

Validity of the Engagement to Academic Tasks Questionnaire in Peruvian college students

Validez del cuestionario Engagement to Academic Tasks Questionnaire en universitarios peruanos

Validez do questionário Engagement to Academic Tasks Questionnaire em universitários peruanos

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Abstract

Students' interest and involvement of students in their e-learning during the COVID-19 pandemic has been a little-studied reality. The manifestation of cognitive, emotional, and behavioral involvement has been particularly different in recent years, so having instruments that allow it to be done is necessary for educational research. Therefore, it was sought to adapt and validate an engagement instrument that allows measuring the involvement of students during the pandemic. For this, an engagement questionnaire was applied to 297 university students. The results indicate that the original factorial structure of the model is maintained when adapting to education in a virtual context. Likewise, it was possible to identify that there were no differences in the model according to the gender of the participant, which corroborates a factorial invariance of the model. That is, it has been possible to adapt and validate a psychometric instrument that measures the engagement of students online.

Keywords: academic engagement; confirmatory factor analysis; college students; education; learning

Resumen

El interés e involucramiento de los estudiantes por su propio aprendizaje en virtualidad durante la pandemia por la COVID-19 ha sido una realidad poco estudiada. La manifestación del involucramiento cognitivo, afectivo y conductual ha sido particularmente diferente durante los últimos años, por lo que contar con instrumentos de medición es necesario para la investigación en la educación. Por ello, se buscó adaptar y validar un instrumento de *engagement* que permita medir el involucramiento de los estudiantes durante la pandemia. Para ello, se aplicó un cuestionario de *engagement* a 297 estudiantes universitarios. Los resultados indican que la estructura factorial original del modelo se mantiene al adaptarse a la educación en contexto virtual. Asimismo, se pudo identificar que no existen diferencias en el modelo según el sexo del participante, lo que corrobora invarianza factorial. Se ha podido adaptar y validar un instrumento psicométrico que mide el *engagement* de los estudiantes en virtualidad.



Palabras clave: engagement académico; análisis factorial confirmatorio; universitarios; educación; aprendizaje

Resumo

O interesse e o envolvimento dos estudantes no seu próprio aprendizado virtual durante a pandemia do covid-19 tem sido uma realidade pouco estudada. A manifestação de envolvimento cognitivo, afetivo e comportamental tem sido particularmente diferente nos últimos anos, por isso contar com instrumentos de mensuração é necessário para a pesquisa em educação. Por conseguinte, procurou-se adaptar e validar um instrumento de engagement que permita medir o envolvimento dos estudantes durante a pandemia. Para isso, foi aplicado um questionário de engagement a 297 estudantes universitários. Os resultados indicam que a estrutura fatorial original do modelo é mantida quando adaptada à educação num contexto virtual. Também foi possível identificar que não havia diferenças no modelo segundo o sexo do participante, o que corrobora a invariância fatorial. Foi possível adaptar e validar um instrumento psicométrico que mede o engagement dos estudantes no contexto virtual.

Palavras-chave: engajamento acadêmico; análise fatorial confirmatória; estudantes universitários; educação; aprendizagem

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Due to the COVID-19 pandemic, the educational experience underwent several changes (Navarro et al., 2021; Vilela et al., 2021). This caused the students to experience virtual and hybrid education, modalities with which they were not familiar. Therefore, it is relevant to analyze the impact of virtual education on students' learning and motivation (Navarro et al., 2021). One of the variables that could be important is engagement and its measurement in the academic context.

Engagement is a construct that has been studied in work-related contexts (Oriol-Granado et al., 2017). In the field of education, engagement has generated growing interest from educators and researchers, becoming an important conceptual framework to consider (Alrashidi et al., 2016). Academic engagement is understood as the degree of involvement that students have in achieving their academic goals (Gutiérrez et al., 2017). Thus, such involvement comprises how students interact with their academic activities (da Rocha et al., 2016; Hew et al., 2016), as well as the physical and psychological resources dedicated to the educational experience (Peña et al., 2017).

