

RESEARCH PAPER

Validation of the Game User Experience Satisfaction Scale (GUESS-18) in Brazilian Secondary School Students

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Abstract. Digital games have become increasingly relevant not only as entertainment products but also as cultural and interactive media experiences, reinforcing the need for reliable instruments to assess player experience and satisfaction. Despite the growing Brazilian gaming market, there is still a lack of validated instruments in Brazilian Portuguese for measuring game user experience. This study aimed to translate, culturally adapt, and preliminarily validate the Game User Experience Satisfaction Scale (GUESS-18) for use in the Brazilian context. Using a sample of 259 Brazilian secondary school students, the study included translation procedures, cultural adaptation through comprehension testing and item reformulation, item sensitivity analysis, exploratory and confirmatory factor analyses, and reliability assessment of the scale's nine dimensions. Exploratory Factor Analysis (EFA) indicated acceptable sample adequacy ($KMO = 0.584$), confirmed by Bartlett's Test of Sphericity, $\chi^2(153) = 1281.494$, $p < 0.001$. The analysis identified nine factors with loadings ranging from 0.605 to 0.967, conceptually consistent with the original GUESS-18 theoretical structure and subscales. Although the Confirmatory Factor Analysis (CFA) fit indices were below the reference values commonly recommended in the literature, the EFA results support the structural consistency of the Brazilian version. Reliability analysis showed Cronbach's alpha values ranging from acceptable to very good across the nine factors and the overall scale. The findings suggest that GUESS-18-BR is a promising instrument for assessing player experience and satisfaction among Brazilian players, contributing to research and development in digital games and user experience evaluation.

Keywords: Digital Games, GUESS-18, Player Experience, Playtest, Scale Validation

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1 Introduction

The digital games industry has experienced rapid growth worldwide, reaching gross revenues of US\$188.8 billion in 2025 and a player base of approximately 3.6 billion users, representing a 4.4% increase compared to 2024. All global regions have shown growth in the number of players (Global Games Market Report, 2025).

In recent years, digital games have assumed a central role in contemporary culture, extending beyond their original entertainment function. Recent studies indicate that games act as cultural mediators, influencing social practices, interaction patterns, perceptions of the world, and identity construction processes [Cerezo-Pizarro *et al.*, 2023]. More than cultural products, games constitute a symbolic infrastructure that permeates different spheres of everyday life, including education, work, and consumption [Yodovich *et al.*, 2025]. In this context, games have also undergone a process of legitimization as relevant cultural artifacts, driven by their increasing integration with other creative industries and by the expansion of their narrative and representational diversity [Gislaam *et al.*, 2025].

In addition to their economic and cultural relevance, digital games have also gained prominence in sectors beyond entertainment through the use of so-called serious games. According to Zyda [2005], serious games can be defined as a “mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and

strategic communication objectives” (p.26).

The rapid growth of the digital games industry has resulted in an increasing number of game releases and, consequently, greater challenges in developing competitive and engaging games. As player expectations continue to evolve, understanding how users perceive and experience games has become an essential component of game design and evaluation. Consequently, playtesting and Player Experience (PX) evaluation have become common practices throughout the development cycle. However, obtaining meaningful feedback depends on reliable, psychometrically validated instruments capable of accurately assessing player satisfaction and game user experience [Phan *et al.*, 2016].

Measuring player satisfaction and game user experience is a complex task due to the multidimensional nature of Player Experience. Different instruments assess distinct constructs, including enjoyment, curiosity, immersion, usability, presence, concentration, aesthetics, and emotional engagement. A systematic mapping conducted by Borges *et al.* [2020] identified dozens of Player Experience assessment instruments, revealing considerable conceptual diversity among existing scales and questionnaires.

Beyond conceptual differences, Borges *et al.* [2020] also highlighted an important methodological limitation: most available instruments have been originally developed in English, while only a small number have undergone proper translation and psychometric validation for other languages. Since language constitutes an essential cultural component of

user interaction, the use of untranslated questionnaires or instruments without cross-cultural validation may compromise respondents' understanding and threaten the validity of the collected data.

Supporting this perspective, Walsh *et al.* [2013] argued that administering questionnaires in a language different from participants' native language increases respondents' cognitive effort, whereas directly translating assessment instruments does not guarantee the preservation of their original psychometric properties. Consequently, linguistic and cultural adaptation, followed by psychometric validation, are essential to ensure reliable Player Experience assessment across different populations.

