INTERNATIONAL JOURNAL OF PSYCHOLOGY AND NEUROSCIENCE

Translation and cultural adaptation of a questionnaire to evaluate player experience

Tradução, Adaptação cultural e Validação de um questionário para avaliação de experiência do jogador

Thiago Strahler Rivero 1, Emmy Uehara Pires 2, Marcus Vinicius Costa Alves 3, Jessica Fernanda Silva 4, Carlos Guilherme Schlottfeldt 5, Silvia Adriana Prado Bolognani 6, Thirzá Baptista Frison 7, Naraiana de Oliveira Teixeira 8, Danilo Assis Pereira 9, Leandro Fernandes Malloy-Diniz 10, Orlando Francisco Amodeo Bueno 11

1. Doutorando no departamento de psicobiologia da Universidade Federal de São Paulo, Brazil.
2. Profa. Dra. do departamento de psicologia da Universidade Federal Rural do Rio de Janeiro, Rio de Janeiro, Brazil.
3. Doutorando no departamento de psicobiologia da Universidade Federal de São Paulo, Brazil.
4. Especialista em Neuropsicologia, Rondônia, Brazil.
5. Prof. da Universidade Pitágoras, UNIMINAS, Minas Gerais, Brazil .
6. Coordenadora do Centro Paulista de Neuropsicologia, AFIP, São Paulo, Brazil.
7. Coordenadora do Bitácora- Centro de Neuropsicologia, Rio Grande do Sul, Brazil.
8. Profa. Dra. do departamento de educação da Universidade Federal de Goiais, Brazil.
9. Diretor do IBNeuro (Brazilian Institute of Neuropsychology and Cognitive Sciences, Brasília, Brazil.
10. Prof. Dr. do departamento de Medicina Molecular da Universidade Federal de Minas Gerais, Brazil.
11. Prof. Dr. do departamento de Psicobiologia da Universidade Federal de São Paulo, Brazil.

Thiago Strahler Rivero, Corresponding author, Email adress: **thiagorivero@gmail.com**

Resumo

Jogos digitais cada vez mais vêm sendo utilizados como ferramentas para avaliação e e treinamento de funções cognitivas, principalmente por sua capacidade de aumentar o engajamento dos jogadores nas tarefas. O Revised Gameplay Questionnaire (Questionário Revisto de Jogabilidade, QRJ) foi construído para avaliar diversas heurísticas relacionadas a experiência subjetiva do jogador durante uma sessão de jogo. Nosso artigo procedeu com a tradução e adaptação cultural Brasileira do QRJ. Empregou-se os Princípios de Boas Práticas para o Processo de Tradução e Adaptação Cultural para medidas de auto-relato de pacientes (PRO, Wild et al, 2005), que envolveu 10 passos: Preparação, Primeira tradução, Conciliação, Retro-tradução, Revisão da retro-tradução, Harmonização, Esclarecimento Cognitivo, Revisão dos resultados do esclarecimento cognitivo, Revisão final de sintaxe e ortografia, e Escrita do relatório. O uso dos princípios PRO, propiciou que a versão final do instrumento seja satisfatória para seu uso em pesquisas, principalmente para a validação psicométrica do questionário.

Palavras-chave: jogos digitais, envolvimento, adaptação psicométrica, questionário

Abstract

Video games are increasingly being used as tools for cognitive functions assessment and training, especially for its ability to increase the player's engagement on task. The Revised Gameplay Questionnaire (Questionário Revisado de Jogabilidade, QRJ) was designed to evaluate different heuristics related to subjective player experience during a gaming session. The present work proceeded with the translation and brazilian cultural adaptation of QRJ. We employed the Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO, Wild et al, 2005), which envolved 10 steps: Preparation, Forward Translation, Reconciliation, Back Translation, Back Translation Review, Harmonization, Cognitive Debriefing, Review of Cognitive Debriefing Results, Proofreading and Final Report. The use of PRO principles, has provided a satisfactory final version of the instrument for its use in research, especially for the psychometric validation of the questionnaire.

Keywords: videogame, engagement, psychometric adaptation, questionnaire

Introduction

The use of digital games in cognitive research goes back to the year 1977 when a game simulating dominoes was created for the first time to study decision making and cognitive strategy (Reisman, 1972). In 1982, the launch of the first flight simulator from the Microsoft Company (Microsoft Fly Simulator®, v1.0, 1982) opened a new field of studies using digital games as skills training tools through simulations. Since then, this games have been more and more studied and the research field enhanced (for a review on the subject, see the case of driving skills simulator games, Sue, Ray, Talaei-Khoei, Jonnagaddala, & Vichitvanichphong, 2014).

In addition to the simulation and specific skills training, digital games have also been used as auxiliary tools in the treatment of various diseases and health conditions. Several reports include attention deficit disorder and hyperactivity (Van Dongen-Boomsma, Vollebregt, Buitelaar, & Slaats-Willemse 2014), autism spectrum disorder (Wijnhoven, Creemers, Engels, & Granic, 2015), depression disorder (Merry, et al., 2012), aging in older adults (Anguera et al., 2013), among others (for a recent review on the impact of games on mental health, cognition and changes in neuroimaging, see Shams, et al., 2015).

This interest in the use of digital games as a therapeutic tool is associated to specific features of the use of technology already studied and known since the advent of telemedicine. Some observed advantages are the ability to scale the diagnosis and treatment access, the ability to collect patients' performance data faster in a more secure and automated way, and the ease of being able to carry out such treatment remotely, for both the health professional and the patient (Kato, 2010). However, a key benefit that video game has added to the current model of telemedicine and ehealth is associated with its ability to generate engagement and

motivation in the process of use. These aspects are essential for adhesion and decreased dropout rates of treatment – these rates are high in patients with mental disorders (Granic, Lobel, & Engel, 2014; Burke et al., 2009; Flores et al., 2008).

Motivation, commitment and experience are fundamental in gaming to create treatments through these tools, but not all games provide pleasurable experiences, which reduces focus on the task and the consequent engagement in what is being requested (Granic et al., 2014;. Jones, Scholes, Johnson, Katsikitis, & Carras, 2014). This difficulty of assessing the gaming experience is associated with the subjectivity of the gaming style, but is also directly related to the use of barriers and experience that the player encounters during a game session.

The treatments and training employing digital games, for the most part, present games that were created by the researchers themselves (not commercial games). However, they rarely have clear methods to assess the gaming experience for patients, which can become an important confounder. For example, the player may underperformed or have a lack of engagement in the treatment because he did not emotionally connected to the game presented, or due to the difficulties encountered regarding the usability of the tool. Important efforts have been made by various laboratories in an attempt to establish methods for the construction of scientific games (Mayer et al., 2014; Göbel, Gutjahr, & Steinmetz, 2011) and for the creation and refinement of tools to assess the user experience during a gaming session (Kiili, Perttula, Lindstedt, Arnab, & Suominem 2014; Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, 2013; Nacke, Drachen, & Goebel, 2010).