Academic engagement has been measured through various psychometric instruments; however, one disadvantage to consider is that most of them have been adaptations of scales from the work-related engagement construct. In this regard, one of the most widely used and recognized tests is The Engagement Questionnaire UWES (Schaufeli et al., 2006), which has been adapted in the region as UWES-S9 (Carmona-Halty et al., 2019; Guerra & Jorquera, 2021; Laureano et al., 2020; Matta, 2021). Among the criticisms of this questionnaire is that it measures academic engagement in a one-dimensional manner and, therefore, lacks depth in its definition (Dominguez-Lara et al., 2020), unlike other psychometric approaches to engagement. Therefore, researchers need to have a clear understanding of how they define engagement and at what level it will be measured (Fredricks et al., 2016).

Fredricks et al. (2016) pointed out that academic engagement can address various aspects of the student's experience, being a flexible construct that responds to contextual characteristics and is subject to environmental change (Fredricks et al., 2004). Academic engagement allows for predicting the learning outcomes achieved by the student and - indirectly- evaluating the practices carried out by the teacher in the classroom (Shernoff et al., 2016).

Boekaerts (2016) asserts that academic engagement tends to increase when teachers assign challenging tasks, that present opportunities for choice. Therefore, high levels of engagement can lead to better academic outcomes in the educational context. This is supported by Lara et al. (2018), who indicate that a high degree of academic engagement would lead to successful academic outcomes within the educational system. In addition, Bae and Han (2019) note that in educational systems, there is a need to improve the quality and educational standards in schools and universities, emphasizing the necessity to know and understand how students spend their time and energy during their studies.

Engagement is considered a rather broad construct (Fredricks et al., 2016; Reschly & Christenson, 2012), in which two main theoretical perspectives or approaches can be distinguished. The first implies that engagement consists of three dimensions: cognitive engagement, behavioral engagement, and emotional-affective engagement (Alrashidi et al., 2016; Fredricks et al., 2004). The second perspective argues that engagement consists of vigor, dedication, and absorption (Alrashidi et al., 2016; Schaufeli et al., 2002). This conceptual ambivalence leads to practical difficulties in establishing parameters for the measurement of the construct (Jimerson et al., 2003). Consequently, various instruments have been developed to measure engagement, and to some extent, they have coincided in similar dimensions.

An example of this is the proposal by Aspeé et al. (2019), whose theoretical structure is comprised of three dimensions: academic development-oriented engagement, personal-integral development-oriented engagement, and citizen development-oriented engagement. These dimensions address the theoretical principles mentioned earlier that make up the engagement and involvement of students in academic activities.

On the other hand, Lara et al. (2018) proposed a different three-dimensional structure for measuring academic engagement, which includes a cognitive, behavioral, and affective dimension. This theoretical proposal includes specific aspects of the engagement experience, as well as the measurement of a person's involvement at the behavioral, cognitive, and affective levels. Additionally, Zapata et al. (2018) designed and validated an instrument that linked the concept of engagement to indicators such as the quality of interactions, learning strategies, institutional support, and collaborative learning, among others. Furthermore, Parra and Pérez (2010) developed an instrument for psychology students, whose theoretical structure characterized engagement in three dimensions: dedication, vigor, and absorption. However, their findings were not empirically consistent with the proposed model, as they obtained a bifactorial structure.

