

ORIGINAL

Validation of the Time Management Behavior Questionnaire in Cuban University Students

Validación del Time Management Behavior Questionnaire en estudiantes universitarios cubanos

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ABSTRACT

Introduction: the Time Management Behavior Questionnaire (TMBQ) assessed behaviors related to time management and had not been adapted for the Cuban context. The objective of this research was to validate the Cuban version of the TMBQ in university students.

Method: a technological assessment study was conducted using quantitative techniques. The reliability of the instrument was determined using Cronbach's alpha coefficient, and exploratory and confirmatory factor analyses were performed to assess the construct validity of the instrument.

Results: a total of 131 university students participated. A global Cronbach's alpha coefficient of 0,853 was reported. The exploratory factor analysis partially reproduced the original structure (KMO = 0,730, Bartlett's test $X^2(1379) = 528$, $p < 0,001$). The confirmatory factor analysis corroborated the consistency of the factors.

Conclusions: the adapted TMBQ questionnaire has adequate psychometric properties of reliability and construct validity, indicating that it can be used to measure how university students manage their time.

Keywords: Time Management; University Students; Psychometrics; Assessment.

RESUMEN

Introducción: el *Time Management Behavior Questionnaire* (TMBQ) evaluó las conductas vinculadas a la gestión del tiempo y no había sido adaptado para el contexto cubano. El objetivo de esta investigación fue validar la versión cubana del TMBQ en estudiantes universitarios.

Método: se realizó un estudio de evaluación tecnológica usando técnicas cuantitativas. Se determinó la fiabilidad del instrumento mediante el coeficiente α de Cronbach y se realizaron análisis factoriales exploratorio y confirmatorio para evaluar la validez de constructo del instrumento.

Resultados: participaron 131 estudiantes universitarios. Se reportó un coeficiente α de Cronbach global de 0,853. El análisis factorial exploratorio reprodujo parcialmente la estructura original (KMO = 0,730, prueba de Bartlett $X^2(1379) = 528$, $p < 0,001$). El análisis factorial confirmatorio corroboró la consistencia de los factores.

Conclusiones: el cuestionario TMBQ adaptado posee adecuadas propiedades psicométricas de fiabilidad y validez de constructo, lo que indica que puede ser utilizado para medir cómo los estudiantes universitarios gestionan su tiempo.

Palabras clave: Gestión del Tiempo; Estudiantes Universitarios; Psicometría; Evaluación.

INTRODUCTION

The management of university students' academic time is "a process aimed at establishing and achieving clear academic goals, taking into account the time available and verifying its use," as stated by García-Ros and Pérez-González.⁽¹⁾ Thus, effectively managing academic time involves: (1) determining academic needs and goals to be achieved, (2) evaluating the time available and our perception of its use, which contributes to proposing tasks and responsibilities that fit our abilities and available time, (3) planning, which consists of setting specific goals, planning and prioritizing the tasks to be performed, and (4) monitoring our own performance, observing how we use our time while doing different activities, obtaining information that allows us to persist in the established plan or modify it in the face of various circumstances.

University students face greater challenges every day, so properly managing time would help them overcome obstacles more easily, allowing them to devote the necessary time to each task and facilitating the achievement of established goals and objectives. It is essential to provide tools that enable teaching or knowledge acquisition to modify behaviors that may be harmful and hinder the achievement of goals or objectives.

In recent years, several studies in Europe and Latin America have examined relationships among time management, academic performance, motivation, academic self-regulation, study habits, coping styles, and stress, among other factors.^(2,3,4,5,6) In Cuba, this issue has not gone unnoticed, and research has focused on time management related to stress and psychosocial support during periods of isolation due to the SARS-CoV-2 pandemic.^(7,8,9)

In the systematic review conducted by Morillo-Asuero⁽⁸⁾, the author states that "adequate and effective time management has a positive impact not only on students' academic performance and success, but also on their personal lives." This time management is also reflected in both the degree of self-efficacy and the levels of stress and anxiety experienced by students, which are projected onto their personal well-being.

There are several self-report questionnaires for measuring time management behaviors. Three instruments stand out for their use in university contexts to measure time management: *the Time Structure Questionnaire* (TSQ), *the Time Management Behavior Questionnaire* (TMBQ), and *the Time Management Questionnaire* (TMQ).^(6,10,11)

The TMBQ was adapted in Spain in 2011 by García-Ros and Pérez-González for first-year students at the University of Valencia.⁽¹⁾ In Latin America, it was validated in Venezuela, Colombia, and Mexico among students in different fields of study.^(5,6) It has proven to be understandable and easy to answer in the contexts where it has been applied.