There are few instruments of the quantitative nature available to assess the elements during the gaming experience. In general, we use classical techniques such as "thinking out loud", interviews and focus groups, important techniques and of

a great value to the development of a game, however, these methods is mostly based on open answers without a formal pattern. This fact could interfere in a more specific evaluation of important heuristics of the gaming experience, including significantly distorting the player's experience (Pagulayan, Keeker, Wixon, Romero, & Fuller, 2003). Therefore, information on heuristics related to positive experiences such as the fluid use of the controls, clear objectives, interface consistency, support, customization, variety of stimuli, navigation, appearance, challenge, immersion, feedback, error recovery, rewards, terminology and artificial intelligence, can help to understand the mechanisms inherent in this process (Febretti & Garzotto, 2009; Desurvire & Wiberg, 2009; Pinelle, Wong, & Stach, 2008; Federoff, 2002; Korhonen & Koivisto, 2006). Thus, it is extremely important to have an instrument that identifies more objectively the players' experiences, whether positive or negative. One example is the Revised Gameplay Questionnaire (RGQ; Parnell, 2009).

The RGQ is a tool built for the evaluation of the player's experience after a game. During the research of Mark Parnell (2009), four heuristics were selected to create the RGQ: 1) = affective experience = related to immersion and emotional valence; 2) challenge/focus = related to the absorption of the challenge and the feeling of dominating the game; 3) gameplay = related to the variety of stimuli, goals of clarity, the navigation in the game environment and how the game has trained you and helped you understand its mechanisms; and finally, 4) usability = related to the controls and game commands, customization, consistency, camera (view), and the game interface.

Parnell (2009) found evidence of validity from a study conducted with a sample of 98 respondents. Participants were asked to play for two hours (with a 15 minute break after the first hour), a 2D platform game called PixelJunk™ Eden®

(Q-Games®, 2008), in which the player was expected to collect pollen, which causes the growth of plants within the setting. The result of cluster analysis by hierarchical methods, using the Ward method, generated a 4 clusters solution, which were closer to the theory of heuristics proposed previously: affective experience, challenge/focus, gameplay and usability. However, some anomalies occurred as questions related to control and menus were associated with the experience cluster.

The internal consistency index were high with a Cronbach's alpha of 0.903. Thus, the four clusters were called: 1) Affective experiment, 2) Focus, 3) Gameplay barriers and 4) Usability barriers. The Affective Experience showed an alpha of 0.903; Focus, an alpha of 0.711; Gameplay barriers, 0.814 and usability barriers was 0.760. The author explains the use of the clustering technique because it is more robust than the factor analysis technique, which involves the need of a larger number of participants.

Thus, the aim of this study is to describe the process of translation, cultural adaptation and psychometric validation of the instrument Revised Gameplay Questionnaire (RGQ) for the Portuguese in the Brazilian context.

Study 1) Translation and cultural adaptation

Method

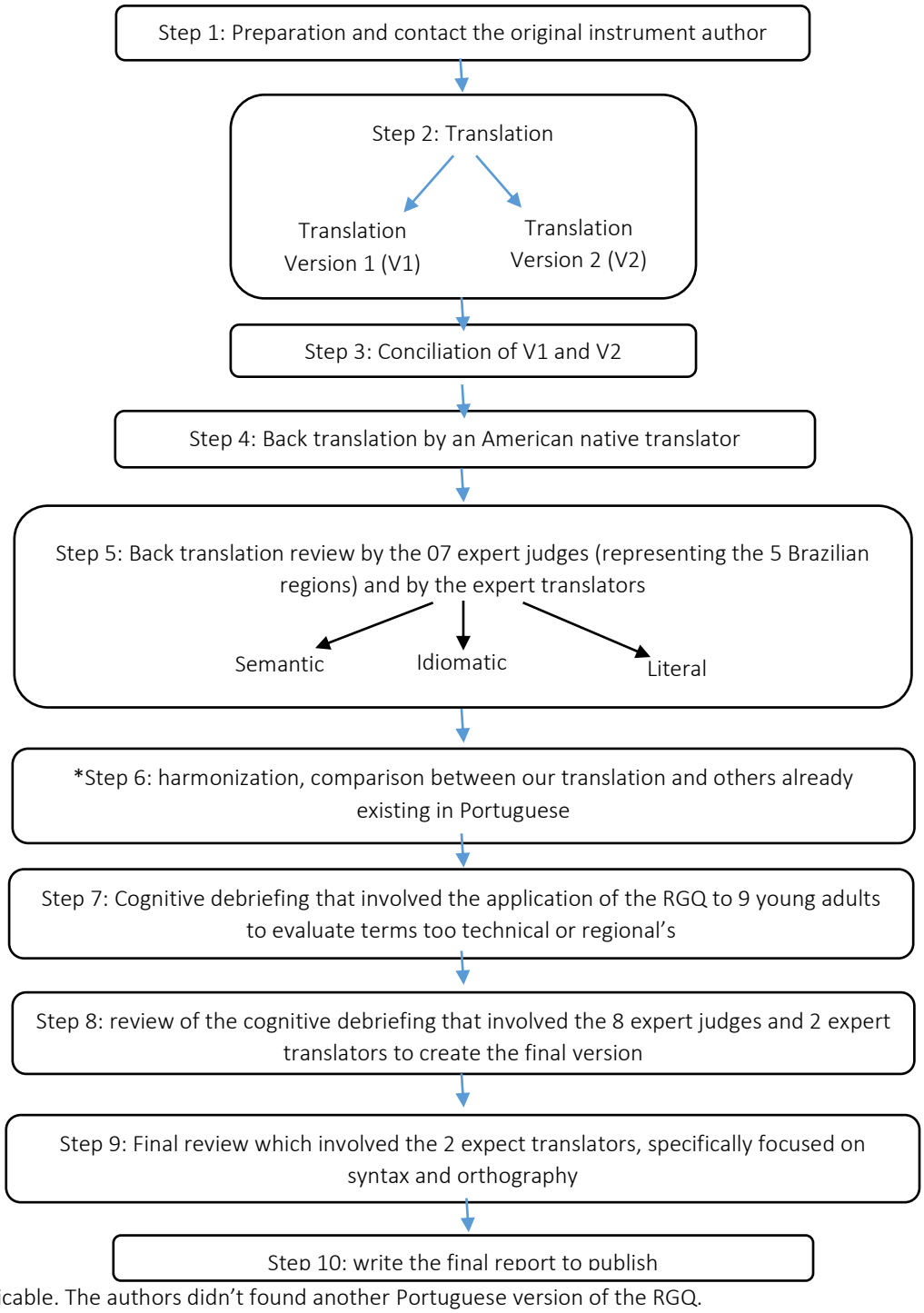
Procedure and participants

The principles and best practices for developing translations and cultural adaptations of self-report instrument (Wild et al., 2005) were followed proposed by the TCA group (The Translation and Cultural Adaptation group) of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR).

