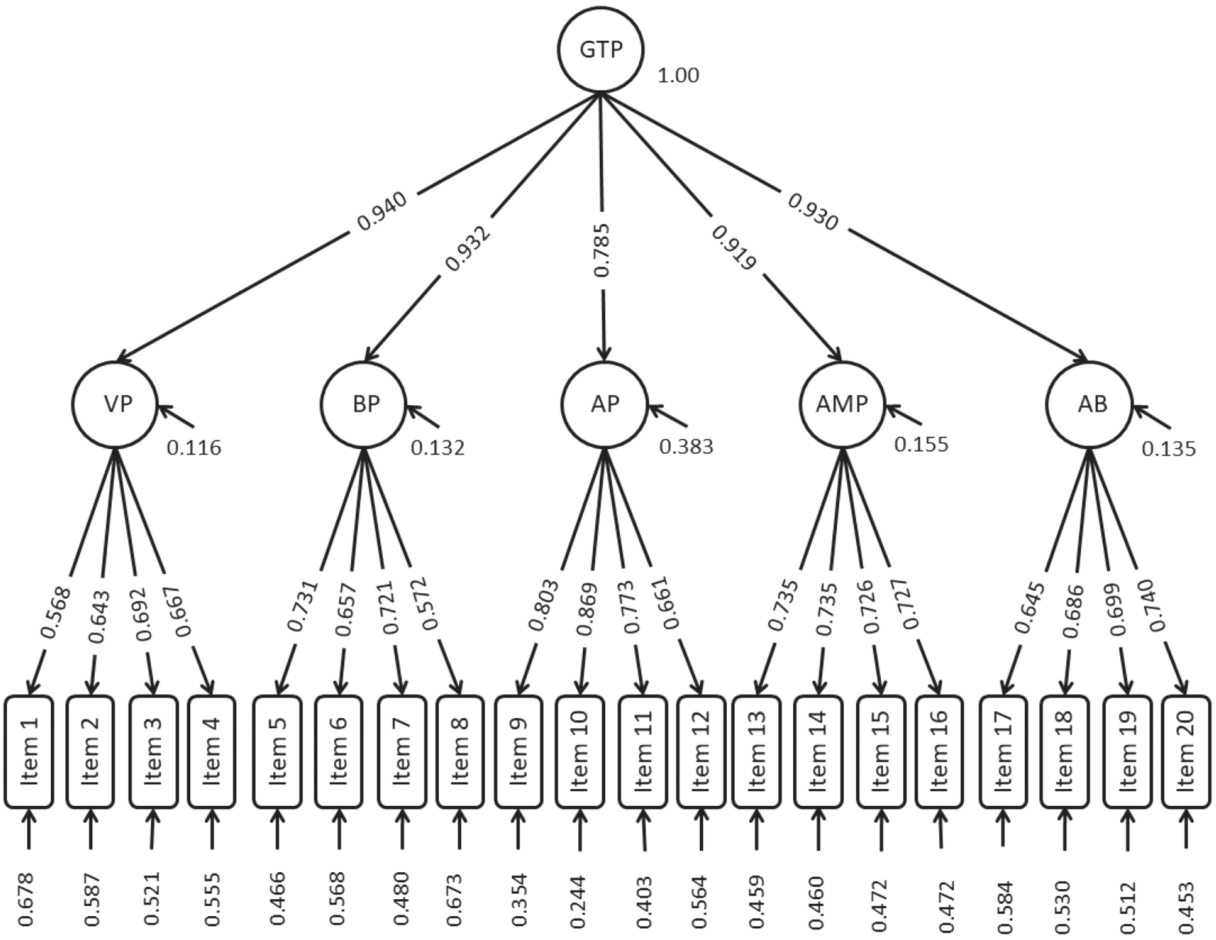
Note: all paths are statistically significant ($p < 0.05$).

Table 3
Average variance extracted (AVE) and shared variance estimates in the Mexican video game players.