The TMBQ to be adapted is a self-administered questionnaire comprising 34 items on how students manage their learning and study time. The subjects' responses indicate the extent to which the items describe their usual time management, using a 5-point Likert scale, where one indicates "never" and five indicates "always." The scale assesses four complementary dimensions: goal and priority setting, time management tools, preferences for disorganization, and perception of time control.⁽¹⁾

There are no references in the literature on the validation of the TMBQ in Cuba. Given the usefulness of this instrument across different sectors of the population, particularly university students, this research was conducted to validate the TMBQ⁽¹⁾, previously linguistically and culturally adapted to the Cuban context.⁽¹²⁾

METHOD

The sample consisted of students from the Faculty of Psychology and the Faculty of Foreign Languages at the University of Havana. The sample is non-probabilistic, intentional, and the subjects were selected through snowball sampling.^(13,14) The inclusion and exclusion criteria are the same as those used in the pilot study.

An online form created in *Google Forms* was used, which facilitated the dissemination of the questionnaire, eliminated the need to convert paper to digital format as in other studies, corrected data entry, and allowed the results to be viewed as soon as they were submitted. The data were downloaded into Excel and then imported into Jamovi for statistical analysis. The questionnaire made it clear to participants that submitting it constituted consent to participate in the research.

The questionnaire was administered to 131 university students, 67 (51,1 %) from the Faculty of Psychology and 64 (48,9 %) from the Faculty of Foreign Languages at the University of Havana. The average age was 20,35 (SD = 1,82), ranging from 18 to 25 years.

The sample was characterized by a predominance of females (107, 81,7 %). Only 3 participants (2,3 %) have children in their care, and 25 (19,1 %) have adults aged 65 or older in their care. Thirty-one point three percent (41) of the study subjects perform paid work alongside their study activities.

Regarding marital status, 91 (69,9 %) were single, 38 (29,0 %) were in a relationship, 1 (0,8 %) was married, and 1 (0,8 %) was divorced. Regarding skin color, 89 (67,9 %) individuals have white skin, 31 (23,7 %) have mixed-race skin, and 11 (8,4 %) have black skin.

Of the subjects studied, 38,2 % (50) were in their first year of college, 19,8 % (26) were in their second year, 27,5 % (36) were in their third year, and 14,5 % (19) were in their fourth year.

A database was created in *Jamovi*⁽¹⁵⁾ based on the Excel file obtained from Google Forms. Exploratory data analysis was performed using descriptive statistical methods.⁽¹³⁾ This allowed for the detection of errors or omissions, which were corrected.

The arithmetic mean and standard deviation were used as summary measures for quantitative variables, and the percentage was used as a summary measure for qualitative variables.

Cronbach's alpha coefficient was calculated overall, by dimension, and after removing one item, for the analysis of internal consistency. An adequate level of reliability was defined as a Cronbach's alpha coefficient greater than 0,6.⁽¹⁶⁾

An exploratory factor analysis (EFA) using minimum residuals was used for construct validity analysis. Before its application, the Kaiser-Meyer-Olkin (KMO) index was calculated, which compares the magnitude of the observed correlation coefficients and the partial correlations between pairs of variables ($KMO \geq 0,5$) and Bartlett's sphericity test, which tests the null hypothesis that the correlation matrix is an identity matrix, in which case there would be no latent factors or variables in the data (we want to reject the hypothesis, $p < 0,05$). These tests can be used to verify the relevance of the selected method. To identify the factors, the correlations of each item with each factor were analyzed in the rotated matrix, and a high correlation was considered if the coefficient exceeded 0,3. The rotation method used was *oblimin*.⁽¹⁷⁾

Confirmatory factor analysis (CFA) was performed using a robust estimator adjusted for variance and weighted least squares mean (WLSMV-R). The estimation method used was MLR, and since the variables are ordinal, the polychoric matrix was used, as it is more appropriate for this type of data.^(18,19)

According to Zhu et al.⁽²⁰⁾, the following goodness-of-fit indices were considered: chi-square (X^2), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Regarding acceptable fit values, a CFI of 0,90 and RMSEA values of 0,08 or less were considered acceptable.^(1,21) The validity of the construct was evaluated by examining the factor loadings. Standardized loadings greater than the limit of $>0,30$ were considered acceptable, and in terms of correlations between factors, values $>0,19$ were considered very low, between $>0,20$ and $<0,39$ as low, between $>0,40$ and $<0,59$ as moderate, between $>0,60$ and $<0,79$ as high, and $<0,80$ as very high. 0,40 and $<0,59$ as moderate, between $>0,60$ and $<0,79$ as high, and $<0,80$ as very high.

