


RESEARCH ARTICLES

Tuckman Procrastination Scale (ATPS) : Psychometric Evidence and Normative Data in Secondary School Students from Lima, Peru

Escala de Procrastinación de Tuckman (ATPS): evidencias
psicométricas y datos normativos en estudiantes de secundaria de
Lima, Perú


Jhorleny Galindo-Contreras

Universidad César Vallejo, Lima, Perú

 <https://orcid.org/0000-0002-2733-7119>

Lincol Orlando Olivas-Ugarte*

Universidad César Vallejo, Lima, Perú

 <https://orcid.org/0000-0001-7781-7105>

Received: 09/05/2021

Revised: 11/15/2021

Accepted: 03/21/2022

Online: 04/22/2022

***Correspondence:**

Email: lolivas2021@gmail.com

Cited as:

Galindo-Contreras, J., & Olivas-Ugarte, L. (2022). Tuckman Procrastination Scale (ATPS) : Psychometric Evidence and Normative Data in Secondary School Students from Lima, Peru. *Propósitos y Representaciones*, 10(1), e1381. <https://doi.org/10.20511/pyr2022.v10n1.1381>

Summary

This instrumental design study was carried out with the objective of analyzing the psychometric evidence of the ATPS scale and preparing normative data for its application in secondary school students in Metropolitan Lima. There are 429 students from 11 to 18 years old participated, selected through a non-probabilistic convenience sampling. The confirmatory factor analysis of the one-dimensional model with 15 items did not fit, so 5 were discarded, reaching an adequate fit for this re-specified model: $X^2/df=1.681$, CFI=.992, TLI=.990, RMSEA=.040, SRMR=.030. Also, evidence of convergent validity was found with test anxiety ($r = .618$) and discriminant validity with academic self-efficacy ($r=-.385$). The reliability was estimated with the alpha coefficients: $\alpha=.85$, and Omega: $\omega=.86$. The factorial invariance analysis showed that the test is equivalent by sex and degree of study ($\Delta CFI < .010$, $\Delta RMSEA < .015$). Finally, normative data were prepared for the interpretation of ATPS scores in secondary school students from Lima. It is concluded that the ATPS-10 has adequate psychometric properties and has normative data that justify its correct use to measure the levels of academic procrastination in Peruvian secondary school students.

Keywords: academic procrastination; validity; reliability; equity; normative data.

Resumen

Este estudio de diseño instrumental se realizó con el objetivo de analizar las evidencias psicométricas de la escala ATPS y elaborar datos normativos para su aplicación en estudiantes de secundaria de Lima Metropolitana. Participaron 429 estudiantes de 11 a 18 años, seleccionados a través de un muestreo no probabilístico por conveniencia. El análisis factorial confirmatorio del modelo unidimensional con 15 ítems no ajustó, por lo que se descartaron 5, alcanzado un ajuste adecuado para este modelo reespecificado: $X^2/df=1.681$, CFI=.992, TLI=.990, RMSEA=.040, SRMR=.030. También, se encontró evidencia de validez convergente con la ansiedad ante exámenes ($r= .618$) y validez discriminante con la autoeficacia académica ($r=-.385$). La confiabilidad se estimó con los coeficientes alfa: $\alpha=.85$, y omega: $\omega=.86$). El análisis de invarianza factorial mostró que la prueba es equivalente por sexo y grado de estudio ($\Delta CFI < .010$, $\Delta RMSEA < .015$). Finalmente, se elaboraron datos normativos para la interpretación de las puntuaciones de la ATPS en estudiantes de secundaria de Lima. Se concluye que la ATPS-10 reúne adecuadas propiedades psicométricas y cuenta con datos normativos que justifican su correcto uso para medir los niveles de procrastinación académica en escolares peruanos de educación secundaria.

Palabras clave: procrastinación académica; validez; confiabilidad; equidad; datos normativos.

Introduction

In today's society it is common to say that in order to achieve our goal more quickly, we need to make additional efforts. This is the opposite behavior of those who leave their tasks to the last minute, an occurrence typically known as procrastination (Angarita, 2012).

As mentioned by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012), in Europe, a continent considered as one of the main exponents in terms of education, 90% of students procrastinate, 50% of them do so on a regular basis, thus, leading them to low academic performance. In South America, Ferrari et al. (2005) report that 61% of students procrastinate, 20% of them have chronic procrastination and in Metropolitan Lima 54.5% complete their activities within a short period of time, only 17.4% perform them at the right time (Marquina et al., 2016).

