CONSTRUCTION, VALIDATION AND PSYCHOMETRIC ANALYSIS OF THE CuSAERS: A TOOL FOR MEASURING STUDENT SATISFACTION IN SOCIAL NETWORK-BASED LEARNING ENVIRONMENTS

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Abstract

Background: -

Objective: This study investigated the use of social networks as educational tools in the university environment, with the aim of designing and validating the Questionnaire of Satisfaction with Educational Activities Performed on Social Networks (CuSAERS).

Methods: Employing a mixed and sequential methodology, we explored the perceptions of Bachelor's and Master's degree students in Physiotherapy who participated in teaching activities via X.com (formerly Twitter) and Instagram. The first phase of the project identified key dimensions of satisfaction from the literature, expert interviews and cognitive interviews. The second phase assessed the psychometric properties of the CuSAERS in a sample of 150 students, addressing construct validity, internal reliability, concurrent validity and discriminant validity.

Results: Exploratory factorial analysis revealed 4 dimensions: Perception of Learning, Task Satisfaction, Self-Fulfilment and Motivation. Reliability was adequate, with the robustness of the Perception of Learning dimension standing out. Concurrent validity was confirmed by moderate correlations with the Academic Satisfaction Scale, which supports the usefulness of the CuSAERS in assessing the impact of social networks on student satisfaction. Significant differences were also observed between Bachelor's and Master's students, with the latter showing the highest level of satisfaction, possibly due to greater academic experience and digital competence.

Conclusions: The results suggest that CuSAERS appears to be a valid and reliable tool for measuring student satisfaction with teaching activities on social networks. This instrument could guide teaching practice, optimize pedagogical strategies in digital environments and ultimately promote more meaningful and collaborative learning. Clinical Trial: No applicable.

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Trial Registration: No applicable.
Keywords: Social media; Student satisfaction; Educational technology; Learning environments; Psychometric validation; Digital learning; Academic engagement; Collaborative learning.

Introduction

Problem contextualization

In the last decade, social networks have drastically transformed the way individuals communicate, learn and collaborate. Not only have they become integrated as a fundamental part of social and personal life, they have also begun to influence areas such as education, facilitating new pedagogical approaches aligned with current trends in digitization and global collaboration [1–3]. These platforms, initially designed for informal exchange and entertainment, have become tools with great educational potential, promoting collaborative learning that transcends geographical and time barriers, allowing interaction between students, teachers and experts from various disciplines [4–6].
In the university education field, the X.com (formerly Twitter) and Instagram platforms stand out, and are used for various purposes: X.com focuses on interaction through text and encourages debate, and Instagram, predominantly audiovisual, is mainly used by young people to share images and videos, and it facilitates the dissemination of information in an attractive and accessible way [3,7]. X.com, in particular, has proven to be effective in fostering information sharing and collaborative learning in the academic context, supporting continuous professional development and providing a

space for critical debate, which has even been implemented in the field of health sciences [8].
However, the use of social media is not limited to these 2 platforms. Facebook and YouTube have also been widely used as educational resources, especially through audiovisual media that complement traditional teaching [9]. In this regard, approximately 30% of teachers share out-of-class activities on social media, thus promoting autonomous and collaborative learning beyond the classroom [10,11]. This approach has allowed for greater integration between students' personal and academic lives, which translates into a better experience with the learning process, improved academic performance and improved student satisfaction [12–16].
Previous research on the impact of social networks on the educational process has highlighted 3 key elements for the ability of students to achieve successful and meaningful learning in these environments: discussion, social presence, and the involvement of the teacher as a facilitator of the learning experience [17,18]. Social presence in particular has been significantly correlated with student satisfaction, given that it allows for closer and more collaborative interaction, both among students and with teachers [19,20]. The presence of the teacher, on the other hand, is essential to ensure that learning on digital platforms is not a passive process, but becomes a dynamic, attractive and productive experience for students [21].

Previous research and experience

Several studies have highlighted that the use of social networks in educational contexts has a positive effect on academic performance and student satisfaction, because these tools encourage interaction and collaborative learning [2]. Gikas and Grant (2013), for example, conducted qualitative research with students at three universities in the United States, finding that social networks provided students with opportunities for collaborative learning, creation and participation in a variety of extracurricular activities related to the subject matter. Similarly, previous research has indicated that the use of Facebook and YouTube as educational resources is also considerable. Most teachers use these audiovisual media in their classes and, as mentioned earlier, approximately 30% of them share extracurricular activities on social networks, thus promoting learning outside the classroom [10,11].
Collaborative learning is essential in all specialties, and in the health sciences it has a great personal and social impact, including cognitive, technical, motor, communication and patient skills. Modalities such as problem-based learning, reverse learning and interaction with social networks can improve academic performance, self-efficacy, student satisfaction and practical knowledge transfer [2,22,23].

Justification for the use of social networks in teaching

The evaluation of student satisfaction with teaching activities constitutes a fundamental aspect in determining the quality of the university's educational process [24,25].
Student educational satisfaction can be defined as "a short-term attitude, which relates to students' subjective evaluations of the extent to which their expectations of particular educational experiences have been met or exceeded" [26]. In addition, some authors suggest that satisfaction with educational processes is a multidimensional construct [25,27,28]. Assessing satisfaction is complex but essential, because it guides the quality and direction of teaching practices. With the paradigm shift toward online activities, this process is expanding. New technologies can facilitate the evaluation of satisfaction, provided that the methodologies implemented respond to students' needs and expectations [29].
In addition, satisfaction not only reflects students' perception of the quality of teaching, but it is also closely related to their academic performance, retention and motivation [28,30,31]. In this context, it is imperative to develop specific tools to assess the satisfaction of students who participate in teaching activities carried out through social networks.

In the case of the use of social media in education, it is essential to understand that these platforms not only change the way information is presented, but also the way in which students interact with each other and with the content. Social networks offer an opportunity to establish student-centered learning, where autonomy, creativity and joint knowledge construction are promoted [17,18].

The implementation of new teaching methodologies based on social networks, such as X.com, Facebook, or Instagram, must be accompanied by mechanisms that evaluate how students perceive these activities. It is necessary to understand what factors influence their satisfaction and how these factors contribute to successful learning. Satisfaction evaluation is a complex process that involves assessing aspects such as the quality of interaction with teachers and peers, the relevance and applicability of the content, the motivation generated by the methodology used and the technical and academic support available to the student [29].

Research has shown that students who feel more satisfied with teaching activities not only achieve better academic results, but also show a greater willingness to participate in collaborative and ongoing activities, which strengthens the educational community and fosters the creation of support networks among students [12,30]. Therefore, it is essential to develop tools that allow measurement of this satisfaction, and thus adjust teaching strategies to adequately respond to the expectations and needs of the students.

Although some tools are available to evaluate the use of social networks in education, most of them focus on measuring interaction or performance, without directly addressing student satisfaction. It is therefore essential to develop and validate a specific tool that can reliably and accurately assess student satisfaction in this context. This tool should consider, among other aspects, the effectiveness of the platform used, the level of interaction, the ease of access to content, the quality of feedback received and the general perception of the added value that the social network brings to the learning process [32].