Based on this, there has been a preference for studying this construct from a more specific perspective: tasks and activities carried out in the classroom. Engagement in this context is defined as a set of favorable behaviors exhibited by students, such as effort, enthusiasm, and initiative (Jang et al., 2016). In this way, Yévenes-Márquez et al. (2022) designed the Engagement to Academic Tasks Questionnaire (Comp-TA) with three dimensions: cognitive, behavioral, and emotional. Firstly, the cognitive dimension is understood as the student's investment and effort in their studies. Secondly, the behavioral dimension refers to the consistency of effort, attendance, tasks, and desired academic behaviors (Fredricks et al., 2004; Shernoff et al., 2016). Finally, the emotional

dimension corresponds to the affective connection, and understanding of how students approach academic activities (Fredricks et al., 2004). Shernoff et al. (2016) add that this dimension relates to the student's emotions in response to their classroom tasks. Moreover, while the questionnaire Yévenes-Márquez et al. (2022) developed was for a school context, it is also applicable in higher education and possesses good psychometric properties.

Thus, the Comp-TA was developed based on three instruments: School Engagement (Lara et al., 2018), the Academic Involvement instrument (Rigo & Donolo, 2018), and the School Task Engagement Scale (Peña et al., 2017). The first instrument was validated in adolescent students and consisted of three factors with adequate reliability coefficients (Cronbach's alpha ranging from .83 to .87). Additionally, the model showed suitable fit indices (RMSEA = .05, CFI = .94, TLI = .93). The second instrument for Academic Involvement was validated in university students and comprised six factors: attachment to the university, classroom attention, active participation, dedication, task focus, and social integration. The internal consistency of the instrument was confirmed with Cronbach's alpha (.896) and theta (.91) (Peña et al., 2017). Lastly, the School Task Engagement Scale was adapted and validated in elementary school students; it was subdivided into three dimensions with adequate reliability coefficients (Cronbach's alpha ranging between .70 and .76) and suitable fit indices for the model with GFI = .92, CFI = .93, and RMSEA = .04 (Rigo & Donolo, 2018).

On the other hand, gender has been shown to relate to academic engagement (Ayub et al., 2017; Dominguez-Lara et al., 2021). The literature suggests that women exhibit higher levels of engagement (Carvajal & Carranza, 2022; Hsieh & Yu, 2023). This difference may have a cultural origin that is reflected in academic tasks (Maluenda et al., 2022; Maunula et al., 2023). However, it is essential to emphasize that most of these studies have not considered the gender invariance implications when conducting validity analyses (Barghaus et al., 2023). Consequently, it is critical to carry out an invariance analysis as a procedure that could promote more objective and bias-free measurement.

Measuring academic engagement in college students is relevant in identifying to what extent the educational experience impacts the development of future professionals. Therefore, the main objective of this study was to evaluate the psychometric properties of an adaptation and extension of the Comp-TA questionnaire (Yévenes-Márquez et al., 2022) with a sample of college students in Metropolitan Lima. As a specific objective, an invariance analysis based on the participants' gender, will be carried out.

Method

Participants

The sample consisted of 297 university students from Lima, Peru. Female students made up 58.2 % of the sample, while male students accounted for 41.8 % of it. The participants' ages ranged from 18 to 32 years ($M = 20.87$, $SD = 2.29$). Additionally, the participants were enrolled in university programs ranging from the second to the twelfth academic term ($M = 6$, $SD = 2.65$). Inclusion criteria required that all participants were of legal age, had taken virtual courses during the 2022-1 academic term, and were enrolled in the university.

To participate in the research, the respondents read an informed consent, which outlined the importance and purpose of the study, as well as its requirements. To safeguard their integrity, it was specified that participation was voluntary, anonymous,

and confidential. Furthermore, they were assured that they could withdraw from the research at any time without experiencing any negative consequences.

Measures

The Engagement to Academic Tasks Questionnaire (Comp-TA) was developed by Yévenes-Márquez et al. (2022). It consists of 15 items and three underlying factors related to academic engagement: behavioral (7 items), cognitive (4 items), and emotional (4 items). The questionnaire uses a Likert response format ranging from 1 to 7, where 1 was *Strongly Disagree*, 2: *Somewhat Disagree*, 3: *Disagree*, 4: *Neither Agree nor Disagree*, 5: *Agree*, 6: *Somewhat Agree*, and 7: *Strongly Agree*.