Subscales	[1]	[2]	[3]	[4]	[5]
[1] Altered visual perceptions sub-modality	**0.415**	0.792	0.640	0.717	0.696
[2] Altered body perceptions sub-modality	0.890	**0.454**	0.520	0.706	0.767
[3] Altered auditory perceptions sub-modality	0.800	0.721	**0.608**	0.494	0.491
[4] Automatic mental processes modality	0.847	0.840	0.703	**0.534**	0.801
[5] Actions and behaviors modality	0.834	0.876	0.701	0.895	**0.480**

Note: the correlations between subscales are below the diagonal, squared correlations between subscales are above the diagonal, and AVE estimates are presented on the diagonal.

Figure 2
Five-factor GTPS model with higher-order factor for the Mexican video game players.



Note: all paths are statistically significant ($p < 0.05$).

Table 4
Results of internal consistency for GTP scale.

Internal consistency	GTP subscale				
	Subscale VP	Subscale BP	Subscale AP	Subscale AMP	Subscale AB
Cronbach's alpha	0.731	0.765	0.853	0.821	0.786
McDonald's omega	0.741	0.772	0.869	0.820	0.787
Composite reliability	0.738	0.767	0.860	0.821	0.787

Note: Subscale VP: altered visual perceptions sub-modality; Subscale BP: altered body perceptions sub-modality; Subscale AP: altered auditory perceptions sub-modality; Subscale AMP: automatic mental processes modality; Subscale AB: actions and behaviors modality.

Table 5
Relationship between the gaming frequency, gaming session length, number of game genres played by participants and GTP subscales (N = 607).

Variables	Subscale VP	Subscale BP	Subscale AP	Subscale AMP	Subscale AB	Total GTP
Gaming frequency	0.09*	0.10*	0.06	0.08*	0.07	0.09*
Gaming session length	0.14***	0.18***	0.15***	0.19***	0.17***	0.19***
Number of game genres	0.41***	0.41***	0.41***	0.44***	0.45***	0.51***

*Note: *** p < 0.001; ** p < 0.01; * p < 0.05; Subscale VP: altered visual perceptions sub-modality; Subscale BP: altered body perceptions sub-modality; Subscale AP: altered auditory perceptions sub-modality; Subscale AMP: automatic mental processes modality; Subscale AB: actions and behaviors modality.*

Further analysis conducted with video game genres as criterion-related validity showed that players who played specific genres (e.g., action games, adventure games, first-person shooter games) had higher scores in all the subscales of GTP. There was no difference between those who played educational games and sports games and those who did not played these game genres (see Table 6 for the full results).

Item location threshold values (β) and item discrimination parameter (α) are shown in Table 7 for GTPS subscales. The first threshold (β1) described the location on theta (θ) when the response that was recoded to 1 was chosen versus all other responses. The second threshold (β2) described the location on theta when a response that was recoded to 1 or 2 was chosen versus all other responses. The third threshold (β3) described the location on theta when a response that was recoded to 1, 2, or 3 was chosen versus a response that was recoded to 4 or 5. The fourth threshold (β4) described the location on theta when the response that was recoded to 1, 2, 3, or 4 was chosen versus the response which was recoded to 5. In this context, the theta reflected a latent trait assessed by GTPS subscales (see Hambleton & Swaminathan, 2013; Yang & Kao, 2014). The all-item discrimination parameters (α) were higher than 1, suggesting that all items were well-identified individuals at different latent trait levels (see Hambleton & Swaminathan, 2013; Yang & Kao, 2014).

The CCC presents the probability of choosing a certain response on the frequency scale (from 1 – "Never" to 5 – "Almost all the time") at different levels of the latent trait associated with GTPS subscales scores (see Figure 3). Each curve in each plot reflects the probability of choosing a certain response level (from 1 – "Never" to 5 – "Almost all the time"). For instance, the black curve (solid line) in Figure 3 represents the change in probability of choosing the first response level (1 – "Never") as a latent variable (theta θ) level function. This curve is higher at the lower end of the latent trait corresponding to the GTP dimension. These results indicate that individuals with a low level of certain GTP dimensions tend to choose the first response level (1 – "Never") on this item. When the latent trait increases, the probability of selecting the first response level (1 – "Never") decreases, whereas at the same time, the probability of choosing the other response level increases.