As reflected by their low performance, procrastination affects the academic life of students, which is why it is important to recognize more precisely the behavior of this variable. There are different instruments that can be used to measure it, such as the Aitken Procrastination Inventory (Aitken, 1982), the Procrastination Assessment Scale for Students (PASS) of Solomon and Rothlum (1984), or the Academic Delay Scale (EDA) of Clariana and Martin (2008). Though in Peru the tool most used in recent years has been Busko's Academic Procrastination Scale (EPA) (1998), adapted by Álvarez (2010), and reduced to 12 items by Domínguez et al. (2014), it should be mentioned that there is some controversy about its dimensionality, which interferes with the interpretation of its scores, especially if it is sought to be applied in adolescents. Therefore, a valuable alternative is the Tuckman Procrastination Scale (TPS) (1990) due to its understandability, brevity, and one-dimensional structure, making it perfect to be used in Peruvian schoolchildren.

The study group of Furlan et al. (2010) adapted the TPS to Spanish, ruling item 4 out: I usually delay making difficult decisions. Suitable fit indices were found for a one-dimensional model after applying a confirmatory factor analysis (CFA): CFI= .99, GFI= .98, RMSEA= .04; also, its reliability was demonstrated by the internal consistency method (α = .94). Alegre-Bravo and Benavente-Dongo (2020) analyzed the psychometric properties of this scale in a sample of 764 university students from the city of Lima-Peru, reporting acceptable results for the CFA: RMSEA = .056, CFI= .979, GFI= .986, and reliability: α = .845, ω = .848, after eliminating items 5: I start working immediately, even in activities that are displeasing to me, 7: I spend the necessary time for all activities, even if I find them boring, and 12: I wish I could find an easy way to get moving, presumably by being reverse-worded.

Despite these results, to date, no research has been identified in the Peruvian context on the psychometric properties of this new version known as ATPS in secondary school students. Therefore, in order to fill this gap, this study was carried out in Metropolitan Lima, which has a multicultural and extensive population, it also considered economic resources areas below the average, which in many instances causes work to take up quality time from parents to children in different aspects of their daily lives, but especially in their studies, which is often the reason why they drop out, this being a very common behavior among students.

However, it is important to know more about the variable of the study. Therefore, it should be understood that the word procrastinate originates from the Latin term Procrastinare, which means to leave for tomorrow or delay the development of the assigned activity (Ferrari et al., 1995). For the Royal Spanish Academy (RAE, 2002) it is the action of lengthening something. Regarding psychology, this action affects the stress generated by the pressure it represents, because performing it implies leaving their basic needs in a short time they have left to comply with what is required (Angarita, 2012).

Likewise, when we talk about procrastination, we refer to the people who carry out their activities because they like or find it pleasant, different from those who do them because the activities are already established since it represents a personal conflict, about doing what they like to do or, failing that, procrastinate. (Quant & Sánchez, 2012).

In the mid-seventeenth century in the sermon of the Reverend Walker, it was already known that those who procrastinated did not reach the goal of being saints, on the contrary, they were considered sinners (Carranza & Ramírez, 2013). However, procrastination begins to be considered as a negative act from modernity onwards, because its productive systems were very important for economic and social development. (Kachgal et al., 2001). For Steel (2007), the first analysis on procrastination was carried out by Milgram in 1992, who explains that people usually assume many responsibilities to be developed in the short term, and as they cannot fulfill them, they procrastinate.

Regarding the models, we can find the behavioral one, which means that for a behavior to be achieved, it must be reinforced, the outcome of this can be favorable or unfavorable. Therefore, it is considered that a procrastinator strengthens their negative thoughts according to the environment in which they are, so it is important to do it without unrealistic aspirations (Skinner, 1977).

Moreover, another important aspect for Ferrari and Emmons (1995) is emotions because the procrastinators perceive satisfaction and pleasure in not fulfilling their duties, which, in their minds, they avoid fulfilling them. It should be noted that by doing so their avoidance to complete a task does not mean refusal to carry it out, obviously erroneous ideas, which produces in them feelings of liberation and satisfaction. In turn, it is important to clarify that, if they were to be fulfilled within a time limit, they emphasize that accomplishment all the more by taking on extra effort.