In Figure 1 you can see the flow chart of the process of translation and adaptation

of RGQ. The following 10 steps proposed by the PRO were followed; 1) Preparation; 2) First translation; 3) Conciliation; 4) Retro-translation; 5) Back-translation review; 6) Adjustment; 7) Cognitive debriefing; 8) Review of the results of the cognitive debriefing; 9) Proofreading; 10) Write the final report.

Figure 1. Flowchart of translation and cultural adaptation



*Not aplicable. The authors didn't found another Portuguese version of the RGQ.

The study was divided into ten steps, and all participants agreed to make available the data for the study (Table 1). In the first step, the author of the original scale was contacted by email and we requested he's approval for the scale translation procedure. In addition, translators (two specialized translators) and the committee of expert judges were selected.

Table 1. Steps related to PRO's guidelines: participants and sample characterization

Steps number	Step name	Step objective	Participants	Descriptive data
1	Preparation	Authorization by the author of the Questionnaire Revised gameplay; selection of translators and expert judges committee;	- Author of the original scale and, - 02 experts translators	- Human-computer interaction area researcher - Both translators are bilingual and neuropsychologists
2	Forward translation	Production of two separate versions to Portuguese (V1 and V2);	- 02 experts translators	- Both translators are bilingual and neuropsychological
3	Conciliation	Synthesis of V1 and V2;	- 07 expert judges	- 07 bilingual Psychologists / Neuropsychologists
4	Back Translation	Carried out by a translator who had no contact with the V1 and V2	- 01 expert translators	- Native American English-Portuguese translator
5	Back Translation Review	Comparison between the back translation and the original questionnaire	- 07 experts judges and - 02 expert translators	- 07 bilingual Psychologists / Neuropsychologists bilingual - 02 neuropsychologists and bilingual translators
6	Harmonization	Not applicable	Not applicable	Not applicable
7	Cognitive debriefing	Questionnaire application in a sample of 09 young adults videogame players	- 09 Judges nonspecialists	Age: M = 28.36 (SD = 5.85) Education: M = 18.45 (SD = 4.39) Gender: Male. = 8; Fem. = 3
8	Review of Cognitive Debriefing Results	Review by expert judges and creation of the synthetic version 3	- 07 expert judges - 02 experts translators	- 07 bilingual Psychologists / Neuropsychologists bilingual - 02 neuropsychologists and bilingual translators
9	Proofreading	Review and creation of the final version of RGQ	- 02 experts translators	- 02 neuropsychologists and bilingual translators
10	Final Report	Write an article reporting the construction steps in the process of translation and adaptation	- 02 experts translators	- 02 neuropsychologists and bilingual translators

Note: M= mean; SD= standard deviation; Fem= female.

In the second step, the original version of RGQ was translated jointly by a group of experts. Seven bilingual researchers with extensive experience in psychology and research on evaluation psychology, videogames and new technologies,

participated in this stage. All these experts were psychologists and represented the five regions of Brazil (North, Northeast, South, Southeast and Midwest), with seven different states of Brazil (Minas Gerais, São Paulo, Rio de Janeiro, Bahia, Goias, Rio grande South and Rondonia), which contributed to avoid the use of regional terms. All participants in this stage had graduate in health and four had doctoral degree.

In the third step, the authors performed a version synthesis of two translation versions (V1 and V2) that have been assessed by the expert judges committee, thus creating a single version. This version was called synthesis 1.

In the fourth step, a Native American sworn translator, fluent in Portuguese and English and that had no contact with any of the two versions, made the reverse translation of the version obtained after the synthesis (step 3).

In the fifth step, the committee of expert judges and the author of the original questionnaire compared the back translation and the original questionnaire in English with respect to literal, idiomatic and semantics equivalence. This version of the scale was called Synthesis 2.

The sixth step was not applicable to this study because it involved the comparison of our translation with other translations of the questionnaire in Portuguese adapted to Brazil. This step was not carried out because of the lack of other translations.

In the seventh step, the synthesis version 2 of the questionnaire was applied in a bilingual sample, composed of young adults recruited from the researchers' social network. The bilingual sample consisted of 09 (33% female) participants who had proved their fluency by having a certificate of proficiency in English. All had higher education (22% incomplete and 78% complete) and a mean age of 28.0 (SD = 5,196) years. The procedures involved the use of an online game called Browse Quest, which involves an online

adventure in a 2D open world, for 10 minutes and subsequently the subject answered the RGQ. In addition, when they finished answering the questionnaire, the subjects were asked to indicate possible items that were not appropriate or that were not understandable.

The eighth step involved reviewing the results of cognitive debriefing by the translators and the committee of expert judges. Thus, creating a synthetis version 3.

The ninth step involved a final review by the translators, taking into account mainly syntax and spelling of the synthesis version 3.

The tenth step involved the writing of this article, as suggested by PRO's norms. The writing of this final report, collaborates with future adaptations of the instrument for other cultures.

This research project takes part in a larger project related to the construction and validation of digital games for neuropsychological rehabilitation for patients with Attention Deficit Disorder and Hyperactivity. The main project, as well as its sub-projects (the result of this current work) were submitted and approved by the Research Ethics Committee of the Federal University of São Paulo, registered in CAAE (00751612.7.0000.5505) and is a FAPESP project (case No. 2012 / 02045-9). All subjects involved in the study signed a digital informed consent to participate in the research.

Instrument

The RGQ is a self-report questionnaire consists of 26 items related to the four gameplay sub-domains: affective experience, focus, gameplay barriers and usability barriers, as built on the original author's model, Mark Parnell (2009). The examinees must examine each of the items considering their feelings, behaviors and difficulties encountered during the last game and classify them according to a Likert scale of seven points, namely: 1 =

Strongly Disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly Agree. The score of the scale ranges from 26 to 182 points and high scores indicate a more complete gaming experience, with a greater emotional involvement, better focus on the game and few usability and playability barriers. In addition to an overall score, RGQ allows the calculation of partial scores recorded in the four subdomains of gameplay, namely the affective experience (items 1, 4, 10, 22 *, 24 *, 26), focus (items 2, 3 , 6, 9, 13 *, 18, 19, 20 *, 23), playability barriers (items 12 *, 14, 15 *, 16, 25) and usability barriers (items 5, 7, 8, 11, 17 *, 21 *). 1 The items marked with the sign * receive reverse score for the calculation of partial and full scores (7, 6, 5, 4,3,2,1).

Data analysis

Data analysis will follow an analysis of semantic, literal and idiomatic agreement between the original questionnaire and the translated and adapted version. The main focus will be on demonstrating the way the 3 scale syntheses were built, focusing on suggestions and adaptations that were incorporated at each of the construction steps to the final version of the RGQ. Table 2 shows the changes of each of the three synthesis, and presents the back-translation and the necessary decision-making of the team involved in this study.