Despite the growing relevance of digital games in Brazil, validated instruments for assessing player satisfaction and game user experience in Brazilian Portuguese remain very limited. To address this gap, this study aimed to translate, culturally adapt, and psychometrically validate the Brazilian Portuguese version of the 18-item Game User Experience Satisfaction Scale (GUESS-18). By providing a validated instrument, this study seeks to support researchers and game developers in conducting more reliable Player Experience evaluations within the Brazilian context.

The remainder of this paper is organized as follows. Section 2 introduces the GUESS-18 scale and summarizes its dimensions and intended applications. Section 3 describes the methodological procedures, including translation, cultural adaptation, data collection, and psychometric analyses. Section 4 presents the results of the preliminary validation of the Brazilian Portuguese version of the instrument. Section 5 discusses the findings in light of previous research and the study's limitations. Finally, Section 6 concludes the paper and outlines recommendations for future validation studies involving broader Brazilian populations.

2 GUESS-18 Scale

The original Game User Experience Satisfaction Scale (GUESS-55), introduced and validated by Phan *et al.* [2016], consists of 55 items designed to assess nine dimensions of player experience: Playability/Usability (PLA), Narratives (NAR), Play Engrossment (ENG), Enjoyment (ENJ), Creative Freedom (CRF), Audio Aesthetics (AA), Personal Gratification (PG), Social Connectivity (SC), and Visual Aesthetics (VA). According to the authors, the scale can be administered to different types of players, ranging from novice to experienced gamers, and across multiple game genres. **Table 1** presents the number of items and a brief description of each subscale.

Keebler *et al.* [2020] developed a shorter version of the GUESS scale, consisting of 18 items distributed across the same nine subscales, with two items per dimension (GUESS-18). The shortened version was specifically designed for game design, playtesting, and interactive game research contexts, which often require repeated assessments and rapid iterations, making the administration of a 55-item instrument excessively burdensome. Due to its practicality and suitability for repeated assessment contexts, the GUESS-18 version was selected for translation, cross-cultural adaptation, and validation in the present study.

3 Methods

The adaptation of the GUESS-18 to Brazilian Portuguese was conducted in three stages: (1) translation of the original instrument, (2) cultural adaptation through comprehension testing and item refinement with representatives of the target population, and (3) preliminary psychometric validation of the resulting Brazilian Portuguese version. This procedure sought to ensure not only linguistic equivalence between the original and translated versions, but also semantic clarity and cultural appropriateness for Brazilian respondents. The methodological steps are described in the following sections.

3.1 Translation into Brazilian Portuguese

The translation of the GUESS-18 scale into Brazilian Portuguese was independently carried out by two specialists fluent in both Portuguese and English. After completing the translations, the specialists met to compare their versions and resolve any inconsistencies. One of the authors of the present study subsequently reviewed the terminology to ensure its adequacy within the context of digital games.

3.2 Cultural Adaptation through Comprehension Testing

In order to verify the adequacy and comprehensibility of the scale among secondary school students, the target population of this study, two focus groups were conducted. The first took place at a Centro Integrado de Educação Pública (CIEP), and the second at a secondary education school, both located in Rio de Janeiro, Brazil. The focus groups were conducted with class 1001 (11 students) and class 1002 (18 students), both full-time secondary education classes.

During the sessions, the researcher explained the objectives of the focus groups, emphasizing that there were no right or wrong answers and instructing participants to identify any terms or complete items they did not understand while responding to the scale. After the initial instructions, participants were given time to complete the instrument and record any doubts or comprehension difficulties.

Following completion of the scale by all participants, the researcher read each item individually, identifying comprehension difficulties and collecting participants' suggestions for potential reformulations. After all items had been discussed, participants were asked to provide an overall evaluation of the language used in the instrument, as well as whether the items were sufficient to assess the gameplay experience. **Table 2** presents the evaluation of the translated GUESS-18 items during the focus groups and the reformulations considered necessary. These reformulations constituted the cultural adaptation stage of the instrument, aiming to improve semantic clarity, reduce ambiguity, and ensure the comprehensibility of the items for Brazilian secondary school students while preserving the conceptual meaning of the original scale.

Table 3 presents a side-by-side comparison between the original English version of the GUESS-18 and the final Brazilian Portuguese version resulting from the translation and cultural adaptation process. This comparison allows readers to examine the wording of the original items and the corresponding adaptations incorporated into the GUESS-18-BR.

After the modifications identified during the comprehension testing were incorporated, the final Brazilian Portuguese

Table 1. Brief Description of the GUESS-55 Subscales and Dimensions.