The relevance of this teaching innovation project lies in its ability to provide accurate feedback on the quality of the activities carried out through social networks, allowing teachers to improve and adapt these strategies to the needs and expectations of the students. This approach will not only lead to greater satisfaction, but also to a better understanding of the content and higher academic performance. In addition, a rigorous evaluation of student satisfaction allows educational institutions to identify areas for improvement in both the design and implementation of teaching activities, fostering a cycle of continuous improvement that enhances the quality of teaching and learning.

The creation of a tool that specifically measures student satisfaction represents a step forward in the quest to improve the quality of university education in a continuously evolving technological context. This tool will not only identify the elements that contribute to a positive educational experience, but it will also allow us to understand how social media can best be harnessed to foster meaningful and engaged learning. In addition, it will provide teachers and administrators with clear guidance for making informed decisions regarding the use of social media in the classroom to maximize its benefits and mitigate potential disadvantages.

Student satisfaction is an essential component of the educational process, especially in today’s rapidly changing environment, where digital technologies are transforming the ways we teach and learn. Measuring this satisfaction with tools adapted to the use of social media will allow institutions not only to improve the learning experience, but also to prepare students for a professional environment where digital skills and the ability to collaborate are increasingly valued.

Based on the aforementioned framework, the primary objective of this study is to design and evaluate the reliability and construct validity of the Questionnaire of Satisfaction with Educational Activities Performed on Social Networks (CuSAERS) through a pilot application in a sample of Bachelor’s and Master’s Physiotherapy students. Secondary objectives include (1) identifying the key dimensions of perceived satisfaction with educational activities conducted on social networks—namely, interaction with the instructor, quality of content and peer collaboration—and (2) comparing students’ satisfaction according to the specific social media platform used (X.com, Instagram), to

determine students' preferences and particular needs.

Methods

Study design

This study used an exploratory sequential mixed design, combining qualitative and quantitative methods for the development, construction and validation of the CuSAERS. The first qualitative phase, which included a literature review, semi-structured interviews, expert content validation, cognitive interviews and a pilot test, has been previously published [33]. This first phase had been aimed at identifying the dimensions of satisfaction perceived by students with regard to educational activities carried out on social networks, such as interaction with the teacher, the quality of the content and collaboration between colleagues.

The second phase focused on the psychometric evaluation of the CuSAERS. During this stage, the questionnaire was administered to a representative sample of Bachelor's and Master's students to assess its psychometric properties, including validity and reliability. The study was approved by the university's ethics committee of La Salle Higher Center for University Studies, following the ethical guidelines established by the Declaration of Helsinki.

Participants

The sample selected on a non-probabilistic basis consisted of 150 Bachelor's and Master's degree students in Physiotherapy from a Spanish university. Of these, 90 were Bachelor's students and 60 Master's students. All participants were 18 years or older and enrolled in official academic programs. As an inclusion criterion, participants had to have previously participated in educational activities developed on social networks, specifically on X.com or Instagram.

All students signed an informed consent document before participating, which explained the objectives of the study, the confidentiality of the data and the voluntary nature of their participation. This process followed the ethical guidelines established by the Declaration of Helsinki and was approved by the university's ethics committee.

Teaching innovation activities

The Master's students participated in an academic activity designed on Instagram. This activity consisted of the critical analysis of therapeutic exercises published in video format on this platform. Students watched the videos, identified technical errors, proposed modifications and justified their proposals based on scientific evidence. This task not only fostered autonomous and critical learning, but also promoted the use of social networks as a professional learning tool. The students' responses and observations were subsequently discussed in a digital forum supervised by the teacher, who acted as moderator and interlocutor, offering specific and targeted feedback.

The Bachelor's students participated in an activity developed on X.com. This activity included a virtual debate on aspects related to chronic pain. Each student had to perform prior research on the assigned topic and present their position in the form of X.com threads, using technical but accessible language. The debates were enriched with bibliographical references and the integration of specific hashtags to facilitate the monitoring of the discussions. The teacher's involvement focused on moderating the debate, posing critical questions to deepen the arguments and providing direct feedback on the content and quality of the interactions.

Both activities were designed to maximize students' active participation, integrating the use of social networks as an innovative pedagogical resource. The strategies employed sought to foster critical, technical and communicative skills in digital contexts, thus contributing to more dynamic and meaningful learning.

Procedure:

Phase 1. Development of CuSAERS

The first phase was described in a previous study and consisted of a literature review and interviews with experts in educational methodology, social networks and rehabilitation, as well as with physiotherapy students [33].

Phase 2. Psychometric Evaluation

In the second phase, the CuSAERS questionnaire was administered to a sample of 150 students, of whom 90 were Bachelor's and 60 Master's students. The students completed the questionnaire online, and a cross-sectional design was used to assess the psychometric properties of the instrument.

Data analysis

Descriptive statistics

The data analysis was performed exclusively using JAMOVI software, which allowed all statistical evaluations of the study to be performed. Descriptive statistics were used to summarize the categorical variables, expressed in absolute and relative frequencies, and the continuous variables, which were reported in terms of means, standard deviations and 95% confidence intervals.

Normality assessment

The normality of the data was comprehensively assessed, employing both statistical tests and graphical methods.

The Kolmogorov–Smirnov test was applied to determine whether the distributions of the variables differed significantly from a normal distribution. This test was complemented by a visual analysis using Q-Q plots and histograms, which allowed the alignment of the data with the theoretical normal curve to be assessed

In addition, skewness and kurtosis coefficients were calculated to assess the shape of the distributions.

Skewness values close to 0 indicate symmetric distributions, whereas positive or negative values indicate skewing to the right or left, respectively. As for kurtosis, values close to 3 indicate mesocurtic distributions, whereas higher or lower values suggest leptokurtic or platykurtic distributions, respectively. These metrics provided a quantitative framework for interpreting the normality of the data distributions.

Lastly, additional analyses were performed to assess the influence of outliers on the distributions. They were identified and visually examined using boxplots, which allowed us to determine whether these outliers had a significant impact on the structure of the data.

Construct validity

Construct validity was assessed with an exploratory factor analysis (EFA) to identify the optimal factor structure.

The analysis employed generalized least squares factorization [34] combined with oblimin rotation [35]. The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett's test of sphericity were used to evaluate the factor analysis models. The KMO test measures sampling adequacy, with values ranging from 0 to 1, the values above 0.50-0.60 being considered acceptable [36].