Regarding the instrument's validity, in the exploratory factor analysis, the Unweighted Least Squares extraction method and the Promin oblique rotation method were used. The Bartlett's sphericity test was significant, with a KMO of 0.86, indicating that the correlation matrix was suitable for factor analysis. A three-factor solution was extracted, explaining a total of 57 % of the variance, which is considered an adequate percentage (Pérez & Medrano, 2010). Concerning the psychometric properties of the scale, the fit indices obtained in the Confirmatory Factor Analysis (CFI = .92, TLI = .90, RMSEA = .07) indicate a satisfactory internal structure validity, comprising three dimensions (Kline, 2016).

Additionally, a protocol was designed, in which experts in the field were asked to evaluate the instrument's items based on three criteria: Relevance, Sufficiency, and Coherence. Relevance pertains to whether the proposed item corresponds to the assigned dimension. Sufficiency relates to whether the item is suitable for measuring the evaluated concept. Lastly, Coherence assesses whether the item is appropriate in terms of wording.

Procedure

The present research employs a quantitative research design aimed at validating an instrument through expert judgment and psychometric assessments. To adapt the Comp-TA for a population of university students in Lima, permission was obtained from the authors of the original instrument for its use and application. After obtaining this permission, the authors of the current research translated the items into Spanish. Subsequently, the questionnaire underwent a content validation process involving four expert judges. Afterward, the questionnaire was adapted into a digital format using Google Forms and incorporated the informed consent and sociodemographic data sheet. This allowed for an online pilot test of the questionnaire with four participants, during which comments and observations regarding the instrument were collected. Following this, the instrument was administered, and the data collection was conducted virtually.

Data analysis

For the present study, RStudio version 2022.12.0 was used. First, descriptive analyses and the Aiken criterion were performed. Additionally, the internal reliability of the three dimensions and the overall instrument was analyzed using Cronbach's alpha and McDonald's omega coefficients. Regarding the aim of the study, a Confirmatory Factor Analysis (CFA) will be conducted to determine if the structure of the original model is maintained through this analysis. In this regard, the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) will be reviewed. Acceptable values for these factors are as follows: RMSEA < .06, SRMR < .08, CFI > .95, TLI > .95. For Invariance analyses (metric and scalar), the cutoff points proposed by Rutkowski and

Svetina (2014) will be considered, these suggest that the values for scalar and metric invariance fit indices should be as follows: $\Delta CFI > -.010$, $\Delta RMSEA < .015$.

Results

First, descriptive analyses of the instrument (items, dimensions, and total score) are reported (Table 1). Regarding content validity, the results obtained for each item are reported (Table 2).

Subsequently, a confirmatory factor analysis (CFA) was conducted to verify that the original three-dimensional structure of the scale is replicated in the current sample. The Mardia's test was performed to check the assumption for structural equations, that the observed variables together follow a multivariate normal distribution (Kline, 2016). The Mardia's test revealed skewness ($\hat{\gamma}_1 = 1747.64$, $p < .05$) and multivariate kurtosis ($\hat{\gamma}_2 = 28.32$, $p < .05$) indices of the set of questionnaire variables, indicating that the data did not follow a multivariate normal distribution.

CFA was carried out using the maximum likelihood estimation method with Satorra-Bentler correction (2001) due to the data not meeting the assumption of multivariate normality. This analysis confirmed the three-dimensional factorial structure of the adapted scale, yielding good fit indices ($\chi^2(df) = 202.435(87)$, $p < .001$; $S-B\chi^2 = 1.383$, $CFI = .924$, $TLI = .908$, $RMSEA = .067$ ($CI = .057-.077$), $SRMR = .056$). The cognitive engagement dimension consisted of items 1, 2, 3, and 4; the behavioral engagement dimension included items 5, 6, 7, 8, 9, 10, and 11; and the emotional engagement dimension comprised items 12, 13, 14, and 15. The factor loadings were significant ($p < .001$) and ranged from .510 to .855 (Figure 1).