Consequently, when certain GTP dimension level is very high, individuals tend to choose the highest response level (Embretson & Reise, 2000; Hambleton & Swaminathan, 2013; Jean-Pierre et al., 2014). Considering the pattern of the curves for each response (see Figure 3), it was noticeable that the second response level (2 – "Once") did not discriminate for the levels of the latent variable characterizing each of the GTPS subscales. More specifically, the curve for the second response level (2 – "Once") converged with the range of the curve for the first response level (1 – "Never") and the third response level (3 – "A few times") for each item included in the GTP subscale data.

DISCUSSION

The present study aimed to validate and adapt the GTPS in a Mexican sample. In this context, the adaptation and validation of the GTPS in a Mexican sample with a higher-order factor showed acceptable results, as in the previous study (Cudo et al., 2022). Consequently, in line with Cudo et al. (2022), there is a general tendency of video game experiences to automatically transfer to real-life contexts. Most players (96%) reported that they have experienced GTP.

Table 6

The differences between video game players across game genres in GTPS subscales and GTP total score (N = 607).

Action	Yes (N = 309)		No (N = 243)		*U*	*z*	*p*	η^2	Educational	Yes (N = 19)		No (N = 533)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.30	3.56	7.80	3.41	28109.50	-5.10	0.001	0.043	Subscale VP	9.26	4.34	8.62	3.54	4763.50	-0.44	0.659	0.000
Subscale BP	8.74	3.79	7.49	3.53	29802.00	-4.19	0.001	0.029	Subscale BP	8.58	3.98	8.18	3.72	4804.00	-0.38	0.702	0.000
Subscale AP	11.79	4.01	10.11	4.32	28834.00	-4.70	0.001	0.036	Subscale AP	11.05	5.19	11.05	4.20	5053.00	-0.02	0.988	0.000
Subscale AMP	11.39	4.20	9.25	4.03	26945.00	-5.71	0.001	0.054	Subscale AMP	10.37	4.50	10.45	4.25	4975.00	-0.13	0.897	0.000
Subscale AB	10.78	4.02	8.90	3.80	27342.00	-5.50	0.001	0.050	Subscale AB	10.42	3.95	9.93	4.03	4630.00	-0.64	0.524	0.001
Total GTP	52.00	16.12	43.55	15.97	26095.50	-6.16	0.001	0.063	Total GTP	49.68	18.46	48.23	16.53	4843.00	-0.32	0.747	0.000
Adventure	Yes (N = 359)		No (N = 193)		*U*	*z*	*p*	η^2	MMORPG	Yes (N = 104)		No (N = 448)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.40	3.68	7.23	2.85	22693.00	-6.72	0.001	0.074	Subscale VP	10.27	3.98	8.26	3.36	16389.00	-4.74	0.001	0.037