The optimal number of factors was determined using multiple criteria, including Kaiser's eigenvalue criterion (eigenvalue ≥1), examination of the sedimentation graph [37], parallel analysis [38] and

exploratory graphic analysis [39]. Factors were chosen on the basis of their stability, defined as having two or more items per factor with minimal cross-loadings.
To assess model fit, a semi-confirmatory parallel analysis was performed using several fit indices. The root mean square error of approximation (RMSEA) was calculated with a confidence interval (CI) of 90%. RMSEA values up to 0.08 are considered indicative of a reasonable fit to the data, with values closer to 0.05 or lower suggesting a good fit. In addition, the Tucker-Lewis Index (TLI) was calculated, with values close to or above 0.95 indicating an excellent fit. The Bayesian Information Criterion (BIC) was also assessed, in which lower (more negative) values are preferred, suggesting a model that better explains the data with fewer parameters. Lastly, the model fit was confirmed using the chi-squared test. A non-significant chi-squared value indicates that the observed and expected covariances of the model do not differ significantly, supporting an adequate model fit.
To maintain the theoretical framework and ensure content validity, items were selected based on their factor loadings. In the PFA, only those items with factor loadings above 0.4 on each factor were included [40].

Internal consistency (reliability)

Internal consistency was assessed using Cronbach's α coefficient, with values above 0.70 considered adequate, and McDonald's ω coefficient, which provides a complementary estimate of internal consistency. This approach allowed a robust assessment of the homogeneity of the items that make up the dimensions of the CuSAERS.

Concurrent validity

Concurrent validity was assessed by calculating Pearson correlations between CuSAERS scores and the Academic Satisfaction Scale (ASS), used as a reference instrument. The ASS defines academic satisfaction as "the well-being and enjoyment that students perceive in their experiences within the academic role" [41].
This instrument, composed of 7 items organized into a single factor, uses a 7-point Likert scale and has demonstrated high reliability (ordinal α = .92) and structural validity in Chilean university contexts [42].
In addition, previous experience in using social networks, measured in months, was included as an additional variable to explore its relationship with CuSAERS scores. This information allowed us to assess whether the length of time spent using social networks significantly influences the perception of academic satisfaction in activities performed in these environments.
The values of the correlations between the CuSAERS, ASS and social networking experience were interpreted according to the criteria of Schober and Schwarte (2018). The correlations were classified as follows: insignificant (0.00-0.10), weak (0.10-0.39), moderate (0.40-0.69), strong (0.70-0.89) and very strong (0.90-1.00) [43].

Floor and ceiling effect

The presence of floor and ceiling effects was assessed by calculating the percentage of participants who obtained the lowest or highest possible scores on the questionnaire. An effect was considered significant if more than 15% of participants were at these extremes.

Discriminant validity

The discriminant validity of the CuSAERS was explored by comparing groups of students with various levels of engagement in educational activities on social media platforms. Specifically,

analyses were conducted to compare students who participated in activities on X.com versus those who used Instagram, examining differences in their satisfaction scores.
Additionally, students with prior experience using social media were compared with those without such experience to determine the impact of this variable on perceptions of educational satisfaction. A comparative analysis was also performed between Physiotherapy Master's students and Bachelor's students to evaluate potential differences based on academic level.
The comparisons were conducted using the Mann–Whitney U test as a non-parametric method for independent samples, and effect sizes were calculated using rank-biserial correlation. Effect sizes were interpreted as small (r=0.10), moderate (r=0.30) and large (r=0.50). These analyses identified significant differences that support the ability of the CuSAERS to distinguish between groups with diverse educational characteristics and contexts.

Results

Normality analysis

The normality of the data was assessed through a comprehensive analysis that included both statistical tests and graphical methods, providing an in-depth understanding of the distribution of the items in the CuSAERS. The results of the Shapiro–Wilk test indicated that the date significantly deviated from a normal distribution ($p < 0.001$), confirming that the variables did not meet the assumption of normality. This finding was consistent with skewness and kurtosis values, which suggest deviations from perfect symmetry and distributions far from the ideal mesokurtic shape. Most of the items showed negative skewness, indicating a tendency for participants to give higher scores on the satisfaction scale, while predominantly platykurtic kurtosis reflected lower concentration at the scale's extremes.
The visual analysis complemented these statistical evaluations. Q-Q plots and histograms demonstrated that the data did not align with the theoretical normal curve, confirming the presence of biases and lighter tails in the distribution of scores. Additionally, the influence of outliers was explored using boxplots, which revealed greater dispersion in specific items, such as Item 8 and Item 12. These items, which had the highest standard deviations, reflected the heterogeneity in the participants' perceptions regarding these specific aspects of the questionnaire.

Descriptive analysis

The descriptive analysis of the items showed means and medians centered around values close to 3, reflecting a tendency toward neutral or moderately positive responses. Standard deviations ranged between 0.752 and 1.046, demonstrating differences in the dispersion of responses. Items with the highest dispersion were Item 8 and Item 12, whereas Item 16 presented the lowest variability.
Regarding distribution, most items exhibited negative skewness, suggesting a slight tendency toward higher scores, except for Item 8, which showed skewness close to 0. Platykurtic kurtosis predominated, indicating lower concentration of responses at the extremes, except for some items, such as Item 3 and Item 4, which displayed more leptokurtic distributions.
In terms of internal consistency, the item-total correlations were heterogeneous, ranging from −0.001 (Item 16) to 0.539 (Item 10). Items 11 and 16 stood out for having near-zero or negative item-total correlations, suggesting a lower contribution to the instrument's consistency. Cronbach's alpha (α) and McDonald's omega (ω) coefficients ranged between 0.645 and 0.716, and between 0.674 and 0.755, respectively, indicating moderate reliability overall. The highest reliability values were observed for Items 11 and 16, although these items had low item-total correlations, which might imply atypical behavior for these items (Table 1).

Table 1. Descriptive statistics and reliability coefficients upon item removals.

Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Item 1-all correlation	Cronbach's alfa (α)	McDonald's omega (ω)
Item 3	2,98	0,797	3,0	-0,948	1,01	0,481	0,653	0,683
Item 4	3,12	0,764	3,0	-0,977	1,31	0,455	0,657	0,685
Item 6	2,92	0,821	3,0	-0,897	0,7	0,296	0,679	0,729
Item 7	3,02	0,846	3,0	-0,552	-0,323	0,490	0,650	0,684
Item 8	2,49	1,046	3,0	-0,05	-1,18	0,287	0,683	0,732
Item 9	2,98	0,831	3,0	-0,352	-0,618	0,432	0,659	0,695
Item 10	3,19	0,773	3,0	-0,929	0,887	0,539	0,645	0,674
Item 11	3,18	0,831	3,0	-0,351	-1,47	0,029	0,715	0,752
Item 12	2,63	1,05	3,0	-0,204	-1,14	0,382	0,666	0,721
Item 13	3,04	0,846	3,0	-0,387	-0,78	0,274	0,682	0,731
Item 16	3,01	0,752	3,0	-0,021	-1,22	-0,001	0,716	0,755
Item 17	3,02	0,935	3,0	-0,786	-0,164	0,311	0,674	0,723

Factor analysis (construct validity)

The KMO test indicated that the data were suitable for factor analysis, with an overall value of 0.701, which is considered acceptable for conducting the analysis. Bartlett's test of sphericity confirmed the adequacy of the data, rejecting the null hypothesis that the correlation matrix is an identity matrix ($\chi^2(136) = 759$, $p < 0.001$).