It should be noted that procrastinators always start activities, once accepted, this may be delayed when they want to complete it, that is where the discouragement behavior stands out, replicating these actions many times and are reflected in their school performance (Schouwenburg, 2004).

There is the cognitive model, in which the processing of information matters in great proportion because if they have negative thoughts, they seek to exclude themselves and end up failing in the attempt to carry out their activities (Wolters, 2003).

But the theoretical basis is the cognitive-behavioral model by Ferrari et al. (1995), since, though they have the predisposition to do it, they do not manage to do it since either at the beginning, the middle, or end of the task, they begin to have thoughts of procrastination, leaving tasks unfinished, turning it into a habit that generates a feeling of despondency.

In this regard, Ferrari et al. (1995) highlight that no matter how many negative thoughts a procrastinator can have, they are aware of what they do. Meaning that, despite being on time to deliver the tasks, they do not do it because it does not fit the time they plan to devote to them, so they become demotivated and prefer not to fulfill them, bearing in mind that it is not the right thing to do.

Although it is known that procrastination affects the academic performance of adolescents (Furlan et al., 2012), there are no measuring instruments, valid, reliable, equitable, or normative data that allow early identification of these behaviors to classify students according to their level of procrastination. For this reason, it is convenient to carry out this research, which will contribute to a better evaluation and psychoeducational intervention.

Consequently, following a sequential order, the following ideas were formulated as specific objectives: 1) Analyze the evidence of validity based on the content, 2) Perform the preliminary statistical analysis of the items, 3) Analyze the evidence of validity based on the internal structure, 4) Analyze the evidence of validity in relation to other variables, 5) Analyze the evidence of reliability, 6) Analyze the evidence of equity, and finally, 7) Elaborate normative data.

Method

Design and Type of Research

It is an instrumental design research (Montero and León, 2002; Ato et al., 2013), and specifically, a psychometric one, since it is responsible for analyzing the validity, reliability, and equity of an

instrument, in this case, a psychological test that contributes to understanding human behavior (Alarcón, 2008).

Participants

The sample consisted of 429 students from the first to the fifth year of high school: first = 72, second = 50, third = 161, fourth = 60, and fifth = 86, 190 (44.3%) men and 239 (55.7%) women, from 11 to 18 years of age ($M=14.22$, $SD=1.4$), from schools in Metropolitan Lima: North Lima = 149 (34.7%), South Lima = 145 (33.8%), Central Lima = 76 (17.7%), East Lima = 48 (11.2%), and Callao = 11 (2.6%), who were selected by non-probability and convenience sampling, until completing an amount greater than 400, which is considered sufficient to validate a scale (Arafat et al., 2016).

Instruments

Adapted Tuckman Procrastination Scale (ATPS)

Originally prepared by Tuckman (1990). This instrument was composed of 72 items, but a second revision was made reducing them to 35. It was later adapted in Argentina by Furlan et al. (2010), who created a new version of 15 items with a Likert-type response format with 5 options, going from never = 1 to always = 5. The score varies between 15 and 75 points, and higher scores indicate a higher presence of procrastinating behaviors.

Academic Situations Specific Perceived Self-Efficacy Scale (EAPESA)(EAPESA)

Made in Spain by Palenzuela (1983), it has 10 items with 4 Likert response alternatives from never = 1 to always = 4. The score varies between 10 and 40. In addition, the evaluation time does not exceed the 10 minutes. The scale was used as a discriminating variable. In this research, a confirmatory factor analysis was suitable fit indices: $X^2/df= 2.344$, $CFI=.992$, $TLI=.989$, $SRMR=.031$, and $RMSEA=.056$ In addition, its reliability was estimated with the omega coefficient:.90.

Test Anxiety Inventory (Tai-State)

It is of Spanish origin (Bauermeister et al., 1983). In addition, Domínguez-Lara (2016) reviewed its internal structure, and identified 15 items with Likert-type response alternatives from nothing = 1 to a lot = 4. Its minimum raw score is 15 and its maximum raw score is 60. It was used as a convergent variable. In this study, confirmatory factor analysis was performed to verify the one-dimensional structure of the Inventory, finding adequate fit indices: $X^2/df= 3.641$, $CFI=.948$, $TLI=.939$, $SRMR=.059$, and $RMSEA=.079$ Likewise, its reliability was estimated with the omega coefficient:.89.