Subscales	Number of Items	Brief Description
Usability/Playability	11	The ease with which the game can be played, considering clear goals/objectives and minimal cognitive interference or obstruction arising from the user interface and controls.
Narratives	7	The narrative aspects of the game (e.g., events and characters) and their ability to capture the player's interest and shape their emotions.
Play Engrossment	8	The extent to which the game is able to maintain the player's attention and interest.
Enjoyment	5	The degree of pleasure and enjoyment perceived by the player as a result of playing the game.
Creative Freedom	7	The extent to which the game fosters the player's creativity and curiosity, allowing them to freely express their individuality during gameplay.
Audio Aesthetics	4	The different audio aspects of the game (e.g., sound effects) and the extent to which they enrich the gameplay experience.
Personal Gratification	6	The motivational aspects of the game (e.g., challenge) that promote the player's sense of accomplishment and desire to succeed and continue playing.
Social Connectivity	4	The extent to which the game facilitates social connection among players through its tools and features.
Visual Aesthetics	3	The game's graphics and how visually appealing they are perceived to be by the player.

Table 2. Evaluation and Reformulation of Items in the Brazilian Portuguese Version of the GUESS-18 Scale

Item	Original Wording in Portuguese	Observed Difficulty	Revised Wording
2	"A história do jogo capturou a minha atenção desde o início."	Some students demonstrated difficulty understanding the original Portuguese term used to refer to the game narrative. Consequently, a more familiar and widely used equivalent term was adopted to improve clarity and comprehension.	"A história do jogo capturou a minha atenção desde o início."
3	"Eu me sinto desconectado do mundo exterior enquanto jogo."	Some students demonstrated difficulty understanding the expression "outside world".	"Eu me sinto desconectado do que acontece ao meu redor enquanto jogo."
8	"Eu fico muito focado no meu próprio desempenho enquanto jogo"	One student did not understand the statement.	"Eu fico muito focado nos meus resultados e em como estou indo no jogo"
9	"Eu acho que o jogo favorece a interação (por exemplo, chat) entre os jogadores"	One student did not understand the statement.	"Eu acho que o jogo favorece a interação e a comunicação (por exemplo, chat) entre os jogadores"
10	"Eu gosto dos gráficos do jogo"	One student did not understand the statement.	"Eu gosto dos gráficos do jogo (por exemplo, imagens, cenários, personagens)"
11	"Acho a interface (elementos que aparecem na tela) do jogo fácil de navegar"	Some students demonstrated difficulty understanding the English-derived technical term "interface".	"Acho os elementos que aparecem na tela (menus, botões e ícones) do jogo fáceis de usar"
12	"Eu gosto do conceito ou história do jogo"	Some students demonstrated difficulty understanding the more abstract terminology used to describe the game's narrative and concept.	"Eu gosto da história ou da ideia do jogo"
18	"Eu acho o jogo visualmente atraente"	One student did not understand the statement.	"Eu acho o jogo visualmente atraente (cores, cenários e personagens)"

Table 3. Original GUESS-18 Items and Final Brazilian Portuguese Version (GUESS-18-BR)

Original English Item	Brazilian Portuguese Item
1. I find the controls of the game to be straightforward	1. Eu acho que os controles do jogo são simples de entender.
2. I am captivated by the game's story from the beginning.	2. A história do jogo capturou a minha atenção desde o início.
3. I feel detached from the outside world while playing the game.	3. Eu me sinto desconectado do que acontece ao meu redor enquanto jogo.
4. I feel the game allows me to be imaginative.	4. Eu sinto que o jogo me permite ser criativo.
5. I think the game is fun.	5. Eu acho que o jogo é divertido.
6. I feel bored while playing the game.	6. Eu me sinto entediado enquanto jogo.
7. I enjoy the sound effects in the game.	7. Eu gosto dos efeitos sonoros do jogo.
8. I am very focused on my own performance while playing the game	8. Eu fico muito focado nos meus resultados e em como estou indo no jogo.
9. I find the game supports social interaction (e.g., chat) between players	9. Eu acho que o jogo favorece a interação e a comunicação (por exemplo, chat) entre os jogadores.
10. I enjoy the game's graphics.	10. Eu gosto dos gráficos do jogo (por exemplo, imagens, cenários, personagens).
11. I find the game's interface to be easy to navigate.	11. Acho os elementos que aparecem na tela (menus, botões e ícones) do jogo fáceis de usar.
12. I enjoy the fantasy or story provided by the game.	12. Eu gosto da história ou da ideia do jogo.
13. I do not care to check events that are happening in the real world during the game.	13. Fico desligado do mundo real enquanto estou jogando.
14. I feel creative while playing the game.	14. Eu me sinto criativo enquanto jogo.
15. I feel the game's audio (e.g., sound effects, music) enhances my gaming experience.	15. Acho que o áudio do jogo (por exemplo, efeitos sonoros, música) melhora minha experiência de jogo.
16. I want to do as well as possible during the game.	16. Quero me sair o melhor possível durante o jogo.
17. I like to play this game with other players.	17. Eu gosto de jogar este jogo com outros jogadores.
18. I think the game is visually appealing.	18. Eu acho o jogo visualmente atraente (cores, cenários e personagens).