For factor extraction, the minimum residuals method combined with oblimin rotation was used. The analysis identified a 4-factor solution, which explained 39.7% of the total variance (Table 2). The first factor explained 18.14% of the variance and consisted of 5 items related to "Perception of Learning." The second factor explained 9.63% of the variance and grouped 3 items associated with "Task Satisfaction." The third factor explained 9.20% of the variance and consisted of 2 items related to "Self-Realization." Lastly, the fourth factor explained 2.73% of the variance and comprised 2 items highlighting "Motivation."
Table 2 presents the factor loadings, where a clear differentiation of the items within the identified factors is shown. Most of the items showed factor loadings above 0.70 in their respective factors, indicating appropriate saturation and relevance to the model. However, some items exhibited high unique variances, suggesting the need to review their inclusion in the theoretical model.

Table 2. Factor loadings of the items in relation to the factor solution.

	Factor loadings				
	1	2	3	4	Unique Variance
Ítem 4. Las actividades educativas en redes sociales me motivan a hacer preguntas y participar en discusiones. Item 4. Educational activities on social media motivate me to ask questions and participate in discussions.	0,825				0,301
Ítem 10. Las actividades formativas en redes sociales fomentaron mi reflexión, síntesis y razonamiento. Item 10. Training activities on social media foster my reflection, synthesis, and reasoning.	0,820				0,316
Ítem 3. **Las actividades educativas en redes sociales promueven mi participación.** Item 3. Educational activities on social media promote my participation.	0,811				0,322

	Factor loadings				
	1	2	3	4	Unique Variance
Ítem 7. El uso de redes sociales en la educación aumentó mi interés en los contenidos de la asignatura. Item 7. The use of social media in education has increased my interest in the course content.	0,750				0,433
Ítem 9. Es positivo usar redes sociales como herramienta de aprendizaje. Item 9. Using social media as a learning tool is beneficial.	0,684				0,532
Ítem 13. El tiempo dedicado a actividades formativas en redes sociales está bien aprovechado. Item 13. The time spent on training activities on social media is well utilized.		0,817			0,290
Ítem 6. Mi experiencia educativa en redes sociales me hace sentir que es un entorno adecuado para expresar mis ideas. Item 6. My educational experience on social media makes me feel that it is a suitable environment to express my ideas.		0,702			0,377
Ítem 17. Mi experiencia indica que las redes sociales son adecuadas para adquirir conocimientos relacionados con mi carrera. Item 17. My experience indicates that social media is suitable for acquiring knowledge related to my field of study.		0,585			0,631
Ítem 15. Me parece positivo que las actividades formativas en redes sociales sean abiertas y públicas. Item 15. I find it positive that training activities on social media are open and public.	-	-	-	-	0,971
Ítem 5. Usar redes sociales como herramienta de aprendizaje facilita mi interacción con otros estudiantes. Item 5. Using social media as a learning tool facilitates my interaction with other students.	-	-	-	-	0,976
Ítem 8. Estoy satisfecho con mi participación en las actividades educativas desarrolladas con las redes sociales. Item 8. I am satisfied with my participation in educational activities conducted through social media.			0,893		0,193
Ítem 12. Estoy satisfecho con lo que he aprendido en las actividades educativas en redes sociales. Item 12. I am satisfied with what I have learned in educational activities on social media.			0,829		0,312

	Factor loadings				
	1	2	3	4	Unique Variance
Ítem 1. Las actividades educativas en redes sociales mantienen mi motivación y compromiso con el aprendizaje. Item 1. Educational activities on social media keep me motivated and engaged in learning.	-	-	-	-	0,980
Ítem 16. Las actividades educativas en redes sociales aumentan mi motivación para aprender más que con los métodos tradicionales. Item 16. Educational activities on social media increase my motivation to learn more than traditional methods.				0,450	0,794
Ítem 11. Las actividades en redes sociales me motivan a participar activamente en mi aprendizaje. Item 11. Activities on social media motivate me to actively participate in my learning.				0,305	0,904
Ítem 2. Considero que las redes sociales facilitan el aprendizaje. Item 2. I believe that social media facilitates learning.	-	-	-	-	0,942
Ítem 14. Mi experiencia educativa en redes sociales es muy positiva y la recomiendo. Item 14. My educational experience on social media has been very positive, and I recommend it.	-	-	-	-	0,977

Note. The generalized least squares extraction method was used in combination with an oblimin rotation.

Although the results of the parallel analysis indicated that the 3-factor model showed good fit indices (RMSEA = 0.028, 90% CI 0.001–0.053; TLI = 0.970; BIC = −347; $\chi^2(88) = 99.8$; p = 0.183), the 4-factor model was selected because it presented a similar fit (RMSEA = 0.022, 90% CI 0.001–0.052; TLI = 0.981) and greater consistency with the initially proposed theoretical dimensions. Additionally, the 4-factor model explained a higher percentage of variance (39.7%) compared to the 3-factor model (36.7%) (Table 3).

Table 3. Fit measures for the comparison between the three models.

		RMSEA 90% CI					Model's test		
Model Factors	Variance %	RMSEA	Inferior	Superior	TLI	BIC	χ^2	df	p
2	28,2	0,087	0,073	0,103	0,727	-292	230	103	< ,001
3	36,7	0,028	0,001	0,053	0,970	-347	99,8	88	0,183

		RMSEA 90% CI					Model's test		
Model Factors	Variance %	RMSEA	Inferior	Superior	TLI	BIC	χ^2	df	p
4	39,7	0,022	0,001	0,052	0,981	-295	80,4	74	0,285

The scree plot (Figure 1) shows the eigenvalues of the factors as a function of the number of extracted factors. This plot allows for the visualization of the proportion of variance explained by each factor. In this case, a sharp decline in eigenvalues is observed between the first and fourth factors, followed by stabilization in the values starting from the fifth factor, suggesting the presence of an "elbow" in the plot.
This pattern indicates that 4 factors are the most relevant for the factor solution, given that they explain a significant proportion of the variance before the eigenvalues consistently decrease. This result aligns with the selection of the 4-factor model based on the fit indices and the theoretical coherence of the model.

Figure 1. Scree plot of the exploratory factor analysis of the CuSAERS.

Note: The plot shows the eigenvalues of the extracted factors. The "elbow" in the curve suggests retaining 4 factors, which explain the majority of the total variance.

Internal consistency

Table 4 presents the descriptive statistics and reliability coefficients for the evaluated scales. The overall mean for the CuSAERS was 2.97 (SD = 0.413), with moderate internal consistency coefficients for both Cronbach's alpha (α = 0.703) and McDonald's omega (ω = 0.732). Among the subscales, Perception of Learning showed the highest internal consistency (α = 0.882; ω = 0.884) and a mean of 3.06 (SD = 0.662), indicating a positive perception of learning. On the other hand, the Motivation subscale presented the lowest consistency values (α = 0.286; ω = 0.287), suggesting that it may require revision to improve its reliability.

Table 4. Descriptive statistics and reliability of the CuSAERS questionnaire and its subscales.