Subscale BP	8.91	3.88	6.86	3.02	23752.50	-6.14	0.001	0.062	Subscale BP	10.03	3.85	7.77	3.57	15221.50	-5.55	0.001	0.051
Subscale AP	11.93	4.16	9.41	3.87	22787.50	-6.65	0.001	0.073	Subscale AP	12.59	4.13	10.69	4.17	17188.00	-4.18	0.001	0.029
Subscale AMP	11.30	4.15	8.85	4.00	22996.50	-6.54	0.001	0.070	Subscale AMP	12.55	4.02	9.96	4.16	14977.00	-5.69	0.001	0.053
Subscale AB	10.69	4.09	8.57	3.52	24357.50	-5.78	0.001	0.055	Subscale AB	11.88	4.07	9.50	3.89	15653.50	-5.23	0.001	0.045
Total GTP	52.23	16.67	40.93	13.67	21076.50	-7.59	0.001	0.095	Total GTP	57.31	16.70	46.19	15.85	14640.50	-5.91	0.001	0.058
First-person shooter	Yes (N = 255)		No (N = 297)		*U*	*z*	*p*	η^2	RPG	Yes (N = 235)		No (N = 317)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.70	3.62	7.73	3.27	25790.50	-6.50	0.001	0.070	Subscale VP	9.14	3.66	7.97	3.34	30303.50	-3.77	0.001	0.023
Subscale BP	9.29	3.93	7.25	3.27	26168.50	-6.31	0.001	0.066	Subscale BP	8.74	3.86	7.46	3.41	30007.50	-3.94	0.001	0.026
Subscale AP	12.12	4.11	10.13	4.12	27664.50	-5.48	0.001	0.049	Subscale AP	11.93	3.99	9.87	4.26	26827.50	-5.64	0.001	0.052
Subscale AMP	11.95	4.06	9.16	3.99	23833.50	-7.53	0.001	0.093	Subscale AMP	10.97	4.31	9.74	4.09	30921.00	-3.42	0.001	0.019
Subscale AB	11.08	3.93	8.98	3.86	26210.00	-6.26	0.001	0.065	Subscale AB	10.55	4.02	9.14	3.91	29643.00	-4.12	0.001	0.028
Total GTP	54.14	16.14	43.25	15.28	23224.50	-7.84	0.001	0.101	Total GTP	51.32	16.50	44.17	15.82	27897.50	-5.05	0.001	0.042
Racing	Yes (N = 130)		No (N = 422)		*U*	*z*	*p*	η^2	Simulation	Yes (N = 95)		No (N = 457)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.17	3.55	8.48	3.56	24186.50	-2.05	0.040	0.007	Subscale VP	9.67	3.70	8.43	3.50	17371.50	-3.08	0.002	0.016
Subscale BP	8.85	3.60	7.99	3.74	23150.50	-2.71	0.007	0.012	Subscale BP	9.38	3.69	7.95	3.69	16464.00	-3.73	0.001	0.023
Subscale AP	11.75	3.91	10.83	4.30	23683.00	-2.36	0.018	0.009	Subscale AP	12.32	4.18	10.79	4.20	17083.00	-3.28	0.001	0.018
Subscale AMP	11.36	3.98	10.17	4.30	22824.00	-2.91	0.004	0.014	Subscale AMP	11.51	4.12	10.23	4.26	17686.00	-2.85	0.004	0.013
Subscale AB	10.68	3.87	9.72	4.05	23349.50	-2.58	0.010	0.011	Subscale AB	11.64	4.15	9.60	3.92	15607.00	-4.33	0.001	0.031
Total GTP	51.82	15.44	47.19	16.78	22490.00	-3.11	0.002	0.016	Total GTP	54.52	16.82	46.98	16.25	16013.00	-4.03	0.001	0.027