version of the GUESS-18 scale (GUESS-18-BR) was established. The complete instrument is presented in **Table 4**.

3.3 Data Collection and Sampling

To validate the GUESS-18-BR, a sample of secondary school students ($n = 370$) from two Brazilian secondary education institutions located in the state of Rio de Janeiro was recruited. Participants completed a questionnaire consisting of two sections: the first collected identification and demographic information, while the second contained the GUESS-18-BR scale. Before responding to the scale, participants were instructed to identify a digital game they had played frequently and recently, answering the instrument based on that specific game experience. Participants were also asked to indicate the specific game being evaluated. This procedure was intended to ensure that responses were based on a game with which participants had sufficient familiarity and experience. This participant instruction was consistent with the procedure adopted in the original GUESS-18 validation study.

The online version of the questionnaire was completed by 255 students and administered by teachers from the Administration technical course and the Computing discipline. An additional 115 students completed the questionnaire through in-person administration in the classroom in the presence of one of the researchers. During data collection, the administrators explained the purpose of the study to all participants and remained available throughout the application process. The average completion time was approximately 15 minutes.

Since the GUESS-18 is specifically intended to assess player experience, the questionnaire included two screening questions: (1) “Do you usually play digital games?” and (2) “If you answered ‘YES’ to the previous question, how often do you play?”. Access to the GUESS-18-BR was only granted to participants who answered “YES” to the first question and reported either MEDIUM gaming frequency (between 2 and 8 hours per week) or HIGH gaming frequency (more than 8 hours per week).

After the exclusion procedures, the final sample consisted of 259 participants, including 86 women (33.2%), 167 men (64.5%), and 6 participants who preferred not to disclose their gender (2.3%). Participants’ mean age was 16.3 years, ranging from 15 to 18 years old.

Among the participants who completed the GUESS-18-BR, 124 were enrolled at the CIEP school (47.9%), while 135 were enrolled across four campuses of the secondary education institution (52.1%): 39 from the Duque de Caxias campus, 44 from the Engenho Novo campus, 27 from the Realengo campus, and 25 from the Tijuca campus. Regarding educational level, 143 participants were enrolled in the first year of secondary education (55.2%), 89 in the second year (34.4%), and 27 in the third year (10.4%).

The anonymized dataset generated during this study has been made publicly available through the Zenodo repository (DOI: <https://doi.org/10.5281/zenodo.20386698>), supporting transparency, reproducibility, and future secondary analyses.

3.4 Ethical Considerations

This study was approved by the Brazilian Research Ethics Committee under approval number 6.573.650. Participation was voluntary, and informed consent was obtained from all

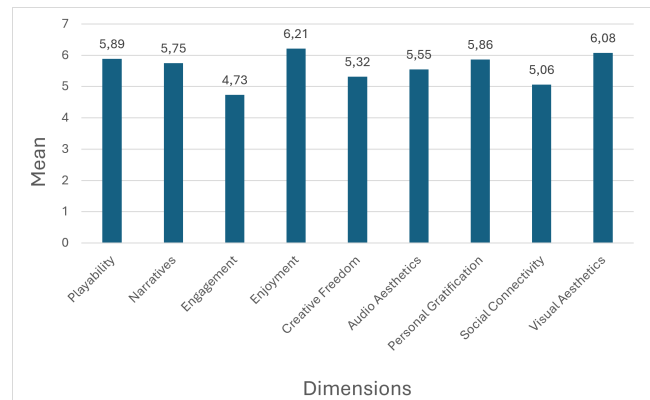


Figure 1. Mean scores obtained for each GUESS-18-BR dimensions.

participants and their legal guardians when required. All procedures were conducted in accordance with applicable ethical guidelines for research involving human participants.