Results

The results referring to versions synthesis 1-3 consisted of qualitative data obtained from the comparison of the versions of the direct translation and back translation of RGQ by the experts and review by the expert judges and experts translators following the cognitive debriefing (Table 2).

Table 2. Translation process of the Revised Gameplay Questionnaire

	Items				
	Original version	**Conciliation V1 e V2 (step 1)**	**Back translation (step 2)**	Review post Cognitive Debriefing **(step 3)**	**Synthesis of comparative analysis of the three steps**
1	I enjoyed the game.	Eu gostei do jogo	I liked the game	Eu desfrutei do jogo	In the post back-translated version we realized that the term "gostou" was closer to the word "liked" which is a more generic term and bland than "enjoyed". Therefore it was decided to translate to the term "desfrutar" because it has a greater literal, semantic and idiomatic proximity with the original term.
2	I was focused on the game.	Eu estava focado no jogo	I was focused on the game.	Eu estava focado no jogo	The translation fully kept the literal, semantic and idiomatic component of the English version.
3	I could identify with the characters.	Eu pude me identificar com os personagens.	I could identify with the characters.	Eu pude me identificar com os personagens.	The translation fully kept the literal, semantic and idiomatic component of the English version.
4	I thought that the game was fun.	Eu achei que o jogo foi divertido.	I though the game was fun.	Eu achei que o jogo foi divertido.	The translation fully kept the literal, semantic and idiomatic component of the English version.
5	The game trained me in all of the controls.	O jogo me treinou em todos os comandos/controles	The game trained me in all the commands/controls.	O jogo me treinou em todos os comandos/controles	The translation kept the semantic and idiomatic equivalence of the English version.
6	I thought the level of difficulty was right for me.	Eu acho que o grau de dificuldade do jogo foi adequado para mim	I think that the DEGREE OF difficulty of the game was ADEQUATE for me.	Eu acho que o grau de dificuldade do jogo foi adequado para mim	The translation kept the literal, semantic and idiomatic equivalence of the English version.
7	I found the game's menus to be usable.	Eu penso que os menus do jogo são práticos e apropriados	I think that the game's menu was pratical and appropriate.	Eu acredito que os menus do jogo são práticos e apropriados	The translation kept semantic equivalency.
8	I knew how to use the controller with the game.	Eu sabia como usar os controles (teclado, mouse, joystick) dentro do jogo	I knew how to use the controls(keyboard, mouse, joystick) in the games.	Eu sabia como usar os controles (teclado, mouse, joystick) dentro do jogo	The translation kept the semantic and idiomatic equivalence of the English version.
9	I was unaware of the passage of time whilst playing.	Eu não percebi a passagem do tempo enquanto jogava	I did not realize the time passing while playing the game.	Eu não percebi a passagem do tempo enquanto jogava	The translation kept the semantic component of the English version.
10	I found the appearance of the game world to be interesting.	Eu achei a aparência/visual do mundo/ambiente do jogo interessante.	I found the appearance of the game world interesting.	Eu achei a aparência/visual do mundo/ambiente do jogo interessante.	We chose to add appearance/visual and world/environment, considering the different genres of games.
11	I knew how to change the settings in the game.	Eu sabia como mudar as configurações no jogo	I knew how to change the game configurations.	Eu sabia como mudar as configurações no jogo	The translation fully kept the literal, semantic and idiomatic component of the English version.
12	My objectives in the game were unclear.	Meus objetivos no jogo não estavam claros	My objectives in the game were not clear.	Meus objetivos no jogo não estavam claros	The translation fully kept the literal, semantic and idiomatic component of the English version.
13	I thought about things other than the game whilst playing.	Eu pensei em outras coisas além do jogo enquanto jogava	I was thinking of other things besides the game while playing.	Eu pensei em outras coisas além do jogo enquanto jogava	The translation fully kept the literal, semantic and idiomatic component of the English version.
14	I knew how the game would respond to my actions.	Eu sabia como o jogo iria responder às minhas ações	I knew how they game would respond to my actions	Eu sabia como o jogo iria responder às minhas ações	The translation fully kept the literal, semantic and idiomatic component of the English version.
15	I couldn't find my way in the game world.	Eu não consegui encontrar meu caminho dentro do mundo do jogo	I could not find my way in the game world.	Eu não consegui encontrar meu caminho dentro do mundo do jogo	The translation fully kept the literal, semantic and idiomatic component of the English version.
	I always knew	Eu sempre sabia como	I always knew how to	Eu sempre soube	After the cognitive debriefing, we corrected "Eu

16	how to achieve my aim in the game.	conquistar meu objetivo no jogo	achieve my objective in the game.	como conquistar meu objetivo no jogo	sempre sabia" to “eu sempre soube," because it has a greater literal, semantic and idiomatic proximity, with the original term.
17	I found the game's menus to be cumbersome.	Eu achei os menus do jogo complicados.	I found the menu of the game complicated.	Eu achei os menus do jogo complicados.	The translation kept the semantic component of the English version.
18	I found the game mechanics to be varied enough.	Eu achei a mecânica do jogo suficientemente variada	I found the mechanics of the game sufficiently diviersified.	Eu achei a mecânica do jogo suficientemente variada	The translation fully kept the literal, semantic and idiomatic component of the English version.
19	I forgot about my surroundings whilst playing.	Eu esqueci o que acontecia ao meu redor enquanto jogava.	I forgot what was happening around me while I played.	Eu esqueci o que acontecia ao meu redor enquanto jogava.	The term "about" was translated as "o que acontecia" in order to maintain the semantic equivalence of the original sentence.
20	My field of view made it difficult to see what was happening in the game.	Meu campo de visão tornou difícil ver o que estava acontecendo no jogo.	My field of view became dificult to see what was happening in the game.	Meu campo de visão externo tornou difícil ver o que estava acontecendo dentro do jogo.	The term "field of view" has generated a number of questions during the step of cognitive debriefing, because it could be translated as “campo de visão” or “área de visão” and could also refer to the character of the game or the player. We chose to add "externo" expression and "dentro do jogo" to clarify that the question relates to the field of view that player has (room, board, computer, videogame) and that somehow made difficult realizing what was happening inside the game. This question is directly related to the game's ability to hold the attentional focus of the player so we considered the appropriate changes to maintain the semantic sense.
21	I found using the options screen to be difficult.	Eu achei difícil utilizar a tela de opções	I found it difficult to utilize the options screen.	Eu achei difícil utilizar a tela de opções	The translation fully kept the literal, semantic and idiomatic component of the English version.
22	The aesthetics of the game were unimpressive.	A estética do jogo não era impressionante	The aesthetics of the game were not impressive.	A estética do jogo não era impressionante	The translation fully kept the literal, semantic and idiomatic component of the English version.
23	I thought the camera angles in the game were appropriate.	Eu achei que os ângulos da câmera no jogo eram apropriados.	I thought that the angles of the camera in the game were appropriate.	Eu achei que os ângulos da câmera no jogo eram adequados.	Embora a tradução inicial tenha mantido a equivalência semântica, considerou-se que o termo “adequado” tem uso mais comum que “apropriado” Although the initial translation maintained the semantic equivalence, we considered that the term 'adequado' is more commonly used than "apropriado".
24	The game failed to motivate me to keep playing.	O jogo falhou em me motivar a continuar jogando	The game failed to motivate me to continue playing.	O jogo falhou em me motivar a continuar jogando	The translation fully kept the literal, semantic and idiomatic component of the English version.
25	I always knew where to go in the game.	Eu sempre sabia aonde ir no jogo	I always knew where the game was going.	eu sempre soube aonde ir no jogo	After the cognitive debriefing, we corrected "Eu sempre sabia" to “eu sempre soube," because it has a greater literal, semantic and idiomatic proximity, with the original term.
26	I wanted to explore the game world.	Eu queria explorar o mundo do jogo	I wanted to explore the world of the game.	Eu queria explorar o mundo do jogo	The translation fully kept the literal, semantic and idiomatic component of the English version.