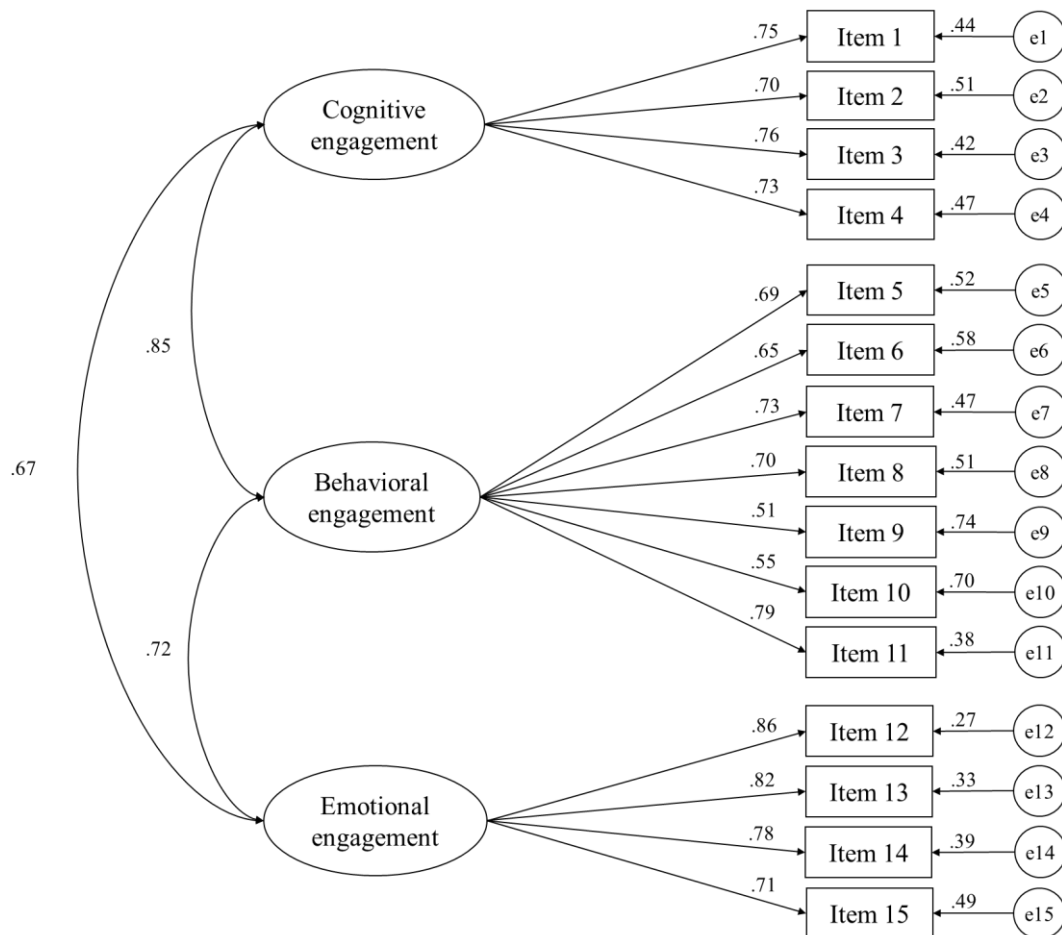
Table 1
Descriptives of the Comp-TA Questionnaire