RESULTS

The overall Cronbach's alpha coefficient for the *TMBQ.cu* was 0,853, indicating high instrument reliability. The first dimension had a Cronbach's alpha coefficient of 0,735, the second dimension had a Cronbach's alpha of 0,737, the third had a Cronbach's alpha of 0,704, and the fourth had a Cronbach's alpha of 0,557. Adequate reliability values were achieved across all dimensions, except the fourth, *Perception of control over time*.

In the item elimination analysis, excluding items 11 and 29 increased the questionnaire's internal consistency, raising Cronbach's α to 0,857. When performing this analysis by dimension, it was found that, in the first dimension, items 21 and 26 slightly increased the Cronbach's α value to 0,737 and 0,736, respectively. In the second dimension, the elimination of items 11 and 27 increased Cronbach's α to 0,754 and 0,743, respectively. In the third dimension, the exclusion of item 29 raised Cronbach's α to 0,734, and in the fourth dimension, the elimination of item 10 increased Cronbach's α to 0,564.

The average total score for the *TMBQ.cu* was 104,9 ($SD = 17,67$), ranging from 55 to 146. For the first dimension of this questionnaire, the average was 33,7 ($SD = 6,63$), with a minimum value of 16 and a maximum value of 47. The second dimension reported an average of 29,3 ($SD = 7,59$), with a minimum value of 14 and a maximum value of 44. The third dimension had an average of 28,2 ($SD = 5,65$), with a minimum of 13 and a maximum of 40, and the fourth dimension had an average of 13,8 ($SD = 3,65$), with a minimum of 5 and a maximum of 24.

Exploratory factor analysis (EFA) was performed using the least-squares method with an *oblimin* rotation, yielding a four-factor solution for 33 items.

Table 1. EFA factor loadings matrix for the *TMBQ.cu*.

	Factor				Uniqueness
	1	2	3	4	
Item 1	0,493				0,734
Item 2			0,470		0,741
Item 3		0,510			0,627
Item 4			0,335		0,854
Item 5	0,580				0,666
Item 6	0,459				0,715
Item 7	0,534				0,700
Item 8			0,497		0,597
Item 9	0,547				0,597

Table 1. EFA factor loadings matrix for the *TMBQ.cu*.

	Factor				Uniqueness
	1	2	3	4	
Item 10	0,322				0,782
Item 11				-0,160	0,967
Item 12			0,496		0,636
Item 13	0,713				0,409
Item 14		0,701			0,493
Item 15			0,490		0,732
Item 16				0,291	0,783
Item 17	0,392				0,749
Item 18		0,890			0,213
Item 19			0,585		0,543
Item 20			0,503		0,649
Item 21				0,307	0,834
Item 22		0,393	0,339		0,674
Item 23				-0,336	0,737
Item 24		0,551			0,505
Item 25			0,493		0,686
Item 26				-0,309	0,782
Item 27				0,291	0,830
Item 28			0,502		0,757
Item 29			0,289		0,891
Item 30	0,443	0,376			0,577
Item 31	0,407				0,733
Item 32				-0,304	0,626
Item 33			0,251		0,848

The analyses before the application of the CFA indicated that the Kaiser-Meyer-Olkin (*KMO*) index (0,730) indicated strong partial correlations between pairs of variables, suggesting the relevance of using this statistical method. Meanwhile, Bartlett's test of sphericity reported a statistically significant result ($X^2(528) = 1379$, $p < 0,001$), thereby rejecting the null hypothesis that the correlation matrix is an identity matrix and corroborating the relevance of the method used. These results allowed for the construct validation of the instrument and tested the hypothesis of a multifactorial or multidimensional structure comprising four factors of the *TMBQ*.

Table 1 shows the factor loadings matrix for the AFE, which explains 31,3 % of the total variance. Only loadings greater than 0,3 are shown in the table; lower values are indicated in bold.