a) The first synthesis

The first synthesis occurred after the V1 and V2 have been submitted to the committee of expert judges representing the five regions of Brazil (North, Northeast, South, Southeast and Midwest). This step aimed to avoid regionalisms or terms that were incomprehensible or too technical/complex.

b) The second synthesis

The second synthesis occurred after the back translation and the consequent discussion about its similarity with the author's original questionnaire. Also, along with the expert judges committee, the only change proposed by the author was discussed, which involved the first question. The translated version of the item 1 ("I enjoyed the game") was considered inadequate idiomatically. This led to the modification of the first translated version of the item 1 from "*Eu gostei do jogo*" to "*Eu desfrutei do jogo*".

c) The third synthesis

After the cognitive debriefing, we identified the need to improve the translation of three items, namely items 7, 16 and 25. The translated versions of item 7 ("I found the game's menus to be usable."), item 16 ("I always knew how to Achieve my aim in the game") and item 25 ("I always knew where to go in the game") were considered idiomatically inadequate. This led to the modification of the first translated version of item 7 from "I think that the game menus are practical and appropriate" *("Eu penso que os menus do jogo são práticos e apropriados*") to "I believe that the game menus are practical and appropriate" ("*eu acredito que os menus do jogo são práticos e apropriados*"); item 16 from "I always knew how to conquer my goal in the game" ("*Eu sempre sabia como conquistar meu objetivo no jogo*") to "I've always known how to achieve my goal in the game" ("*Eu sempre soube como conquistar meu objetivo no jogo"*); and finally the initial translation of the item 25 "I always know where to go in the game" ("*Eu sempre sabia aonde ir no jogo*") to "I always knew where to

go in the game." *(“eu sempre soube aonde ir no jogo”).*

These changes had the intention to offer idiomatic proximity with the term in the original version of the instrument. Finally, version 3 was elaborated - considered the final version of the translation and adaptation of RGQ into Portuguese used in Brazil - consisting of 26 items, as shown in column 4 of Table 2.

Study 2) Psychometric Validation

Method

Participants

Participants, from both genders, were recruited in a private school in São Paulo, Brazil. Their parents filled a questionnaire to check health condition, psychotropic medication use or any sensorial, developmental or neurological disorders. School informed if any student have repeated a grade. If any of these conditions were detected, she/he would be excluded from this study. The final sample (N=101 adolescents) presented homogeneity in the demographic characteristics (mean age=10.9, SD=0.3, ranging from 10 to 12 y.o., 52 female), and presented 6 years of formal education. This study was approved by the university’s Institutional Ethical Committee Review Board, under the registration number (CAAE) 00751612.7.0000.5505. Primary caregivers signed the informed consent form.

Instruments

The Dragon Hunter Task (DHT) is a self-paced video game based-task specifically developed for this study. It is a 10-min continuous performance task-like where motor responses have to be executed (or inhibited) depending on the presence of a specific element (magical aura) on the screen. This response inhibition task was embedded in the context of an adventure game where the participant have to recover 12 sapphires stolen by mighty dragons. These dragons hold a magical aura that protects them from any type of attack. Each magical aura has a specific inter-stimuli interval (ISI 3, 4, 5, 6, 7,

8, 9 seconds), signaling the participants to suppress any type of motor activity (i.e., attack the dragons). Several inter stimuli intervals were presented in a randomized order and its primary function was to avoid the learning effect. The game was divided in 12 stages. In each stage, the participant have 9 trials to achieve 5 correct hits (i.e., performing an attack when the magic aura disappears), not necessarily in a sequential order. If the participant make 5 correct answers, she is rewarded with one of the 12 sapphires and the stage is completed. However, if the participant made 5 errors, she failed the stage and advances to the next without rewards.

RGQ adaptation

In the present study, we employed the above presented version of RGQ. We submitted the young adult version of RGQ to a cognitive debriefing process to adapt the instrument to adolescents. The pilot sample was composed of 10 adolescents, 5 female, 12 y/o and 6 year of education. They have to point out items which were inadequate to the present context or items that were incomprehensive. Through the obtained results, we excluded 5 items: 2 that were incomprehensive to the participants (item 18 “I found the game mechanics to be varied enough” and 20 “My field of view made it difficult to see what was happening in the game”) and 3 items that did not apply to the DHT experience (item 11 “I knew how to change the settings in the game”, “I found the menus of the games to be cumbersome” and 21 “I found using the options screen to be difficult”).

Proceedings

The RGQ collection occurred collectively in the classroom after the use of DHT. The complete research proceeding lasted 50 minutes. The participants were submitted to four data collection steps: 1) DHT tutorial; 2) previous videogame proficiency questions; 4) DHT assessment; 4) and answering the RGQ.

Data analyses

Bayesian statistics were employed. To verify the dimensionality and to understand the factorial structure of RQG, exploratory factorial analyses (EFA) were executed via Mplus software (Muthén & Muthén, 2015; *7.31 version*).

Results

Evidence of validity and dimensionality of RGQ

Despite many alternatives of reliability estimates, Bayesian alpha coefficient (Balpha) was used because it is relatively non-biased when compared to Cronbach's alpha, allowing prior information that stabilize the reliability inferences and internal consistency (Okamoto, 2013; Brannick & Zhang, 2013; Padilla & Zhang, 2011). The Balpha obtained for RGQ was equal to 0.88, with 95% credible interval (C.I.) between 0.84 and 0.93.

Dimensionality and latent analysis were performed by Bayesian EFA in the RGQ items. Items were considered as continuous and categorical variables to compare different fit models. Both continuous and categorical options were considered due to the limitation of Mplus software (Muthén & Muthén, 2015; version 7.31) that only calculates the models fit, as the Deviance Information Criterion (DIC), Bayesian Information Criterion (BIC), and the estimated number of parameters (pD) for continuous variables, enabling the comparison of the models through the Bayes factor (BF). However, when the variables were considered as categorical (using polychoric correlations) the correlation matrix fitted better when compared to Pearson's.