Table 6

The differences between video game players across game genres in GTPS subscales and GTP total score (N = 607). (continuation).

Fighting	Yes (N = 107)		No (N = 445)		*U*	*z*	*p*	η^2	Strategy	Yes (N = 186)		No (N = 366)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	10.05	3.49	8.30	3.51	16887.50	-4.69	0.001	0.036	Subscale VP	9.37	3.63	8.27	3.48	27972.00	-3.44	0.001	0.019
Subscale BP	9.97	3.93	7.76	3.55	15954.50	-5.34	0.001	0.047	Subscale BP	9.10	3.88	7.73	3.57	26778.00	-4.13	0.001	0.028
Subscale AP	12.52	4.14	10.70	4.18	17853.50	-4.03	0.001	0.027	Subscale AP	11.63	4.15	10.75	4.24	29840.50	-2.38	0.017	0.009
Subscale AMP	12.13	3.97	10.04	4.23	17202.50	-4.47	0.001	0.033	Subscale AMP	11.56	4.16	9.88	4.20	26150.00	-4.47	0.001	0.033
Subscale AB	12.26	3.94	9.39	3.85	14263.00	-6.47	0.001	0.069	Subscale AB	11.24	4.08	9.29	3.84	24824.00	-5.22	0.001	0.045
Total GTP	56.93	16.17	46.20	16.01	15038.00	-5.92	0.001	0.058	Total GTP	52.90	16.39	45.93	16.20	25693.00	-4.71	0.001	0.037
Puzzle games	Yes (N = 99)		No (N = 453)		*U*	*z*	*p*	η^2	Sports	Yes (N = 65)		No (N = 487)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.36	3.57	8.48	3.55	19075.50	-2.34	0.019	0.009	Subscale VP	8.88	3.60	8.61	3.57	15145.50	-0.57	0.570	0.001
Subscale BP	8.93	3.66	8.03	3.72	18961.00	-2.43	0.015	0.010	Subscale BP	8.00	3.73	8.22	3.73	15306.00	-0.43	0.664	0.000
Subscale AP	12.06	4.27	10.83	4.19	18904.00	-2.46	0.014	0.010	Subscale AP	11.46	4.04	11.00	4.25	14811.50	-0.84	0.399	0.001
Subscale AMP	11.06	4.54	10.31	4.19	20274.00	-1.50	0.134	0.004	Subscale AMP	10.25	4.50	10.47	4.23	15159.50	-0.55	0.579	0.000
Subscale AB	10.37	4.02	9.86	4.03	20666.50	-1.23	0.220	0.002	Subscale AB	10.31	3.75	9.90	4.07	14636.50	-0.99	0.322	0.002
Total GTP	51.79	16.98	47.51	16.41	19085.00	-2.32	0.020	0.009	Total GTP	48.89	16.55	48.20	16.60	15352.50	-0.39	0.694	0.000
Music games	Yes (N = 135)		No (N = 417)		*U*	*z*	*p*	η^2	Other games	Yes (N = 34)		No (N = 518)		*U*	*z*	*p*	η^2
	M	*SD*	*M*	*SD*						*M*	*SD*	*M*	*SD*				
Subscale VP	9.30	3.73	8.43	3.49	24372.00	-2.36	0.018	0.009	Subscale VP	9.00	3.86	8.62	3.55	8362.00	-0.50	0.620	0.000
Subscale BP	8.71	3.62	8.02	3.75	24463.00	-2.30	0.021	0.009	Subscale BP	8.76	3.94	8.15	3.71	7942.50	-0.97	0.334	0.002
Subscale AP	11.77	4.20	10.82	4.21	24621.00	-2.20	0.028	0.008	Subscale AP	12.41	4.83	10.96	4.17	7008.50	-2.00	0.045	0.007
Subscale AMP	11.10	4.19	10.24	4.26	24644.50	-2.18	0.029	0.008	Subscale AMP	10.59	3.74	10.44	4.29	8501.50	-0.34	0.735	0.000
Subscale AB	10.61	4.17	9.73	3.96	24768.00	-2.11	0.035	0.007	Subscale AB	10.41	4.16	9.92	4.02	8164.00	-0.72	0.475	0.001
Total GTP	51.50	16.50	47.24	16.49	23853.00	-2.67	0.008	0.012	Total GTP	51.18	17.06	48.09	16.55	7811.00	-1.10	0.269	0.002