Procedure

Due to the pandemic generated by COVID-19, classes during the 2021 school year were held remotely. Therefore, data had to be collected through a virtual Google form that was distributed on social networks such as Facebook, Instagram, and WhatsApp, within the span of two weeks. The form was prepared by inserting the title of the research, with a brief explanation of its purpose and requirements for the study participants. A consent section for parents (or legal guardians) and minors was also introduced. This section also pointed out the anonymity of their collaboration. Likewise, a personal data sheet was incorporated and it took into account sex, age, school grade, educational management, and location, guaranteeing at all times the confidentiality of their data. Finally, the three instruments to measure procrastination, academic self-efficacy, and test anxiety were included. Once the data collection phase was completed, the participants' responses were exported to a Microsoft Excel spreadsheet for sorting, then transferred to the SPSS 26 statistical program, and lastly, the data analysis was executed with the free software Rstudio, version 4.1.1.

Data Analysis

Initially, the content of the 15 items of the scale was analyzed by the expert judgment method, and the degree of agreement among these specialists in relation to their relevance, pertinence and clarity was quantified with Aiken's V coefficient = .80 (Aiken, 1980).

A statistical analysis of the items was also performed, taking into account the mean, the standard deviation, the univariate skewness and kurtosis coefficients (+/-1.5), the corrected homogeneity index (<.30) (Nunnally & Bernstein, 1995), communalities (<.40) (Detrinidad, 2016) and the discrimination index through the extreme group method.

Likewise, the confirmatory factor analysis was performed in the RStudio software, using as input the polychoric correlation matrix in combination with the weighted least squares robust estimation (WLSMV) due to the ordinal nature of the variable (Brown, 2015) where its absolute fit is $X^2/df < 3.0$, RMSEA < .08, SRMR < .08 (Ruíz et al., 2010) and its comparative fit is IFC > .90, TLI > .90 (Escobedo et al., 2016).

Evidence of convergent validity was analyzed in relation to anxiety and discriminant validity in relation to self-efficacy with the Pearson's correlation coefficient, and the Cohen (1988) criteria were followed to interpret the effect sizes (r^2): small .01, medium .10, and big .25.

The evidence of reliability was analyzed by the internal consistency method and quantified with the coefficients $\alpha > .70$ (Vargas & Hernández, 2010) and $\omega > .65$ (Katz, 2006).

The evidence of equity was analyzed by analyzing factorial invariance at the configural, metric, strong, and strict levels (Cheung and Rensvold, 2002) with respect to sex and school year, considering the following values: CFI > .95, RMSEA < .05 $\Delta CFI < .010$ Y $\Delta RMSEA < .015$ (Chen, 2007).

Finally, normative data were prepared; the Shapiro-Wilk test for normality was preliminarily analyzed (Ghasemi & Zahediasl, 2012), then the percentiles PC= 10, 25, 50, 75, 90 were calculated, reliability was also estimated with K2 cut-off point, all of which determines the level from very low to very high procrastination (Muñiz, 2003).

Results

Content-Based Evidence of Validity

The 15 items established by Furlan et al. (2010) were presented to eight experts who verified the pertinence, relevance, and clarity of each of these items. In addition, this study used the Aiken V coefficient = .96 to also quantify the degree of agreement between these specialists with regard to the content of the test. We would like to mention that the items presented adequate values $\geq .80$ (Aiken, 1980). At this stage no item was removed; however, items 5, 7 were observed for relevance, and item 12 was observed for clarity.

Polychoric Correlation Matrix

In principle, Table 1 presents the matrix of polychoric correlations of the 10 items of this new version of the ATPS, values of which vary between .21; and .61. Next, the procedure followed to reach the ATPS-10 is carefully reported.

Table 1.
Polychoric Correlation Matrix of the Items of the ATPS SCALE

Ítems	P1	P2	P3	P4	P6	P8	P9	P10	P13	P15
P1	-									
P2	.46	-								
P3	.51	.36	-							
P4	.35	.21	.38	-						
P6	.34	.31	.43	.23	-					
P8	.54	.43	.49	.42	.43	-				
P9	.51	.38	.52	.36	.41	.61	-			
P10	.56	.39	.52	.38	.39	.50	.61	-		
P13	.41	.29	.40	.26	.28	.50	.48	.48	-	
P15	.55	.34	.48	.36	.35	.60	.56	.52	.46	-

Preliminary Statistical Analysis of the Items

Table 2 executes the descriptive analysis of the items, where the corrected homogeneity index to be considered within the parameters must be $> .30$; in this case 3 items are not acceptable, since items 5, 7, and 12 were observed (Nunnally & Bernstein, 1995), as well as for communalities, items 2, 4, 6, 12, and 14 do not comply with what is established by (Detrinidad, 2016), since they must be $> .40$; so we are not measuring items belonging to the scale.