When the RGQ items were treated as continuous variables, only the 4-factors model showed a posterior predictive p-value (PPp) above 0.05. But, when the items were treated as categorical, both 3- and 4-factors models showed PPp greater than 0.05; suggesting that both are candidate models to explain the data proper fit (see Table 1). The 1- and 2-factors models did not have appropriate adjustments in the analyses. The 5- and 6-factors models (not shown in Table 1) did not obtain

convergence. Empirical and random eigenvalues greater than 1 were: 8.09, 2.10, 1.87, 1.12, and 1.06. Note that the first eigenvalue was more than 2.5 times bigger than the second, evidencing the unidimensionality of the RGQ questionnaire.

Table 4 – Bayesian EFA models of RGQ using items as continuous or categorical variables.

	EFA model	#Pars.	PPC	PPp	DIC	BIC	pD	BF	log BF
Continuous Variables	1-factor	63	103.33 to 213.86	.000	8575.34	8741.69	61.68	-	-
	2-factors	83	62.03 to 177.75	.000	8554.51	8772.39	80.66	.000	-15.34
	3-factors	102	21.37 to 140.35	.005	8498.66	8801.81	62.51	.000	-14.72
	4-factors	120	-12.34 to 107.82	.055*	8460.94	8837.71	57.98	.000	-17.95
Categorical Variables	1-factor	147	43.50 to 178.71	.000					
	2-factors	167	12.54 to 154.85	.009					
	3-factors	186	-21.51 to 128.12	.083*					
	4-factors	204	-32.47 to 115.81	.155*					

Note: PPC = Bayesian posterior predictive checking using chi-square; PPp = posterior predictive p-value; DIC = Deviance Information Criterion; BIC = Bayesian Information Criterion; pD = number of estimated parameters; BF = Bayes factor.

Although the 3-factors model have had the best fit for the observed data, most of the factor loadings of 1-factor model were higher than 0,30 within the 95% credible interval (Table 2, flagged with an asterisk).

Table 5 – Bayesian EFA posterior factor loadings.

	1-factor	2-factors		3-factors			4-factors			
Item	F1	F1	F2	F1	F2	F3	F1	F2	F3	F4
1	.970*	.933*	.077	.879*	.072	.065	.781	.396	.014	.034
2	.744*	.703*	-.007	.638*	.079	.172	.541	.190	.127	.065
3	.725*	.698*	.175	.721*	.055	-.177	.674*	.020	-.067	.114
4	.973*	.951*	.006	.897*	.015	.111	.797*	.379	.049	-.012

5	.819*	.817*	.041	.841*	-.009	-.114	.806*	.013	-.049	.016
6	.631*	.619*	-.008	.605*	.007	.035	.552*	.093	.066	.003
7	.686*	.697*	-.044	.730*	-.149	-.029	.683*	.050	-.028	-.101
8	.211	.131	.335	.096	.318	-.117	.033	.291	-.151	.220
9	.702*	.734*	-.209	.742*	-.228	.044	.681*	.014	.095	-.164
10	.763*	.777*	-.114	.782*	-.136	.021	.737*	.032	.068	-.112
11	.016	.027	-.415	-.013	-.139	.484*	-.034	-.028	.456*	-.108
12	.475*	.467	-.343	.308	-.007	.536*	.125	.008	.591*	.009
13	.350*	.262	.394	.258	.322	-.169	.187	.232	-.225	.260
14	.213	.089	.165	-.018	.562*	.398	-.074	.047	.371	.554*
15	.325*	.119	.596	.006	.726*	-.021	.013	.077	-.031	.709*
16	.570*	.579*	-.006	.599*	-.042	-.043	.556*	.008	.000	-.007
17	.574*	.572*	-.303	.433	-.005	.477*	.269	.020	.563*	-.005
18	.619*	.579*	.225	.605*	.141	-.226	.598*	-.006	-.136	.202
19	.546*	.479*	-.120	.296	.240	.489*	.067	.088	.562*	.226
20	.408*	.271	.411	.155	.591*	.009	.071	-.015	.042	.706*
21	.711*	.709*	.006	.713*	.017	-.016	.708*	-.084	.046	.071

Only items 8, 11 and 14 did not have significant posterior factor loadings in 1-factor model, and item 8 was not significant on any of the exploratory model.

In Table 2, both 2- and 4-factors models had a factor (F2) without any relevant factor loadings and, therefore, they are not good models to represent the collected data. Following these results, we can justify the use of 1-factor model.

Then, the Bayesian CFA was calculated considering the posterior factor loading of the 3-factors EFA model. By the other side, theoretical model was built by setting the items on their respective factors, according Parnell (2009) theory. In the reduced questionnaire, Affection factor was formed by items 1, 4, 10, 17, 19, and 21; Focus factor by Items 2, 3, 6, 9, 12, 16, and 18; Gameplay factor by items 11, 13, 14, and 15; and Usability factor was composed by

items 5, 7, and 8. The results showed, however, that items 3, 16 and 18 had no significant loads in Focus factor, as predicted in the theoretical model. Item 11 had negative factor loading on Gameplay factor, showing that it is not appropriated; and item 3 had significant load on the Usability factor, which was not provided in the model.

So, these two CFA models were compared: the empirical 3-factors model obtained through EFA, and the Parnell's theoretical model (2009). The number of free parameters of empirical 3-factors was 177, with PPC between -20.29 and 98.13; and PPp equal to 0.10. The correlation of the first (F1) with the second factor (F2) was equal to 0.36 [95% I.C. = 0.15 to 0.86], and with the third factor (F3) was equal to 0.22 [0.07 to 0.61]. A very weak correlation was found between F2 and F3 (ρ = 0.07 [0.09 0.37]). The Parnell's theoretical model (2009) also was calculated using the cross-loadings as variables with priori values varying between -0.2 and 0.2, with PPp equal to 0.09; 220 free parameters and PPP between -21.81 and 109.58. The correlation between Affective experience and Focus was 0.77 [0.55 to 0.90]; Affective experience and Gameplay barriers was 0.29 [0.05 to 0.49]; and between Affective experience and Usability barriers was 0.76 [0.62 to 0.85]. The theoretical model showed no correlation between Focus and Gameplay barriers factors (ρ = 0.20 [-0.11 to 0.45]), and between Usability and Gameplay barriers (ρ = 0.23 [-0.01 to 0,50]).

These CFA results suggest that the Parnell's theoretical model (2009) would need a revision, since it does not accommodate the empirical data of this study better than the model obtained by the EFA approach. Perhaps the exclusion of five items RGQ questionnaire have affected its multidimensional structure and the one-dimensional model (1-factor) has become more promising to fit the present data.

Discussion

The present sudy describes the translation, cultural adaptation and the

validation of the Brazilian version of the Revised Gameplay Questionnaire adapted for the five Brazilian regions, using the method proposed by the TCA group. This methodology proved to be appropriate due to its clear, sequential and rigid structure which provides successive steps that are easily applicable.