Scale	Mean	Standard Deviation	Cronbach's alfa (α)	McDonald's omega (ω)
CUSAERS Total	2,97	0,413	0,703	0,732
Perception of learning	3,06	0,662	0,882	0,884
Task satisfacion	2,99	0,709	0,749	0,756
Self-realization	2,56	0,977	0,849	0,849

Scale	Mean	Standard Deviation	Cronbach's alfa (α)	McDonald's omega (ω)
Motivation	3,10	0,605	0,286	0,287

Concurrent validity

Concurrent validity was assessed using Spearman correlations between the CuSAERS scores and the ASS, as well as prior experience with social media (Table 5). The results showed that the total CuSAERS score had a moderate positive correlation with the ASS ($\rho = 0.58$; $p < 0.001$), supporting its validity as an instrument to evaluate the perception of educational activities on social media. Additionally, significant positive correlations were observed between the ASS and the subscales Perception of Learning ($\rho = 0.44$; $p < 0.001$), Task Satisfaction ($\rho = 0.31$; $p < 0.001$) and Self-Realization ($\rho = 0.28$; $p < 0.01$), indicating a consistent relationship between academic satisfaction and the dimensions evaluated by the CuSAERS.

On the other hand, prior experience with social media showed a weak positive correlation with the CuSAERS total score ($\rho = 0.30$, $p < 0.001$), as well as with Perception of Learning ($\rho = 0.20$; $p < 0.01$) and Self-Realization ($\rho = 0.23$; $p < 0.01$). However, no significant correlations were observed with the Task Satisfaction subscale ($\rho = 0.13$; $p > 0.05$) or Motivation ($\rho = 0.16$; $p > 0.05$). These results suggest that, although prior experience with social media has a positive relationship with overall perception and some specific aspects evaluated by the CuSAERS, its influence on dimensions such as motivation is limited (Figure 2).

Table 5. Correlation matrix.

	1.SASS	2.Social media experience	3.CuSAERS Total	4.Perception of learning	5.Task satisfaction	6. Self-realization	7.Motivation
1	—						
2	0,16*	—					
3	0,58***	0,30***	—				
4	0,44***	0,20**	0,67***	—			
5	0,31***	0,13	0,54***	0,08	—		
6	0,28**	0,23**	0,56**	0,09	0,18*	—	
7	0.065	0,16*	0,23**	-0,07	0,05	0.039	—

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2. Correlations between the total CuSAERS score and external variables.

Note:
(A) Relationship between the total CuSAERS score and the Academic Satisfaction Scale (ASS).
(B) Relationship between the total CuSAERS score and experience with social media (measured in

months).

Discriminant validity

The discriminant validity of the CuSAERS was evaluated by comparing groups of students based on their academic level (Bachelor's or Master's). These comparisons were conducted using the non-parametric Mann–Whitney U test, and the effect size was calculated using rank-biserial correlation. The statistical results and graphical inspection, through box and violin plots, reveal clear differences between the 2 groups, supporting the CuSAERS's ability to discriminate between students with different educational levels (Figure 3).

For the total CuSAERS score (Figure A), Master's students had significantly higher scores ($U = 1113$; $p < 0.001$), with a median of 39, compared with the Bachelor's group, whose median was 34. Box and violin plots showed greater dispersion in the Bachelor's group, whereas scores for the Master's group were more compact and centered on higher values.

The Perception of Learning subscale (Figure B) also showed significant differences ($U = 1064$; $p < 0.001$; $r = 0.613$), with higher scores and less dispersed distributions in the Master's group (median = 18). The plots reveal greater variability in the Bachelor's group, with individual cases at considerably low levels.

For the Motivation subscale (Figure C), although the differences were not statistically significant ($p = 0.062$), the box and violin plots indicated greater dispersion in the Bachelor's group, with extreme values both above and below the median, whereas scores in the Master's group were more compact and consistent.

On the other hand, for the Task Satisfaction (Figure D) and Self-Realization (Figure E) subscales, significant differences were found ($U = 2006$; $p = 0.005$; $r = 0.271$). For Task Satisfaction, the Master's group showed higher scores with less dispersion (median = 9), whereas for Self-Realization, the Master's group's scores were also higher (median = 6), in contrast to the greater dispersion and lower values observed in the Bachelor's group (Table 6).

Table 6. Comparison of CuSAERS scores by academic level.

	Physioterapy Degree (undergraduate) (N=110)			Master's in Physiotherapy (N=50)					
Variables	**Mean±SD**	**Median**	**EE**	**Mean±SD**	**Median**	**EE**	**U Mann-Whitney**	**p**	**Effect Size**
CuSAERS Total	34,10±4,96	34	0,47	38,96±3	39	0,42	1113	< ,001	0;595
Perception of learning	14,86±3,46	15	0,33	17,34±1,62	18	0,23	1064	< ,001	0,613
Motivation	6,31±1,20	6	0,11	5,94±1,20	6	0,17	2260	0,062	0,178
Task satisfaction	8,62±2,37	9	0,22	9,78±0,15	9	0,15	2006	0,005	0,271
Self-realization	4,81±2,08	5	0,19	5,80±1.44	6	0,20	2006	0,005	0,271

Figure 3. Comparative box and violin plots between Bachelor's and Master's groups in the CuSAERS subscales and total score.

Note:

(A) Comparison of total CuSAERS scores between Bachelor's and Master's students.

(B) Comparison of the Perception of Learning subscale between the groups.
(C) Comparison of the Motivation subscale between the groups.
(D) Comparison of the Task Satisfaction subscale between the groups.
(E) Comparison of the Self-Realization subscale between the groups.

The results also indicated differences between students with and without prior experience in social media. The group with experience obtained higher scores across all subscales and in the total CuSAERS score, although the differences were only significant for the total score (U = 2514; p = 0.026; r = 0.2045). For the Perception of Learning, Self-Realization, and Motivation subscales, although statistical significance was not reached (p > 0.05), trends toward higher scores were observed in the group with experience, particularly for Perception of Learning and Self-Realization (Table 7).
These results suggest that familiarity with the use of social media might positively influence overall perceptions of educational activities, although its impact on specific subdimensions is more limited.

Table 7. Comparison of CuSAERS scores by experience with social media.