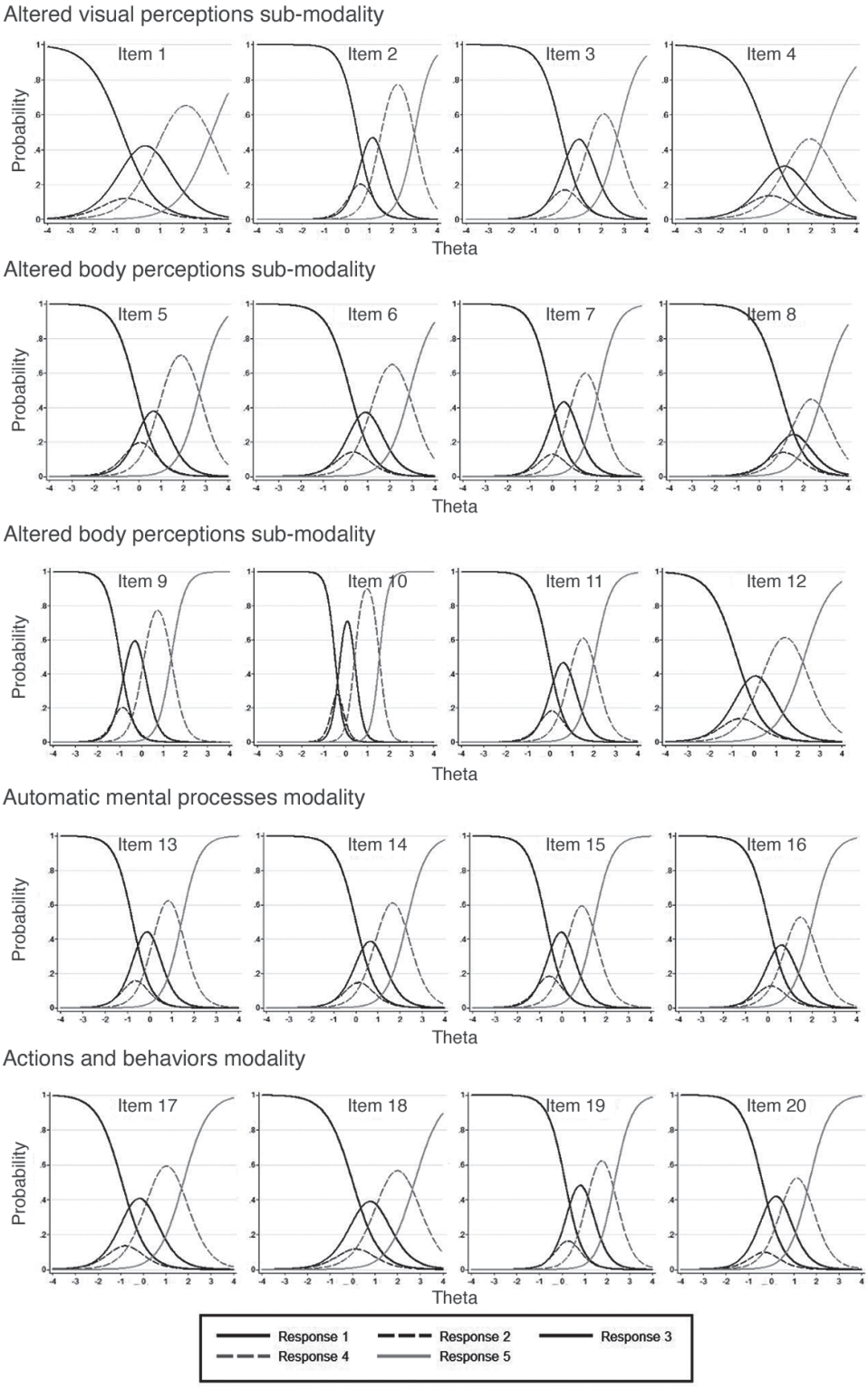
Note: Subscale VP: altered visual perceptions sub-modality; Subscale BP: altered body perceptions sub-modality; Subscale AP: altered auditory perceptions sub-modality; Subscale AMP: automatic mental processes modality; Subscale AB: actions and behaviors modality.

Table 7
Item statistics for the graded response model across items of the GTPS subscales (N = 607).

Altered visual perceptions sub-modality					
Items	α	β1	β2	β3	β4
Item 1	1.35	-0.69	-0.33	1.00	3.29
Item 2	2.74	0.46	0.76	1.50	3.00
Item 3	2.16	0.22	0.54	1.45	2.75
Item 4	1.44	0.01	0.39	1.26	2.65
Altered body perceptions sub-modality					
Items	α	β1	β2	β3	β4
Item 5	2.05	-0.12	0.27	1.05	2.75
Item 6	1.94	0.20	0.50	1.30	2.90
Item 7	2.37	-0.09	0.13	0.91	2.08
Item 8	1.80	0.96	1.28	1.83	2.90
Altered auditory perceptions sub-modality					
Items	α	β1	β2	β3	β4
Item 9	3.28	-0.97	-0.72	0.12	1.37
Item 10	5.23	-0.47	-0.25	0.43	1.55
Item 11	2.68	-0.03	0.24	1.00	2.05
Item 12	1.65	-0.77	-0.43	0.57	2.30
Automatic mental processes modality					
Items	α	β1	β2	β3	β4
Item 13	2.48	-0.76	-0.50	0.27	1.44
Item 14	2.21	0.02	0.29	1.03	2.30
Item 15	2.48	-0.70	-0.40	0.36	1.47
Item 16	2.22	0.04	0.27	0.96	2.02
Actions and behaviors modality					
Items	α	β1	β2	β3	β4
Item 17	1.84	-0.93	-0.63	0.31	1.79
Item 18	1.71	0.02	0.29	1.26	2.75
Item 19	2.61	0.16	0.41	1.22	2.33
Item 20	2.18	-0.38	-0.20	0.62	1.68