The first study focused on three subsequent syntheses of RGQ, mainly aiming to the research of semantic, idiomatic and literal equivalence between the original and the adapted version.

The Brazilian version of the RGQ went through the cognitive debriefing process in which 09 videogame players assessed the use of the questionnaire after a game. From the perceptions of players, three questions had to be modified for a better semantic adequacy. The author of the original instrument was involved during the synthesis steps 2 and 3, which contributed to the final adapted version to be as compatible with the original version as possible.

The use of the principles and best practices proposed by the TCA group collaborates with the thoroughness that is required in a translation and adaptation of an instrument to different cultures. It is critical to adopt linguistic care, to the extent that certain terms may have different meanings, specificities and connotations, inherent to each language or culture, especially when the concerned tool assesses the subjective experience while using a technology that is constantly changing, as digital games. Thus, the literal equivalence in the translation of an instrument may be insufficient to maintain its purpose when used in a new culture. This can be observed in this study in items 7, 16 and 25 of the scale. These items, although they have not shown good psychometric properties for the literal translation, proved to be equivalent in idiomatic and semantic terms when analyzed by judges with high proficiency in English and Portuguese. The importance of searching for equivalence between the foreign language version and Portuguese has been increasingly recognized, with a growing

number of studies that, in different fields, seek the development of instruments considering this concern. The PRO model demonstrated strengths in uniting not only methodological rigor, but also simplicity in the execution of the steps.

In relation to the second study, the validation process, exploratory and confirmatory factorial analises suggestes that Parnell's (2009) theoretical model is unidimensional, after the exclusion of 5 items in the original questionaire.Confirmatory factor analysis (CFA) suggests that the theoretical model of Parnell (2009) need revision, since it does not fit the empirical data better than the CFA model obtained after the exploratory factor analysis (EFA). Perhaps, the exclusion of the five items in RGQ have affected its multidimensional structure and the one-dimensional model has become more promising to fit data.

Psychometrical studies of the RGQ suggested that the four factor structure, proposed by Parnell (2009), was not confirmed. In one hand, we found problems related to item construction such similar items (i.e., item 15 "I always knew how to conquer my goal in the game", and item 20 "I always knew where to go in the game"). On the other hand, the original questionnaire structure could have been impaired by diminishing the number of items (by adjusting the RGQ questionnaire to the Dragon Hunting Task). However, the difficulty to find the multidimensionality proposed by Parnell could be explained by the several heuristics, comprehending each factor on it. For example, the questions on factor 1 (Emotional experience) were related to three different heuristics: fictional immersion, sensory immersion and affective immersion. The factor 4 (Usability barriers), was formed by questions representing 5 different heuristics; control, customizability, consistency, camera (views) and game interface. Even more, each question was lately related to specifics constructs, such as affect, ownership, absorption, consistency, goals, help, controls and others. This amount of variability in the heuristics and theoretical constructs makes it hard to grouping the items into these comprehensive factors.

Another problem with the RGQ construction is related to the number of subjects employed in the cluster analysis. The author used 98 subjects and the initial questionnaire had 49 questions. We believe que cluster analysis is not the best choice to be employed in this kind of study, once it

does not deal with the latent trait, as EFA does.

Problems with the item reduction process, resulting in the final 26 items, can explain why the theoretical 4-factors model also was not found in the present study.

When the author employed a multiple regression technique of each RGQ factor against an appeal scale (i.e., comparing pair of words, such as 'fun-boring' or 'unpleasant-pleasant'), the total R^2=0.73 was found. However, the first factor, Affective experience contributed to explain the variance of R^2=0.60, while Focus was R^2=0.21, Playability barrier was R^2=0.16, and Usability barrier was not significant. This reinforces our findings that this questionnaire has just 1-factor not 4-factors.

Lastly, when Parnell (2009) analyzed the inter-correlations between factors, strong correlations were found among Emotional experience and Playability barriers and complete the questionnaire score. Moderate correlation was found between Usability barrier and the total score. These results suggest que the RGQ questionnaire can be properly used to measure the individual's overall game experience.

It should be also noted that the model proposed by Parnell does not cooperate in creating an instrument that captures a tight and final image on the game experience, but contributes to the perception of variety of features that are present, depending on the game that is evaluated. The relation between barriers and commitment in gaming is the basis of the model proposed by Parnell and the use of RGQ can collaborate on the process of games construction that take into account the emotional experience and the ability of attentional focusing on the game, which is common for the construction of digital games entertainment, but not as common in the construction of serious games for education and health.

This paper presents a new and extremely important tool for the study of user interaction and digital game, especially for the study of emotional experience, focus on activity and usability and gameplay barriers that can harm the player's experience. The RGQ fills a gap in a number of research lines involving videogames as the used methodological tool, as in studies that assess the effect of games on skills training, in the use of simulators, learning content or even as a theoretical

model to understand the behavioral, cognitive, social and emotional functioning. With the ability to know if a particular game presents gameplay and usability barriers, it will be possible to develop more peaceful and pleasurable experiences, eliminating usability artifacts in the data analysis. Evaluating the focus and emotional experience during a game will probably lead to a greater understanding of the player's commitment and motivation during the game, which can contribute to develop instruments that are able to keep the levels of challenges and the player's skill increasing fluidly, following one of the basic requirements for effective learning, one of the main benefits of using digital games in healthcare (Granic et al, 2014;. Jones, et al, 2014.).

Limitations

It is essential to build standards targeting different age groups of videogame players, possibly using as one of the validation criteria the Brazilian indicative classification system, which defines the age ranges of digital games (free, not recommended for children under 10, 12, 14, 16 and 18 years old).

Declaration of Conflict of Interest

Thiago Strahler Rivero received a research grant from FAPESP (Fundação de Amparo a Pesquisa do Estado de São Paulo - Foundation of Research of the State of São Paulo) and the AFIP (Associação do Fundo de Incentivo à Pesquisa - Association for Research Incentive Fund). The authors state that the research was conducted in the absence of any commercial or financial relations that could be construed as a potential conflict of interest.