	Experience in Social media (N=89)			Without experience in social media (N=71)					
Variables	**Mean±SD**	**Median**	**EE**	**Mean±SD**	**Median**	**EE**	**U Mann-Whitney**	**p-value**	**Effect size**
CuSAERS Total	36,42±4,96	37	0.53	34,55±4,77	35	0.57	2514	0,026	0,2045
Perception of learning	15,65±2,97	15	0.31	14,85±3,67	15	0.44	2794	0,204	0,1157
Motivation	6,36±1,23	6	0.13	5,99±1,16	6	0.14	2617	0,053	0,1719
Task satisfaction	9,06±2,31	9	0.25	8,89±1,89	9	0.22	2920	0,399	0,0760
Self-realization	5,35±2,09	6	0.22	4,83±1,74	4	0.21	2639	0,068	0,1649

Discussion

The study results confirm the complex nature of student satisfaction when integrating educational environments mediated by social media. The CuSAERS appeared to be an instrument with adequate psychometric properties, particularly in terms of construct validity and overall reliability, although certain dimensions will require further optimization with a larger sample size. Construct validity, analyzed through EFA, revealed a 4-factor solution—Perception of Learning, Task Satisfaction, Self-Realization, and Motivation—that aligns with the prior conceptualization of satisfaction in digital educational settings [17,18]. These results are consistent with the multidimensional notion of academic satisfaction [25,27,28].
Among the 4 identified factors, Perception of Learning and Self-Realization showed the highest levels of correlations and model fit, which is consistent with previous findings highlighting the importance of acquiring new skills and the sense of achievement in digital learning experiences [4,6]. These components moderately correlated with the ASS, supporting the concurrent validity of the CuSAERS. In line with research highlighting the influence of satisfaction on performance and retention, students who perceived greater learning and personal growth also tended to report higher

overall satisfaction with the educational process [30,31]. The inclusion of socio-emotional elements and social support has been identified as a key component in online learning contexts. A recent study emphasized that emotional support and effective communication through social media significantly increased student satisfaction and motivation in these settings [44].

Psychometrically, the results indicated acceptable values of internal reliability, with moderate Cronbach's alpha and McDonald's omega coefficients overall. The Perception of Learning dimension exhibited the highest internal consistency, reflecting its stability among the proposed dimensions. Conversely, the Motivation subscale displayed lower reliability. This finding suggests that motivation, in the context of educational activities on social media, could be influenced by other contextual factors not fully captured by the CuSAERS items, such as prior digital skills, teaching styles, or the type of social network used [19,20]. Notably, recent studies have identified that platforms such as Instagram have a positive impact on motivation due to their interactive and visual features. In contrast, whereas X effectively fosters critical discussions, it might require a higher level of digital literacy to be fully utilized [45,46]. Reviewing the items in this subscale for future research would be advisable to enhance its consistency and explanatory power. These adjustments align with standard processes in scale development, in which revisions are made to less stable items after the initial empirical validation [40].

Discriminant analyses revealed significant differences between Bachelor's and Master's students. Master's students scored higher on most subscales, particularly in perception of learning, task satisfaction, and self-realization. These results could be explained by several factors. First, Master's students typically have greater academic and professional experience, along with stronger self-management and critical reflection skills, which likely enhance their ability to utilize social media as a learning environment [2,22]. Additionally, studies such as that of Abellán-Roselló et al. (2023) highlight that virtual methodologies could be particularly appealing for students with higher levels of education, due to their flexible structure and orientation toward autonomous learning [47]. The instructional activity on Instagram, focused on the critical analysis of evidence-based therapeutic exercises, could have been especially relevant for their professional profile, fostering greater satisfaction and perceived practical utility. This finding aligns with previous evidence indicating that academic activities on social media facilitate the practical transfer of knowledge, a valued dimension for postgraduate students in health sciences [23].

In contrast, Bachelor's students, who participated in a virtual debate on chronic pain using X, reported lower satisfaction levels. Although X has been highlighted as an effective platform for fostering debate and critical reflection [8], it is possible that lower academic maturity and reduced prior experience in using social media for educational purposes limited their satisfaction with the task [1,14]. Recent studies corroborate that X can effectively improve academic performance and satisfaction when used for interactive exam review sessions or to promote collaborative learning [48,49]. Furthermore, generational differences and digital tool proficiency might influence how students value these experiences [16]. Research by Gao and Li (2019) emphasizes that educators' adoption of X depends on perceived usefulness and compatibility with learning tasks, highlighting the need for tailored approaches to maximize its effectiveness [50]. Similarly, Bledsoe et al. (2014) noted how the use of hashtags and the organization of collaborative debates can improve access to information, class participation, and overall feedback [51]. However, a study by Vanzetta et al. (2016) suggested that the success of social media as educational tools also depends on student and teacher training and ethical awareness, underscoring the need for clearer pedagogical strategies for using social media [52]. It is worth noting, however, that the Bachelor group's scores were not negative overall but moderately positive, suggesting a solid foundation of acceptance for the use of social media in university education, although future studies should test the performance of the instrument in other health sciences degrees.

Regarding differences by platform (X vs. Instagram), although the present study did not directly analyze specific social network types across all participants—given that each subgroup used a

different platform—the results suggest that Instagram, by providing a more practical and audiovisual environment, might favor greater satisfaction among students with higher academic experience and critical skills. Studies such as those by Obeso et al. (2023) and Morais et al. (2024) emphasize that Instagram enhances motivation, participation and educational communication, proving particularly useful for teaching complex concepts through short and visual videos [53,54]. This result aligns with previous findings that highlight how Instagram's audiovisual and interactive features are attractive and help transmit complex information in an accessible manner, fostering active participation and student satisfaction [7]. Conversely, although X is powerful for debate and discussion, it might require greater experience and digital literacy to be perceived as fully satisfying, particularly by less experienced students [10,15].

The moderate correlation between CuSAERS scores and ASS scores further endorses the validity of the proposed questionnaire. This result indicates that perceived satisfaction with activities on social media is closely related to overall academic satisfaction [41,42]. Integrating the ASS, a validated instrument in university contexts, provided a solid criterion for analyzing the concurrent validity of the CuSAERS, offering evidence that the instrument can capture a related and relevant construct from the perspective of well-being and academic enjoyment.

Finally, prior experience with social media showed a weak-to-moderate positive correlation with perceived overall satisfaction. This outcome suggests that students familiar with these digital tools might feel more comfortable with the proposed learning dynamics, which, in turn, increases their satisfaction [12,13]. This trend has been particularly observed in visual platforms such as Instagram and YouTube, where students report greater engagement and motivation when content is presented in an attractive and practical visual format [45,55]. However, the influence of social network experience was not uniform across all CuSAERS factors; for example, its impact on motivation was limited. This finding suggests that educational satisfaction in social media does not depend solely on technological familiarity but also on interaction quality, content relevance, social presence, and the teacher's facilitating role [18,20].

Limitations and future perspectives

This study presents several methodological and contextual limitations that must be considered when interpreting the results. First, the sample selection was non-probabilistic, limiting the generalization power. Additionally, the sample size, restricted to a single university and a specific geographic context, reduces the capacity to extrapolate the findings to other populations [56]. Future studies should include larger, more representative samples, as well as greater diversity of institutions, cultural contexts, and education levels to enhance the external validity of the results [57,58].

Another aspect to address is the expansion of the range of social media studied. This research focused on specific social media; thus, it would be relevant to explore the use of CuSAERS in diverse virtual environments, including Facebook, YouTube, TikTok, or other emerging platforms, to better understand the differential roles these tools play in student satisfaction and educational dynamics [32].

Regarding the statistical approach, although an exploratory factor analysis was conducted to examine the internal structure of CuSAERS, future research could employ confirmatory factor analyses and more complex structural equation models, as well as cross-validation techniques, to refine and strengthen the proposed factor structure [57,59]. It would also be useful to assess the instrument's factorial invariance across various population groups, ensuring metric and conceptual equivalence of the evaluated construct.