It can be seen that the first factor accumulated 9,76 % of the variance. Items 1, 5, 6, 7, 9, 10, 13, 17, 30, and 31 are strongly correlated in this factor. Items 1, 5, 7, 9, 13, 17, and 30 were grouped into the same latent dimension, accounting for corresponding to 70 % of the original test (*Goal and Priority Setting Dimension*). Items 6, 10, and 31, despite belonging to the *Time Management Tools* and *Perception of Time Control* dimensions, have a strong correlation in this factor (0,459, 0,322, and 0,407, respectively) and present high uniqueness values (0,715, 0,782, and 0,733), respectively, suggesting little relevance or contribution of these items to the factorial model. In short, this factor could be called *Goal and Priority Setting* and partially coincides with the dimension of the same name in the original test.

The second factor accounted for 9,20 % of the variance, bringing the cumulative variance to 18,95 %. Items 3, 14, 18, 22, and 24 correlate strongly with this factor. Items 3, 14, 18, and 24 are grouped in the same latent dimension (80 %), coinciding with what occurred in the original test (*Time Management Tools Dimension*). Item 22 had a uniqueness value of 0,674, suggesting little relevance or contribution to the factorial model. This item belongs to the *Preference for Disorganization* dimension in the original questionnaire. Therefore, this factor could be called *Time Management Tools* and partially aligns with the dimension of the same name in the original test.

The third factor accounted for 8,98 % of the variance, bringing the cumulative variance to 27,93 %. Items 2, 4, 8, 12, 15, 19, 20, 25, and 28 are strongly correlated within this factor, and items 29 and 33 are included with low correlations (although they are the highest among these items with respect to the other factors). Items 2, 8, 12, 20, 25, and 29 are grouped in the same latent dimension, coinciding with the original test (*Preferences for Disorganization dimension*).

In summary, this third factor could be called *Preference for Disorganization*, with a 54,54 % match to the corresponding dimension of the original test.

The fourth factor accounted for 3,38 % of the variance, and the cumulative variance amounted to 31,31

% Items 21, 23, 26, and 32 are strongly correlated, while items 11, 16, and 27 showed low correlations, with the particularity that item 11 is not found in any other factor. None of the items in this factor coincide with those in the original test dimension (*Perception of Control over Time Dimension*), and it is mainly composed of items from the first and second dimensions. Items 11, 16, and 27, which have low correlation values (0,160, 0,291, and 0,291, respectively), have high uniqueness values (0,967, 0,783, and 0,830, respectively). This may be related to the low reliability obtained in the fourth dimension ($\alpha = 0,55$). In general, the CFA results show partial replication of the TMBQ's factor structure, with three factors matching the original dimensions by more than 50 %. Hence, the instrument is considered to have adequate construct validity.

Confirmatory factor analysis (CFA) was used to corroborate the consistency of the previously identified factors. A good fit of the four-factor model was obtained in the participatory sample: $\chi^2(489) = 844$, $p < 0,001$; $CFI = 0,911$; $RMSEA = 0,075$, 95% $CI = (0,066, 0,083)$, $p < 0,001$. In addition, the regression weights for each item (see Figure 1) ranged from moderate ($>0,40$ and $<0,59$) to high ($>0,60$ and $<0,79$) to very high ($<0,80$). The CFA corroborated the consistency of the factors with the original dimensions.

DISCUSSION

García-Ros and Pérez-González⁽²²⁾ at the University of Valencia, Spain, in 2012, adapted and validated the TMBQ with 462 new students entering the psychology degree program and the teacher training program. Cronbach's α coefficient was used to measure the internal consistency of the questionnaire and its dimensions. Cronbach's α for the first dimension was 0,84, for the second dimension 0,79, for the third dimension 0,72, and for the fourth dimension 0,71.