Item	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
1. Pienso en lo que ya sé sobre el tema porque puede ayudarme a entenderlo mejor.	4.812	0.982	-0.749	0.545
2. Me esfuerzo por entender lo más que pueda al revisar los documentos del curso para realizar las actividades.	4.752	0.913	-0.353	-0.415
3. Intento identificar la información más relevante.	4.917	0.942	-0.644	-0.106
4. Pienso en distintas maneras de resolver la actividad con el fin de elegir la mejor opción.	4.785	1.070	-0.749	0.262
5. Sigo las indicaciones del(a) profesor(a) para desarrollar las actividades de la clase.	5.050	0.975	-1.129	1.461
6. Contesto las preguntas propuestas por el(la) profesor (a).	4.660	1.191	-0.766	0.055
7. Completo todos los requisitos de la actividad.	4.848	0.993	-0.727	0.367
8. Me concentro cuando el(la) profesor(a) presenta las instrucciones para realizar las actividades de la clase.	4.667	1.110	-0.622	-0.209
9. Cuando no entiendo la actividad le pregunto al(la) profesor(a).	4.373	1.377	-0.571	-0.447
10. Participo en las actividades de la clase.	4.290	1.283	-0.490	-0.417
11. Escucho atentamente los conceptos de la clase para resolver la actividad.	4.673	1.091	-0.702	0.132
12. Siento interés por aprender temas nuevos del curso.	4.802	1.041	-0.585	-0.395
13. Me interesa profundizar en temas relacionados al curso.	4.650	1.103	-0.592	0.010
14. Me gusta empezar un nuevo tema.	4.792	1.068	-0.687	0.087
15. Pienso que las actividades de clase son interesantes y motivadoras.	4.498	1.242	-0.723	0.197
Cognitive engagement	19.267	3.172	-0.574	0.173
Behavioral engagement	32.561	5.752	-0.582	0.355
Emotional engagement	18.743	3.772	-0.620	0.292
Total score	70.571	11.143	-0.582	0.423

Table 2
Results from the validation by expert judgment

Item	Pertinence	Sufficiency	Coherence
1.	1.0	1.0	1.0
2.	1.0	0.75	1.0
3.	1.0	1.0	1.0
4.	1.0	1.0	0.75
5.	1.0	1.0	1.0
6.	1.0	1.0	1.0
7.	1.0	1.0	1.0
8.	0.75	0.75	0.75
9.	1.0	1.0	1.0
10.	1.0	0.75	1.0
11.	1.0	1.0	1.0
12.	1.0	0.75	1.0
13.	1.0	1.0	1.0
14.	0.75	0.75	0.75
15.	1.0	1.0	1.0

Figure 1
CFA Model of the Comp-TA Questionnaire



Subsequently, the reliability of internal consistency was examined using the alpha and omega coefficients for the factors of the Comp-TA. It was identified that the scale demonstrates overall good reliability with a total omega (ω) of .93. On one hand, the cognitive engagement factor showed high reliability with $\alpha = .82$ and $\omega = .84$. Similarly, the behavioral engagement factor also exhibited high reliability with $\alpha = .84$ and $\omega = .89$. Finally, the emotional engagement factor also achieved a high coefficient of $\alpha = .87$ and $\omega = .89$.

The next step was to review the instrument's invariance properties based on the reported gender of the participants (Table 3). Invariance can be analyzed at three levels: metric (focusing on item and factor loading of observed variables), scalar (examining latent variables or factors), and configural (verifying if the factorial structure is similar across groups; Milfont & Fischer, 2010).

Table 3
Invariance across gender

	χ^2 *	df	CFI	TLI	RMSEA	AIC	$\Delta\chi^2$	Δ CFI	Δ TLI	Δ RMSEA
Configural	288.603	174	.926	.910	.067	11401.902	--	--	--	--
Metric	297.333	186	.928	.918	.063	11382.854	-8.73	.002	.008	-.004
Scalar	321.605	198	.920	.915	.065	11380.587	-24.27	-.008	-.003	.002

*All the χ^2 have a *p-value* < .001

According to the criteria proposed by Rutkowski and Svetina (2014), the results showed that the Engagement to Academic Tasks Questionnaire (Comp-TA) scale exhibited strong invariance across participant gender in both metric and scalar variance. These results indicate that there is no variability by participant gender, and the model's structure remains consistent across these groups.