Lastly, the CuSAERS could be related to other relevant indicators of the educational process. Analyzing its correlation with academic performance, intrinsic and extrinsic motivation, peer and teacher interaction, or the presence of virtual learning communities [60] would allow for a more comprehensive understanding of the role of satisfaction in the educational process and its impact on

improving educational outcomes in the medium and long term.

Conclusions

In summary, the results support the initial validity and reliability of the CuSAERS as a promising tool for evaluating student satisfaction with the use of social media for educational purposes. The instrument, composed of 4 dimensions, provides a comprehensive view of the student experience, showing consistent relationships with overall academic satisfaction (ASS) and prior experience with social media. The study highlighted significant differences between Bachelor's and Master's students, underscoring the importance of academic level and chosen pedagogical strategies.
Likewise, the findings suggest that the choice of platform and the design of activities must be adapted to the characteristics and needs of students, maximizing the learning experience and perceived satisfaction. In the context of increasing digitization and flexibility in university education, having valid and reliable tools such as CuSAERS will be essential to guide teaching practices, improve didactic strategies on social media and ultimately promote meaningful, collaborative and satisfying learning.

Conflicts of Interest

None declared.

Abbreviations

ASS: Academic Satisfaction Scale
BIC: Bayesian Information Criterion
CI: Confidence Interval
CuSAERS: Questionnaire of Satisfaction with Educational Activities Performed on Social Networks
EFA: Exploratory Factor Analysis
KMO: Kaiser-Meyer-Olkin
Q-Q: Quantile-Quantile (plots)
RMSEA: Root Mean Square Error of Approximation
SD: Standard Deviation
TLI: Tucker-Lewis Index

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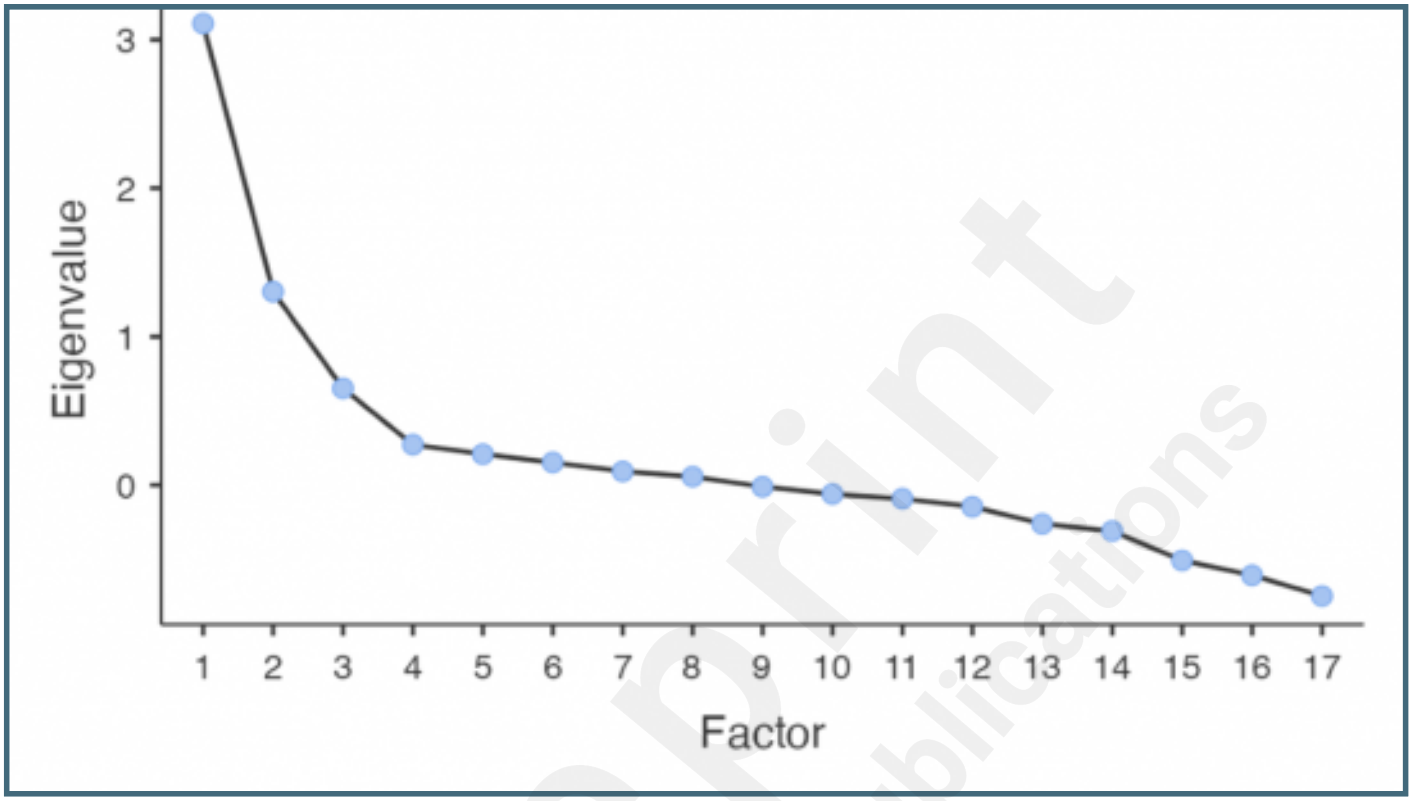
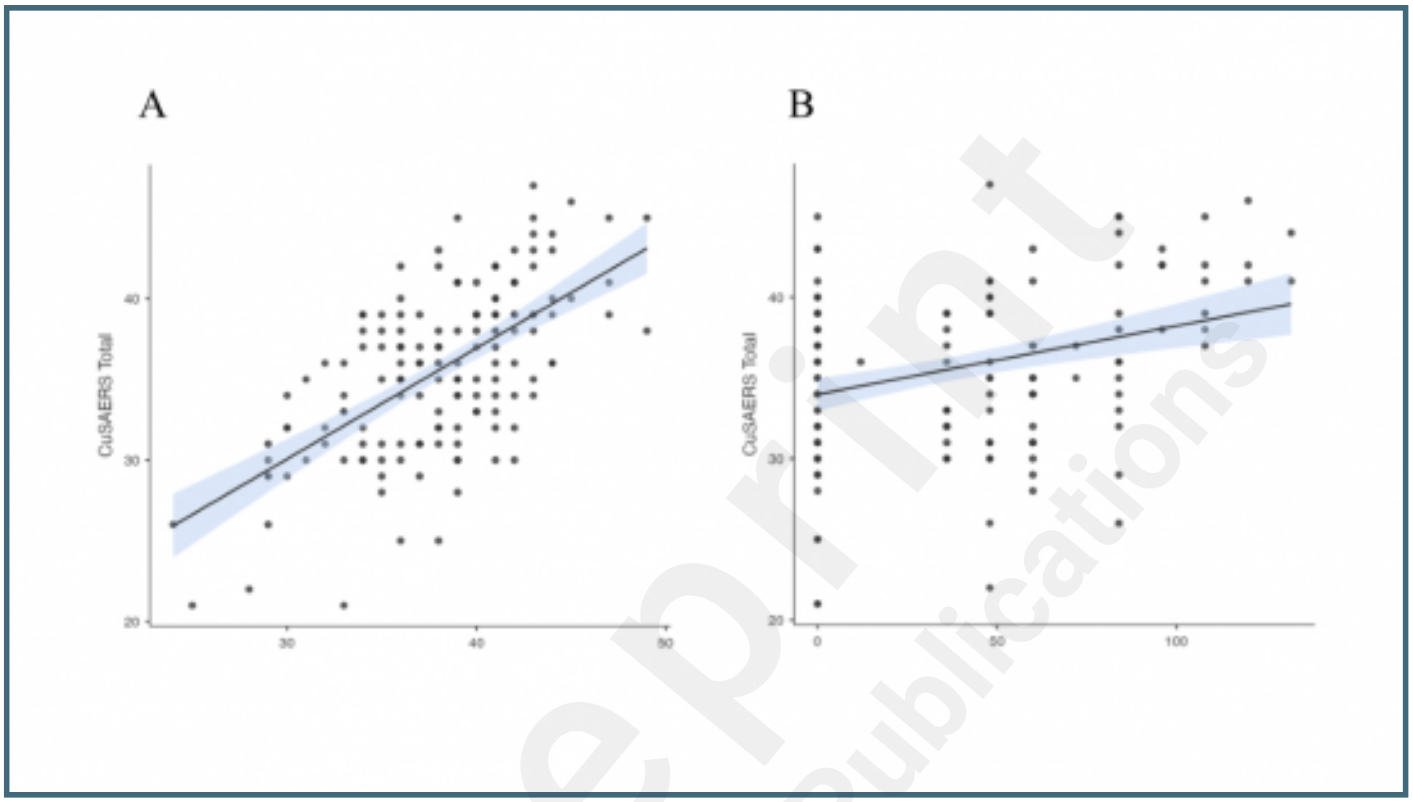
Supplementary Files