Table 2.
Descriptive Analysis of the ATPS Scale Items

Ítems	M	DE	g^1	g^2	IHC	h^2	id	CF
1	2.8	1.0	0.3	-0.1	.64	.54	.000	.69
2	2.3	1.0	0.5	0.1	.44	.29	.000	.48
3	2.4	1.2	0.5	-0.4	.59	.47	.000	.63
4	2.8	1.3	0.2	-1.1	.38	.25	.000	.44
5	2.9	1.1	-0.2	-0.6	.12	.50	.000	.16
6	1.8	1.0	1.3	1.3	.44	.27	.000	.46
7	2.9	1.2	0.2	-0.7	-.03	.48	.029	.03
8	2.4	1.1	0.5	-0.1	.67	.61	.000	.72
9	2.4	1.1	0.4	-0.4	.64	.56	.000	.72
10	2.6	1.2	0.3	-0.7	.65	.55	.000	.71
11	2.6	1.2	0.1	-1.0	.34	.57	.000	.39
12	3.5	1.1	-0.1	-0.7	.21	.35	.000	.25
13	3.0	1.2	0.0	-0.9	.52	.40	.000	.58
14	3.0	1.0	-0.3	-0.2	.34	.35	.000	.37
15	2.7	1.1	0.4	-0.5	.62	.53	.000	.69

Note: M: Mean; SD: Standard Deviation; g^1 : Fisher's asymmetry coefficient; g^2 : Fisher's kurtosis coefficient; IHC: corrected homogeneity index; h^2 : communality; DI: Discrimination index; FL: factor loading.

Evidence of Validity Based on the Internal Structure

A confirmatory factor analysis was performed with the polychoric correlations matrix and the WLSMV robust estimator for the 15 items through the RStudio program, using $X^2/g1 = 4.193$, CFI= .833, TLI .805, SRMR= .096, and RMSEA= .086. However, items 5, 7, and 12 presented low factor loadings $< .30$ (Field, 2013). In addition, its low metric quality was considered in the previous analysis of Table 2 as well as the inverse items 5, 11, and 14.

All the aforementioned items were discarded, to re-run a new CFA with the remaining 10 items, noting a better fit: $X^2/gl=1.681$, $CFI=.992$, $TLI=.990$, $RMSEA=.040$, and $SRMR=.030$ (Ruíz et al., 2010).

Evidence of Validity in Relation to Other Variables

Afterward, a positive relationship was found between the ATPS scale in relation to the Test Anxiety Inventory (TAI-State) ($r=.618$) as a convergent variable with the scale, reaching a large effect size ($r^2=.38$); while, in the scale of Academic Situations Specific Perceived Self-efficacy Scale (EAPESA), its correlation is discriminating, being this negative ($r=-.385$); the effect size is small ($r^2=.15$) (Cohen, 1988).

Evidence of Reliability

It is evident that the alpha coefficient of the scale is .85, denoting a high reliability (Vargas and Hernández, 2010). Similarly, it is evident that the Omega coefficient value is .86, thus demonstrating that it is an acceptable value (Katz, 2006).

Evidence of Equity

As for Table 3, the factorial invariance by sex and school year was performed, finding that the changes in CFI and RMSEA are minimal ($\Delta CFI<.010$, $\Delta RMSEA<.015$), at the configural, metric, scalar, and strict levels (Cheung and Rensvold, 2002; Chen, 2007). Therefore, students tend to interpret the content of the test regardless of whether they are men or women, or whether they belong to a different year. Thus, ATP scores can be attributed to the variable academic procrastination, and not to personal factors (Messick, 1995).

Table 3.