Discussion

The objective of the present study is to adapt the Comp-TA scale to the Peruvian context, gathering evidence of the scale's validity and reliability with university students. The results indicate that the adapted questionnaire has psychometric properties to be considered valid and reliable.

Firstly, it is observed that adequate fit indices were found. Although there is literature that differs in cutoff points, the evidence collected falls within the parameters used by Hu and Bentler (1999), Schreiber et al. (2006), and Rutkowski and Svetina (2014). These results are also similar to the validity and reliability processes conducted by Lara et al. (2018) and Aspeé et al. (2019). An important aspect to consider is that the fit indices for metric and scalar invariance analysis meet the parameters proposed by Rutkowski and Svetina (2014). This analysis is crucial because it provides evidence that there are no significant relevant differences in the factor loadings across the sample. In this sense, the results indicate that the items do not respond differently between groups (gender), implying that the strength of the relationships between the items on the scale and the underlying model is the same in all groups (Milfont & Fischer, 2010).

An important point to highlight is that there are not many studies that have performed invariance analysis when validating psychometric instruments measuring engagement, making this study provide relevant evidence regarding the original factorial structure. Furthermore, maintaining model invariance based on participant gender is relevant for measuring engagement, as there could be differences between groups due to cultural background. Not finding these differences suggests that the model is not affected by participant gender.

On the other hand, the results support the original factorial structure, identifying a three-dimensional model similar to that proposed by Yévenes-Márquez et al. (2022), Fredricks et al. (2004), and Tannoubi et al. (2023). These results reaffirm the importance of studying engagement, considering the interaction of these dimensions, as it allows the study of the degree of intensity and duration of a behavior in the academic context (Freiberg-Hoffmann et al., 2022).

In this regard, Yévenes-Márquez et al. (2022) point out that engagement in the classroom must include emotional, cognitive, and behavioral experiences that interact when facing an academic activity. This implies that the three dimensions can maintain a coherent relationship among them, as evidenced in the presented model.

Regarding gender invariance, when testing for configural, metric, and scalar invariance, it was found that there is no variability based on participant gender. This analysis tests whether different groups respond to the items in the same way, meaning that the strength of the relationships between the items on the scale and the underlying construction is the same in all groups (Hirschfeld & von Brachel, 2014; Milfont & Fisher, 2010). In this case, it is possible to compare the ratings of male and female students, and observed differences in Comp-TA elements may indicate group differences in academic engagement.

Regarding reliability, the reliability coefficients, alpha, and omega, obtained for the three dimensions of Comp-TA were higher than .70, indicating adequate levels of internal consistency in the studied sample (Hair et al., 1998; Ventura-León, & Caycho-Rodríguez, 2017). In this sense, the observed results are similar to the study by Yévenes-Márquez et al. (2022) and are sufficient for conducting future research studies with the validated scale.

On the other hand, among the strengths of Comp-TA, it is noteworthy that it can be applied easily and quickly, identifying three dimensions that have practical functionality within the classroom: emotional, behavioral, and cognitive. In this sense, it is possible to determine which dimension should be addressed by the teacher. Additionally, using Comp-TA allows the identification of whether students' engagement is being positively affected by innovative educational interventions.

As for the limitations of this study, it is important to note that other constructs related to academic engagement were not measured in this research. Future research could evaluate other psychological variables in the nomological network of academic engagement to obtain evidence of convergent, discriminant, and/or criterion validity. Moreover, regarding the study sample, it is essential to highlight that the participants were students from a university in Lima, and due to their particular characteristics, they do not sufficiently represent the reality of university students in the rest of the country. It is suggested that in the future, the study of the psychometric properties of Comp-TA can be extended to university students from other regions of Peru.

Despite the limitations, the Spanish version of Comp-TA applied to university students in Lima is considered a consistent and suitable tool for measuring academic engagement in this population.

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