Figures

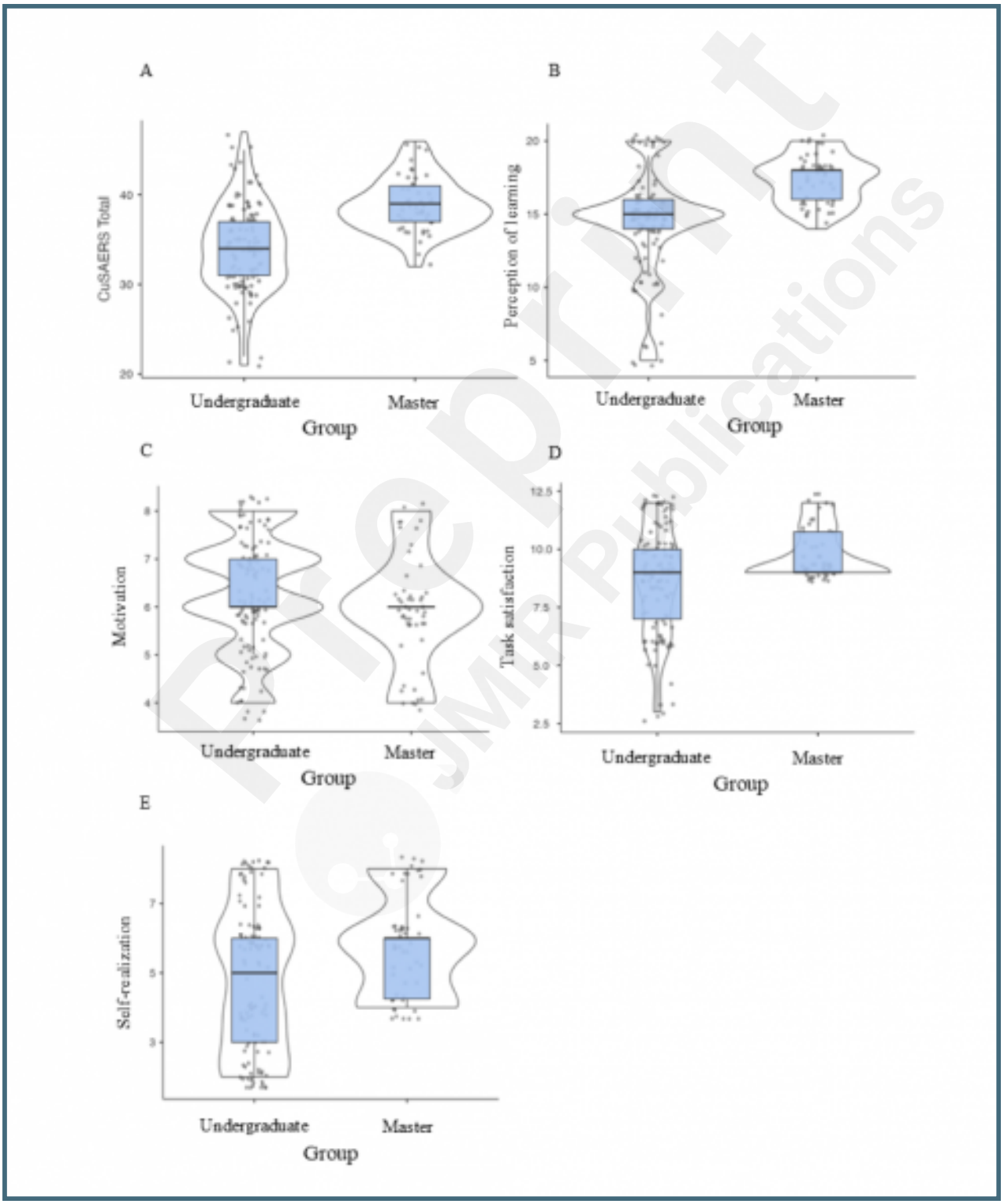
Scree plot of the exploratory factor analysis of the CuSAERS. Note: The plot shows the eigenvalues of the extracted factors. The "elbow" in the curve suggests retaining four factors, which explain the majority of the total variance.



Correlations between the total CuSAERS score and external variables. Note: (A) Relationship between the total CuSAERS score and the Academic Satisfaction Scale (ASS). (B) Relationship between the total CuSAERS score and experience with social media (measured in months).



Comparative box and violin plots between Undergraduate and Master's groups in the CuSAERS subscales and total score. Note: (A) Comparison of total CuSAERS scores between undergraduate and master's students. (B) Comparison of the Perception of Learning subscale between the groups. (C) Comparison of the Motivation subscale between the groups. (D) Comparison of the Task Satisfaction subscale between the groups. (E) Comparison of the Self-Realization subscale between the groups.



Multimedia Appendixes

Supplementary Material. S1. Descriptive statistics and reliability coefficients upon item removal. This table shows the descriptive statistics of all the analyzed items before the factorial analysis. S2. Factorial solution of three factors. The adjustment of the model with four factors was better than this with three factors.
URL: http://asset.jmir.pub/assets/144d5f9dc3a51ac77949b9a8b2ab8219.docx