4 Results

Data analysis was conducted using IBM SPSS Statistics, version 29. Initially, descriptive statistics were calculated for the dimensions of the GUESS-18-BR scale (**Table 5**) considering the study sample ($n = 259$). The Social Connectivity dimension presented a smaller number of valid responses ($n = 224$), since 35 participants evaluated the items in this dimension as “Not Applicable” because the games assessed by these respondents did not include multiplayer functionality. To facilitate comparison among dimensions, the mean scores are also presented graphically in **Figure 1**.

Subsequently, skewness and kurtosis analyses were performed to evaluate item sensitivity and verify the adequacy of data distribution for subsequent factor analyses. Most items (**Table 6**) presented values within the limits recommended in the literature [Kline, 2023], considering broad acceptability criteria (skewness between -3 and $+3$ and kurtosis between -7 and $+7$). Negative skewness was observed in several items, as well as elevated kurtosis values, a pattern that may be partially explained by the methodological strategy adopted in the study, in which participants were instructed to evaluate a game they had played frequently and recently. Because these games were self-selected and generally familiar to the participants, responses may have tended toward more favorable evaluations, resulting in scores concentrated at the upper end of the scale.

Item Q5 (Enjoyment) presented higher kurtosis values, suggesting a ceiling effect, which is also consistent with the fact that participants evaluated games they particularly enjoyed playing. However, since this item showed adequate factor loading in the Exploratory Factor Analysis (EFA) and contributed positively to Cronbach’s alpha, it was retained in the model. Overall, the distribution of the items was considered adequate for subsequent analyses and did not compromise the validity of the scale.

The structural validity of an instrument refers to the degree to which its factor structure adequately reflects the theoretical organization underlying the constructs it intends to measure [Damásio, 2012; Hair et al., 2019]. To assess structural validity, the combined use of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) is

Table 4. Brazilian Portuguese Version of the GUESS-18 Scale (GUESS-18-BR)

1. Eu acho que os controles do jogo são simples de entender.	1	2	3	4	5	6	7	N/A
2. A história do jogo capturou a minha atenção desde o início.	1	2	3	4	5	6	7	N/A
3. Eu me sinto desconectado do que acontece ao meu redor enquanto jogo.	1	2	3	4	5	6	7	N/A
4. Eu sinto que o jogo me permite ser criativo.	1	2	3	4	5	6	7	N/A
5. Eu acho que o jogo é divertido.	1	2	3	4	5	6	7	N/A
6. Eu me sinto entediado enquanto jogo.	1	2	3	4	5	6	7	N/A
7. Eu gosto dos efeitos sonoros do jogo.	1	2	3	4	5	6	7	N/A
8. Eu fico muito focado nos meus resultados e em como estou indo no jogo.	1	2	3	4	5	6	7	N/A
9. Eu acho que o jogo favorece a interação e a comunicação (por exemplo, chat) entre os jogadores.	1	2	3	4	5	6	7	N/A
10. Eu gosto dos gráficos do jogo (por exemplo, imagens, cenários, personagens).	1	2	3	4	5	6	7	N/A
11. Acho os elementos que aparecem na tela (menus, botões e ícones) do jogo fáceis de usar.	1	2	3	4	5	6	7	N/A
12. Eu gosto da história ou da ideia do jogo.	1	2	3	4	5	6	7	N/A
13. Fico desligado do mundo real enquanto estou jogando.	1	2	3	4	5	6	7	N/A
14. Eu me sinto criativo enquanto jogo.	1	2	3	4	5	6	7	N/A
15. Acho que o áudio do jogo (por exemplo, efeitos sonoros, música) melhora minha experiência de jogo.	1	2	3	4	5	6	7	N/A
16. Quero me sair o melhor possível durante o jogo.	1	2	3	4	5	6	7	N/A
17. Eu gosto de jogar este jogo com outros jogadores.	1	2	3	4	5	6	7	N/A
18. Eu acho o jogo visualmente atraente (cores, cenários e personagens).	1	2	3	4	5	6	7	N/A

Table 5. Brazilian Portuguese Version of the GUESS-18 Scale (GUESS-18-BR)

Subscales	Mean	Q1	Q3	IQR	Median	Standard Deviation	Min.	Max.	Range
PLA	5.89	5.50	6.50	1.00	6.00	1.08	1.00	7.00	6.00
NAR	5.75	5.00	7.00	2.00	6.00	1.20	1.50	7.00	5.50
ENG	4.73	3.50	6.00	2.50	5.00	1.69	1.00	7.00	6.00
ENJ	6.21	6.00	7.00	1.00	6.50	0.93	1.00	7.00	6.00
CRF	5.32	4.50	6.50	2.00	5.50	1.53	1.00	7.00	6.00
AA	5.55	5.00	6.50	1.50	6.00	1.44	1.00	7.00	6.00
PG	5.86	5.00	7.00	2.00	6.00	1.24	2.00	7.00	5.00
SC	5.06	4.00	6.50	2.50	5.50	1.66	1.00	7.00	6.00
VA	6.08	5.50	7.00	1.50	6.50	1.03	1.00	7.00	6.00

recommended, as these procedures play complementary roles in the validation process [Marôco, 2014].