Adjusted factorial invariance analysis scores of the ATPS scale

According to sex	X^2	ΔX^2	gl	Δgl	p	CFI	ΔCFI	RMSEA	Δ RMSEA
1.-Configural	92.177	...	70	...	***	.983038	...
2.-Metric	98.075	5.8985	79	9	***	.986	.002	.034	.005
3.-Strong	119.139	21.064	88	9	***	.977	.009	.041	.007
4.-Strict	134.034	14.8946	98	10	**	.973	.004	.041	.001
Depending on their year	X^2	ΔX^2	gl	Δgl	p	CFI	ΔCFI	RMSEA	Δ RMSEA
1.-Configural	154.00	...	105	...	***	.962057	...
2.-Metric	169.60	15.599	123	18	***	.964	.002	.051	.006
3.-Strong	189.57	19.965	141	18	***	.963	.002	.049	.002
4.-Strict	220.69	31.121	161	20	**	.954	.009	.051	.002

Note: ***.001; **.01; ΔX^2 = Delta in Chi-square; Δgl = Delta degrees of freedom; ΔCFI = Variation in CFI; $\Delta RMSEA$ = Variation in RMSEA.

Normative Data

Finally, in Table 4, the normality analysis was performed through Shapiro-Wilk (Ghasemi & Zahediasl, 2012), in which $<.001$ must be obtained. However, .002 was obtained. Consequently, the assumption of normality is not met. Therefore, it was determined to use percentiles, that is, if scores from 10-50 are obtained, respectively, it will determine the level in which they are, that

can be from very low to very high (Muñiz, 2003), in addition to the K2 coefficient cut-off points according to their level (Fernández et al., 2014).

Table 4.
ATPS Scale Percentiles

Percentiles	K2 Reliability coefficient	Raw score	Levels
10	.973	10-19	Very low
25	.905	20-24	Low
50	.860	25-29	Average
75	.903	30-34	High
90	.950	35-50	Very high

In this manner, the reduced version of 10 items of the ATPS (ATPS-10) has normative data for its application in secondary school students of Metropolitan Lima.

Discussion

This study was carried out with the intention of corroborating the psychometric evidence, as well as the normative data of the ATPS scale in secondary school students. The theoretical foundations were based on the cognitive-behavioral approach of Ferrari et al. (1995), who report that initially, people have the predisposition to carry out the activities, but along the way, they delay their development.

With regard to the first objective on the evidence of validity based on the content of the test, the opinion of eight experts was consulted. They verified the relevance, pertinence, and clarity of the items that measure the variable, reaching adequate values ($V=.96$) (Aiken, 1980) for the ATPS. However, three judges observed items 5, 7, and 12 in terms of pertinence and relevance. Meaning that these items would have to be corrected, but it was decided to continue with the study without initially excluding them. In this regard, although it is true that they are acceptable, these items could influence the result of future research.

For the second objective, the preliminary statistical analysis of the items was carried out, finding that the most frequently marked responses were those of almost never (2), and sometimes (3); likewise, the values of the mean and standard deviation showed the same tendency of respondents to answer that they rarely procrastinate. Conversely, the corrected homogeneity index of items 5, 7, and 12 are $<.30$ (Nunnally and Bernstein, 1995), and the communalities of items 2, 4, 6, 12, and 14 are $<.40$ (Detrinidad, 2016), which indicates that these items would not be contributing to adequately measure the variable. In some studies, prior to this, similar results are also presented, such as the research conducted by Alegre-Bravo and Benavente-Dongo (2020), who state that items 5, 7, and 12 do not meet the acceptable condition. Consequently, this information was taken into account for the execution of the confirmatory factor analysis.

However, as a third objective, it was proposed to examine the evidence of validity based on the internal structure of the ATPS scale by means of a confirmatory factorial analysis with polychoric matrices and the WLSMV estimator, observing that the fit indices improved substantially after re-specifying the model, by discarding items 5, 7, 11, 12, and 14, which, according to the content analysis, statistical analysis, and modification indices, generated disturbance in the results. However, we tried to preserve the sense of the variable procrastination without altering the three topics originally proposed by Tuckman (1990): 1) Postponing tasks, 2) Avoiding the unpleasant, and 3) Blaming others (Furlan et al., 2010).

Thus, the fit is $X^2/df = 1.681$, $RMSEA = .040$, $SRMR = .030$ (Ruíz et al., 2010) = $CFI.992$, $TLI = .990$ (Escobedo et al., 2016). Obviously, it is the result that best fits the sample evaluated.