Figure 3

Item response category characteristic curves (CCC) for items from GTPS subscales.



The internal consistency of the Mexican version of the GTPS was assessed with Cronbach's alpha, McDonald's omega, and composite reliability. The internal consistency analysis showed that the Mexican version of the GTPS demonstrated good internal consistency levels.

Regarding the adequacy of the response scale used in the GTPS, the analysis showed that the second response level (2 – "Once") did not discriminate for the levels of the latent variables characterizing each of the GTPS subscales. Consequently, individual results based on the second response should be treated with caution. More specifically, it is important to consider whether the second response is a good indicator of the prevalence of a specific GTP-related behavior. Further research on the item response structure of the GTPS is needed to verify this assumption accurately. However, it is important to note that GTP is usually not a onetime experience, since players generally reported experiencing GTP more than once or experiencing several forms of GTP (Ortiz de Gortari & Griffiths, 2016).

The criterion-related validity analysis showed that the GTP manifestation in the different modalities was positively associated with the gaming session length and the number of game genres. Moreover, there was a positive relationship between the GTP total score and gaming frequency. However, gaming frequency was only positively associated with the altered visual perceptions submodality, altered body perceptions submodality, and automatic mental processes modality subscales. The present study's findings align with previous research indicating the positive relationship between GTPS subscales and time spent playing video games (Cudo et al., 2022; Dindar & Ortiz de Gortari, 2017; Ortiz de Gortari, 2017; Ortiz de Gortari & Griffiths, 2015). Considering the GTP framework (Ortiz de Gortari, 2019), these findings may suggest that playing more game genres and increasing the hours of play may increase the possibility of experiencing GTP. However, it is important to acknowledge that while the amount of playing (i.e., hours playing, playing frequency) is relevant for GTP, experiencing GTP does not require a player to play for several hours or everyday. Similarly, simply playing excessively does not fulfill the gaming disorder criteria. Underlying psychopathological mechanisms and individual characteristics are also related to susceptibility to GTP.

Additionally, there were differences between certain game genres in the GTPS subscales and the GTP total score (see Table 6). In this context, it should be noted that some games may include features that facilitate GTP, such as the simulation of physical objects, which appear to generate associations between the game and the real world (Ortiz de Gortari, 2019; Ortiz de Gortari & Griffiths, 2016; 2017). Also, prolonged exposure to certain features may lead to neural adaptations, resulting in some GTP manifestations (Ortiz de Gortari, 2017; Ortiz de Gortari & Griffiths, 2017).

Limitations

The findings should be interpreted in light of several limitations. The present study was self-reported and cross-sectional in nature. Therefore, causal relationships between the variables cannot be assumed. It should also be borne in mind that survey studies may be limited by method biases associated with respondents (e.g., lack of insight, biased recalls, social desirability). The study was conducted within Mexican culture, so caution should also be taken when generalizing the results to other cultures.

CONCLUSIONS

The Spanish version of GTPS was used on a sample of Mexican video game players and it is a reliable and valid method to assess GTP in the Mexican context. Participants who played certain games had higher GTP scores, suggesting that some video game characteristics may facilitate GTP. The prevalence of GTP was high in the Mexican sample (96%). Experiencing GTP more than once may be more meaningful for establishing the prevalence of GTP. However, a complete-responses theory analysis of the GTPS items would need to be carried out again on a different sample to be sure this is the right direction before deciding to remove the "once" response from the scale response.

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