To verify whether the factor structure of the original GUESS-18 (18 items and 9 factors) would be maintained in the Brazilian Portuguese version, an EFA was conducted using the data collected from the Brazilian sample. The first step involved evaluating the adequacy of the sample and the correlations among the GUESS-18 items for factor analysis. For this purpose, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity were performed (**Table 7**).

The KMO index yielded a value of 0.584, indicating low but acceptable sample adequacy for factor analysis ([Kaiser, 1974]). This result suggests that the correlations among items were sufficient to proceed with the EFA, although not ideal in strength. The relatively low KMO value may be associated with the fact that the GUESS-18 dimensions consist of only two items each, reducing the number of possible correlations among variables and, consequently, the overall consistency of the correlation matrix.

Bartlett's Test of Sphericity yielded $\chi^2(153) = 1281.494$; $p < 0.001$, indicating that the correlation matrix significantly differed from an identity matrix. Therefore, significant corre-

lations existed among the items, confirming the adequacy of the data for factor analysis. Thus, although the KMO measure indicated only moderate adequacy, the overall prerequisite test results supported the use of Exploratory Factor Analysis.

For the EFA, the Principal Axis Factoring (PAF) extraction method was employed, as it is more robust to deviations from normality and appropriate for identifying latent factors underlying the data. An oblique rotation method (Oblimin) was adopted due to the theoretical expectation that the GUESS-18 factors would be correlated, allowing for a more realistic representation of the relationships among the construct dimensions. The EFA results are presented in **Table 8**.

The exploratory factor analysis revealed a nine-factor solution, with factor loadings interpreted based on the pattern matrix ranging from 0.605 to 0.967, all above the minimum recommended threshold of 0.50 [Hair et al., 2019]. Together, the factors explained 65.075% of the total variance, indicating satisfactory explanatory capacity of the obtained factor structure. Conceptual coherence was observed between the extracted factors and the proposed theoretical dimensions, suggesting that the items grouped consistently with the original model and providing initial evidence of construct validity

Table 6. Skewness and Kurtosis Tests for the GUESS-18-BR Items in the Sample

Subscales	Items	Skewness	Kurtosis
PLA	Q1	-1.32	1.53
PLA	Q11	-1.38	2.11
NAR	Q2	-.72	-.54
NAR	Q12	-1.36	1.78
ENG	Q3	-.59	-.66
ENG	Q13	-.41	-.96
CRF	Q4	-.97	-.08
CRF	Q14	-.70	-.21
ENJ	Q5	-2.54	9.13
ENJ	Q6	-1.38	2.06
AA	Q7	-1.22	1.05
AA	Q15	-1.20	.82
PG	Q8	-1.25	1.06
PG	Q16	-1.21	.61
SC	Q9	-.52	-1.11
SC	Q17	-1.20	.33
VA	Q10	-1.26	1.38
VA	Q18	-1.62	3.10

Table 7. KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.584
Bartlett's Test of Sphericity – Approx. Chi-Square	1281.494
df	153
Sig.	< .001

for the GUESS-18-BR.

Within the Enjoyment dimension, both factor loadings presented negative signs (–0.914 and –0.615). This result does not compromise the substantive interpretation of the factor, since negative loadings only indicate the relative direction of the relationship between each item and the factor and do not represent a problem regarding the validity of the structure [Gorsuch, 2015; Harman, 1976; Kline, 2023]. Nevertheless, it is important to understand the origin of this inversion.

Item 6 (“I feel bored while playing the game.”) was originally formulated negatively, which explains the inversion in the sign. Item 5 (“I think the game is fun.”), although not conceptually reversed, also presented a negative loading. As explained by Fabrigar and Wegener [2012], this inversion is common in rotated factor analyses, whether orthogonal or oblique, indicating that the software scaled the common factor in the opposite direction. Therefore, reversing the sign of the loadings for interpretative purposes is considered entirely acceptable and does not affect the validity of the factor solution.