References

Anguera, J. A., Boccanfuso, J., Rintoul, J. L., Al-Hashimi, O., Faraji, F., Janowich, J., et al. (2013). Video game training enhances cognitive control in older adults. *Nature, 501*, 97–101.doi: 10.1038/nature12486

Bellotti, F., Kapralos, B., Lee, K., Moreno-Ger, P. & Berta R. (2013). Assessment in and of Serious Games: An Overview. *Advances in Human-Computer Interaction, vol. 136864 (11).* doi:10.1155/2013/136864

Burke, J. W., McNeill, M. D. J., Charles, D. K., Morrow, P. J., Crosbie, J. H., and McDonough, S. M. (2009). Optimising engagement for stroke rehabilitation using serious games, *The Visual Computer, 25(12),* 1085-1099. doi: 10.1007/s00371-009-0387-4

Desurvire, H., & Wiberg, C. (2008). *Master of the game: assessing approachability in future game design.* In CHI '08: Extended Abstracts On Human Factors In Computing Systems, pp. 3177–3182, New York: ACM. doi: 10.1145/1358628.1358827

Febretti, A. & Garzotto, F. (2009). *Usability, playability, and long-term engagement in computer games*. In CHI EA '09: Proceedings Of The 27th International Conference Extended Abstracts On Human Factors In Computing Systems, pp 4063–4068, New York: ACM. doi: 10.1145/1520340.1520618

Federoff, M. (2002). *Heuristics and Usability Guidelines for the Creation and Evaluation of Fun in Video Games*. Unpublished thesis, Indiana University, Bloomington; Retrived from www.melissafederoff.com/thesis.html

Flores, E., Tobon, G., Cavallaro, E., Cavallaro, F.I., Perry, J.C., & Keller, T. (2008). Improving patient motivation in game development for motor deficit rehabilitation. In: *Proceedings of ACE*, Yokohama. doi: 10.1145/1501750.1501839

Göbel, S., Gutjahr, M., & Steinmetz R. (2011). *What Makes a Good Serious Game - Conceptual Approach Towards a Metadata Format for the Description and Evaluation of Serious Games*. In Dimitris Gouscous and Michalis Meimaris, editors, Proceedings of the 5th European Conference on Games Based Learning, pp. 202–210. Academic Conferences Limited,

Reading, UK, ISBN 978-1-908272-19-5 CD.

Granic, I., Lobel, A., & Engel,s C. M. E. (2013). The Benefits of Playing Video Games. *American Psychological Association. Vol. 69, (1),* 66 –78. doi: 10.1037/a0034857.

Jones, C. M., Scholes, L., Johnson, D., Katsikitis, M., & Carras, M. C. (2014). Gaming well: links between videogames and flourishing mental health. *Frontiers in Psychology, 5:*260. doi:10.3389/fpsyg.2014.00260

Kato, P. M. (2010). Video games in health care: Closing the gap. *Review of General Psychology, 14(2),* 113. doi:10.1037/a0019441.

Kiili, K., Perttula, A., Lindstedt, A., Arnab, S. & Suominem, M. (2014). Flow Experience as a Quality Measure in Evaluating Physically Activating Collaborative Serious Games. *International Journal of Serious Games, 1 (3),* 35-49. doi: 10.17083/ijsg.v1i3.23

Korhonen, H., & Koivisto, E. M. (2006). *Playability heuristics for mobile games*. MobileHCI '06 pp 9-16. New York:AC. doi: 10.1145/1152215.1152218

Mayer, I., Bekebrede, G., Harteveld, C., Warmelink, H., Zhou, Q., van Ruijven, T., & Wenzler, I. et al . (2014). The Research and Evaluation of Serious Games: Toward a Comprehensive Methodology. *British Journal of Educational Technology, 453,* 502-527. doi:10.1111/bjet.12067

Merry, S. N., Stasiak, K., Shepherd, M., Frampton, C., Fleming, T., Lucassen, M. F. (2012) The effectiveness of SPARX, a computerised self help intervention for adolescents seeking help for depression: randomised controlled non-inferiority trial. *BMJ* 344:e2598. doi:10.1136/bmj.e2598

Microsoft Fly Simulator [Computer software]. (1982). Estados Unidos da America, Retrieved from http://fshistory.simflight.com/fsh/index.htm

Nacke, L.E., Drachen, A., Goebel, S. (2010). Methods for Evaluating Gameplay Experience in a Serious Gaming Context. In *International Journal of Computer Science in Sport, 9 (2),* Darmstadt, retrieved from Germany.http://iacss.org/index.php?id=96

Pagulayan, R. J., Keeker, K., Wixon, D., Romero, R. L., and Fuller, T. (2003). *User centered design in games.* In J.A. Jacko and A. Sears (Eds.) The Human Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications. New York: Lawrence Erlbaum Associates.

Parnell, M. J. (2009). *Playing with Scales: Creating a Measurement Scale to Assess the Experience of Video Games.* Retrieved from http://www.uclic.ucl.ac.uk/distinctionprojects/

Pinelle, D., Wong, N., Stach, T. 2008. *Heuristic Evaluation for Games: Usability Principles for Video Game Design*. In Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI 2008), pp. 1453-1462. doi:10.1145/1357054.1357282.

PixelJunk™ Eden [computer software]. (2008). Japan, Retrieved from http://pixeljunk.jp/library/Eden/

Reisman, S. (1972). Dominoes: A computer simulation of cognitive processes. Simulation & Games, 3, 155-164. doi: 10.1177/003755007200300203

Shams, T. A., Foussias, G., Zawadzki, J. A., Marshe, V. S., Siddiqui, I., Müller, D. J., Wong, A. H. (2015). The Effects of Video Games on Cognition and Brain Structure: Potential Implications for Neuropsychiatric Disorders. *Curr Psychiatry Rep*, *17*(9),609. doi: 10.1007/s11920-015-0609-6.

Sue, D., Ray, P., Talaei-Khoei, A., Jonnagaddala, J., & Vichitvanichphong, S. (2014). Assessing Video Games to Improve Driving Skills: A Literature Review and Observational Study. *JMIR Serious Games, 7(2)*:e5. doi: 10.2196/games.3274.

Van Dongen-Boomsma. M., Vollebregt, M. A., Buitelaar, J. K., & Slaats-Willemse, D. (2014) Working Memory training in young children with ADHD: a randomized placebo-controlled trial. *J Child Psychol Psychiatry, 55,* 886-896. doi: 10.1111/jcpp.12218.

Wijnhoven, L. A. M. W., Creemers, D. H. M., Engels, R. C. M. E., & Granic, I. (2015). The effect of the video game Mindlight on anxiety symptoms in children with an Autism Spectrum Disorder. *BMC Psychiatry, 15,* 138. doi:10.1186/s12888-015-0522-x

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A, et al. (2005). Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value in health: *the journal of the International Society for Pharmacoeconomics and Outcomes Research,8(2):*94–104. doi: 10.1111/j.1524-4733.2005.04054.x PMID:15804318.

Stan Development Team (2015). *Stan Modeling Language Users Guide and Reference Manual, Version 2.7.0.*

Kruschke, J. (2015). *Doing Bayesian Data Analysis: a tutorial with R, JAGS, and Stan*. N.Y.: Elsevier.

How to cite this Article: Rivero, T. S., Pires, E.U., Alves, M.V.C., Silva, J.F., Schlottfeldt, C.G., Bolognani, S.A.P., …Bueno, O.F.A. (2016). Translation and cultural adaptation of a questionnaire to evaluate player experience . *International Journal of Psychology and Neuroscience, 2*(1), 206-234.

Received: 23/11/2015; **Revised:** 03/04/2016; **Accepted:** 05/04/2016; **Published online:** 9/05/2016; **ISSN 2183-5829**