Similar values were obtained by Alegre-Bravo and Benavente-Dongo (2020): $X^2 = 184,127$; $gl = 54$, $CFI = .979$, $RMSEA = .056$, who re-specified items 5, 7, and 12 as their factor loadings were very low. Thus, the one-dimensionality is reaffirmed, but now with 10 items.

In this regard, in addition to considering the observations of the expert judges in the criteria of relevance and clarity, as well as in the index of corrected homogeneity, communalities that did not contain adequate values and low factor loadings as reasons that justify the re-specification of the test, it is known that the inverse items can also affect the cognitive processes at the time of responding to the instrument, as possibly happened in this study (Tomás et al., 2012).

Next, in the fourth objective for the validity of criteria in relation to other variables, the ATPS-10 scale was related to the TAI-State scale as a convergent variable, this being positive and statistically significant ($p = .000$, $r = .618$). The same procedure was performed with the EAPESA variable as a divergent variable, resulting in being negative and statistically significant ($p = .000$, $R^2 = .385$) (Cohen, 1988). Consequently, procrastinating implies having periods of anxiety or lacking studies such as the Rossemberg self-esteem scale were significant and negative ($r = -.23$, $p < .01$), and the academic self-efficacy scale was also significant ($r = -.22$, $p < .01$) (Bilge et al., 2013), but it was also correlated with the academic achievement scale, this being ($r = -.140$) (Alegre-Bravo & Benavente-Dongo, 2020). However, further development with other studies such as stress (convergent) and academic performance (divergent) is encouraged in order to achieve results that are the product of a diversity of research studies.

For the fifth objective, the reliability indices ($\alpha = .85$) (Vargas & Hernández, 2010); ($\omega = .86$) (Katz, 2006) of the 10 items, evidencing that in fact, they are higher than expected. The scale is reliable and similar results were found in the Brazilian research ($\alpha = .86$; $\omega = .70$), as well as in the study conducted by (Bilge et al., 2013) ($\alpha = .90$; $\omega = .88$), but the study conducted by (Alegre-Bravo and Benavente-Dongo, 2020) obtained the closest result ($\alpha = .845$; $\omega = .848$). Undoubtedly the studies confirm its veracity. Therefore, it is suggested to develop studies that open up the usefulness of the scale as a background for further research.

In the sixth objective, the evidence of equity was evaluated in two groups, initially by sex where the IFC was $> .95$ in its entirety, $RMSEA < .05$. In turn, ΔCFI are small $< .010$, as well as $\Delta RMSEA$ because they are $< .015$ at the configural, metric, strong and strict level, as mentioned above. It should be understood that it is invariant and equitable for men and women, as well as the school year the student is in, this is supported by (Cheung and Rensvold, 2002; Chen, 2007) when mentioning that if the delta levels are small, it does not alter its measurement.

Finally, the seventh objective was to carry out the normative data by means of the normality test whose result was $.002$, without fulfilling the assumption of normality $< .001$ (Ghasemi and Zahediasl, 2012). Therefore, we chose to use percentiles, in which the minimum raw score is 10 and the maximum 50 (Muñiz, 2003). We also measured reliability through K-2 coefficient according to the percentile obtained (Fernández et al., 2014), which can be from 10, 25, 50, 75 and 90.

Although the validity, reliability and fairness of the ATPS scale have been contrasted with previous research and have been reliably substantiated, it is nevertheless necessary to mention the drawbacks that were encountered: the sampling is non-probabilistic (Bologna, 2013; Supo, 2014) which conditions the participation of only some people, reducing the sample. It is advisable to consider larger samples for better results not only in Metropolitan Lima but in the provinces of the country. Another inconvenient is that due to the virtual modality, there could be bias in the collection of data since procrastination has a negative connotation and students usually want to reflect the opposite; in addition, the limited information available specifically on the instrument makes it impossible to expand in greater detail on the behavior of the variable.

In conclusion, this research has sufficient psychometric evidence to corroborate academic procrastination, but we highly suggest continuing with this research since the ATPS scale does not have many antecedents, in order to have more evidence in different samples for the improvement of psychoeducational intervention programs and also to correlate with several convergent and divergent variables.

Note: This article includes supplementary material: “Tuckman Procrastination Scale (ATPS-10)”, which is available as a stand-alone file at the following link: <https://doi.org/10.20511/pyr2022.v10n1.1381>

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