Subsequently, CFA was conducted using AMOS software to test the fit of the proposed theoretical model. However, the fit indices ($\chi^2/df = 10.09$; GFI = 0.586; CFI = 0.000; RMSEA = 0.188) were below the reference values generally recommended in the literature (CFI ≥ 0.90 ; RMSEA ≤ 0.08 ; Hair et al., 2019), suggesting that the model did not demonstrate satisfactory fit to the observed data in this sample.

The internal consistency of the Brazilian version of the GUESS-18 scale, both overall and across its nine dimensions, was assessed using Cronbach's alpha coefficient (α). **Table 9** presents the obtained results.

Overall, all dimensions except Social Connectivity demonstrated acceptable to good levels of internal reliability, with α values ≥ 0.70 , indicating that the items composing each factor tended to consistently measure the same construct [Marôco and Garcia-Marques, 2006].

The Engagement ($\alpha = 0.815$) and Creative Freedom ($\alpha = 0.866$) dimensions demonstrated good internal consistency and strong correlations between items. The results obtained for Playability ($\alpha = 0.741$), Narratives ($\alpha = 0.755$), Enjoyment ($\alpha = 0.703$), Audio Aesthetics ($\alpha = 0.774$), Personal Gratification ($\alpha = 0.773$), and Visual Aesthetics ($\alpha = 0.764$) suggest acceptable internal consistency, indicating reliable structures for these subscales. The Social Connectivity subscale ($\alpha = 0.628$) presented the lowest reliability value, considered questionable although still acceptable for exploratory studies.

Finally, the complete scale presented an overall Cronbach's alpha of 0.702, confirming satisfactory internal consistency of the GUESS-18-BR, particularly considering its multidimensional structure. This result suggests that the nine dimensions used to measure different aspects of player experience are cohesive and appropriate for studies on game user experience in the Brazilian context, without indicating excessive overlap among dimensions.

Considering that the main objective of the present study was the cross-cultural adaptation and preliminary verification of the factor structure of the GUESS-18 for the Brazilian context, and given that the EFA confirmed the expected theoretical structure with high and conceptually coherent factor loadings, the EFA results were adopted as the primary evidence of structural validity. Therefore, the GUESS-18-BR can be considered a promising instrument for assessing player experience among Brazilian secondary school students and shows potential for use in broader Brazilian populations.

Nevertheless, future studies are recommended to conduct CFA using larger and independent samples in order to confirm the stability and fit of the theoretical model in the Brazilian context, thereby strengthening the confirmatory validity evidence of the instrument.

5 Conclusion

The present study, motivated by the absence of validated instruments in Brazilian Portuguese designed to assess player satisfaction and game user experience, aimed to validate the 18-item version of the Game User Experience Satisfaction Scale (GUESS-18). The scale was selected due to its flexibility regarding applicability to different player profiles and game genres, encompassing nine dimensions that capture important aspects of digital game refinement and evaluation: Playability/Usability, Narratives, Engagement, Enjoyment, Creative Freedom, Audio Aesthetics, Personal Gratification, Social Connectivity, and Visual Aesthetics.

The validation process initially involved the translation of the scale into Brazilian Portuguese, followed by preliminary comprehension testing through two focus groups and the subsequent refinement of items that presented comprehension

Table 8. Correlation Matrix Obtained from the Exploratory Factor Analysis (EFA).

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
PLA Q1							0.795		
PLA Q11							0.733		
NAR Q2									0.675
NAR Q12									0.833
ENG Q3		0.884							
ENG Q13		0.764							
CRF Q4			0.967						
CRF Q14			0.766						
ENJ Q5						-0.914			
ENJ Q6						-0.615			
AA Q7								0.796	
AA Q15								0.750	
PG Q8				0.771					
PG Q16				0.862					
SC Q9					0.605				
SC Q17					0.791				
VA Q10	0.629								
VA Q18	0.893								

Table 9. Internal Consistency Results of the GUESS-18 Dimensions in the Sample.

Subscales	Cronbach's Alpha (α)
Playability	0.741
Narratives	0.755
Engagement	0.815
Creative Freedom	0.866
Enjoyment	0.703
Audio Aesthetics	0.774
Personal Gratification	0.773
Social Connectivity	0.628
Visual Aesthetics	0.764

difficulties. These procedures resulted in the development of the Brazilian Portuguese version of the instrument (GUESS-18-BR). After these preliminary stages, the validation study was conducted with a sample of secondary school students ($n = 370$). Data collection was performed both through an on-line questionnaire ($n = 255$) and through in-person classroom administration ($n = 115$). After the exclusion procedures, the final sample consisted of 259 participants.

The Exploratory Factor Analysis (EFA) indicated low but acceptable sample adequacy for factor analysis ($KMO = 0.584$), suggesting that the correlations among variables were sufficient to proceed with the analysis, although their strength was not ideal. One possible explanation for this result is that each GUESS-18 dimension consists of only two items. Confirming the adequacy of the data for factor analysis, Bartlett's Test of Sphericity yielded $\chi^2(153) = 1281.494$; $p < 0.001$, indicating that the correlation matrix significantly differed from an identity matrix.

The EFA identified nine factors with factor loadings ranging from 0.605 to 0.967, all above the recommended minimum threshold of 0.50. Together, these factors explained 65.075% of the total variance, indicating satisfactory explanatory capacity of the obtained factor structure. Conceptual coherence was observed between the extracted factors and the

proposed theoretical dimensions, suggesting that the items grouped consistently with the original model and providing initial evidence of construct validity for the GUESS-18-BR.

When the Confirmatory Factor Analysis (CFA) was conducted, the fit indices ($\chi^2/df = 10.09$; $GFI = 0.586$; $CFI = 0.000$; $RMSEA = 0.188$) fell below the reference values generally recommended in the literature ($CFI \geq 0.90$; $RMSEA \leq 0.08$; Hair et al., 2019). Despite these results, considering that this study represents a preliminary verification of the GUESS-18 factor structure within the Brazilian context, the EFA findings were adopted as the primary evidence of structural validity. Additionally, most of the nine dimensions presented acceptable to good levels of internal consistency, with Cronbach's alpha values equal to or above 0.70, reinforcing the reliability of the instrument. Taken together, these findings provide preliminary evidence that the GUESS-18-BR constitutes a theoretically coherent and internally consistent instrument for assessing player experience among Brazilian secondary school students.

Taken together, the findings provide preliminary evidence that the GUESS-18-BR constitutes a theoretically coherent and internally consistent instrument for assessing player experience in Brazilian Portuguese. The study also provides an initial contribution toward the availability of validated game user experience measures for Brazilian researchers and game developers.

5.1 Limitations and Future Research

Although the sample size was adequate for the psychometric analyses conducted, participants were recruited exclusively from secondary schools located in the state of Rio de Janeiro. Given Brazil's considerable cultural, socioeconomic, and linguistic diversity, caution should be exercised when generalizing these findings to the broader Brazilian population. Future studies should evaluate the GUESS-18-BR in samples drawn from different regions of the country in order to strengthen evidence of cross-regional validity and measurement stability.

Another limitation concerns the gender distribution of the sample, which was predominantly male. Although gender differences were not examined in the present study, future research should investigate the psychometric performance of the GUESS-18-BR across more balanced demographic groups and assess measurement invariance between genders.

In addition, participants were instructed to evaluate a digital game that they played frequently and recently. While this procedure is consistent with the original GUESS-18 validation study and helps ensure familiarity with the evaluated game, it may also have contributed to more favorable assessments of player experience, as reflected in the negative skewness observed for several items. Future studies may explore the instrument's performance across different game genres and player profiles.

Finally, the validation of a measurement instrument is an ongoing process that requires replication across different and independent samples. Further studies are therefore necessary to examine the consistency of the findings and to strengthen the robustness, stability, and generalizability of the GUESS-18-BR.

Declarations

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Authors' Contributions

JF contributed to conceptualization, investigation, data collection, formal analysis, and writing of the original draft. All authors contributed to the study design, methodology, and review of the manuscript. GM supervised the methodological procedures and contributed to the interpretation of the results. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The datasets analysed during the current study are available in <https://doi.org/10.5281/zenodo.20386698>.

Declaration of Generative AI

The authors acknowledge the use of generative AI tools (ChatGPT) to support text revision and enhance clarity; all content was reviewed and validated by the authors.

Further relevant information

This study was approved by the Brazilian Research Ethics Committee system (Plataforma Brasil), CAAE: 71392623.1.0000.5245, approval number 6.573.650. Participation was voluntary, and informed consent was obtained from all participants and their legal guardians prior to data collection.

Citation Diversity Statement: The authors recognize that citation practices in academic publishing may reflect structural inequalities related to geography, language, gender, and visibility within

the global research community. In preparing this manuscript, efforts were made to include contributions from different scholarly traditions, geographic regions, and publication languages, including studies from Latin American researchers and works published in both Portuguese and English. Nevertheless, the reference list also reflects the concentration of influential literature on game user experience and psychometric validation in North American, European, and Australian contexts. The authors acknowledge this limitation and support continued efforts toward more inclusive and diverse citation practices in future research.

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