In addition, EFA was performed with varimax rotation, KMO (0,88), and Bartlett's test ($\chi^2(5619) = 5241,1$, $p < 0,001$). The factor analysis yielded four factors, accounting for 42,93 % of the variance. The first factor, which explains 24,08 % of the variance, includes all items 1, 5, 6, 7, 9, 13, 17, 21, 27, 31, 32, and 34, of which nine overlap with items from the first dimension, *Setting Goals and Priorities*. The second factor explains 8,29 % of the variance and includes items 3, 11, 14, 18, 22, 24, 25, 28, and 33, 8 of which are in the second dimension, *Time Management Tools*. The third factor explains 6,35 % of the variance and includes items 2, 4, 10, 15, 16, 19, 20, and 29, all items from the third dimension, *Perception of time control*. The fourth factor, which explains 4,22 % of the variance, includes items 8, 12, 23, 26, and 30, which belong to the fourth dimension, *Preferences for disorganization*.⁽²²⁾

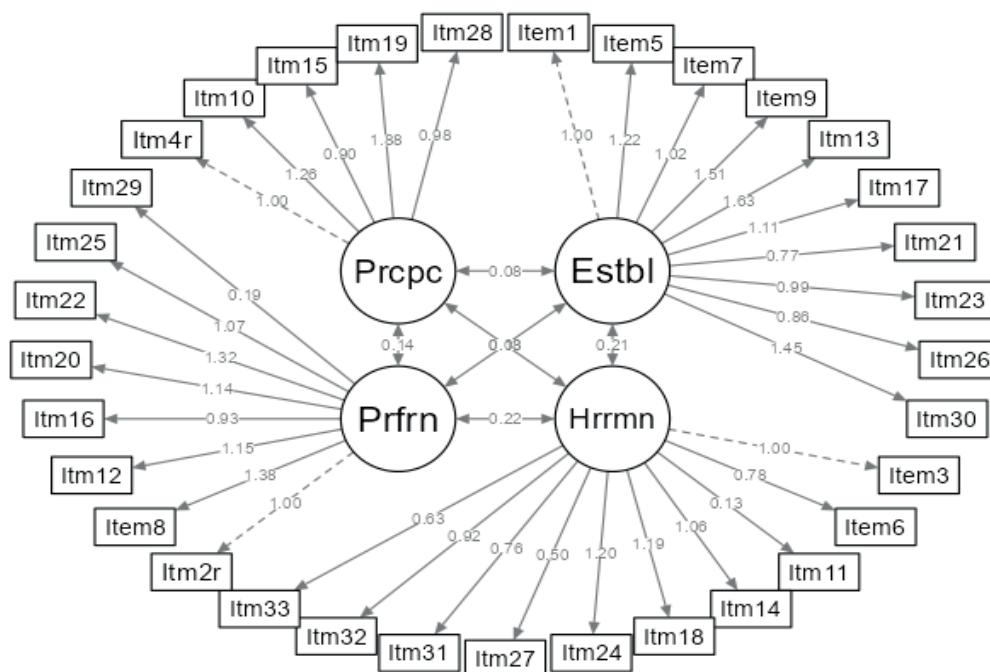


Figure 1. Structural diagram resulting from the PCA performed on the TMBQ.cu.

For their part, Roblero⁽⁷⁾ validated the TMBQ in Mexican university students in 2020. The sample consisted of 289 students from two Mexican universities. The overall Cronbach's α coefficient for the TMBQ is 0,71, with 0,72 for the first dimension, 0,66 for the second dimension, 0,53 for the third dimension, and 0,55 for the fourth dimension. In the AFE, a $KMO = 0,774$ was obtained, and Bartlett's sphericity test was significant ($\chi^2 = 1846,88$; $p < 0,001$). Four factors were selected, explaining 34,92 % of the total variance. The first factor

comprised items 1, 5, 7, 9, 10, 13, 17, 21, 26, 27, 30, and 31, accounting for 15,36 % of the variance. The second factor grouped items 3, 14, 15, 23, 18, 24, and 32, accounting for 8,04 % of the variance. The third factor grouped items 2, 6, 19, 20, and 28, accounting for 4,91 % of the variance. The fourth factor comprises items 8, 12, 25, 29, and 33, accounting for 6,61 % of the variance. Structural models were developed in the CFA to identify the relationship between observable and latent variables. The first model showed differences in fit, as indicated by the following indices: $X^2(458) = 840,850$; $p < 0,001$; $RMSEA = 0,054$; $CFI = 0,732$; $GFI = 0,843$.

Cahuana-Cuti⁽⁹⁾ conducted research in Peru in 2021, applying the TMBQ to determine whether there was a significant relationship between time management and academic commitment among 217 students. The overall *Cronbach's α* for the TMBQ was 0,86, the first dimension obtained a *Cronbach's α* of 0,83, the second dimension obtained a *Cronbach's α* of 0,86, the third dimension obtained a *Cronbach's α* of 0,61, and the fourth dimension obtained a *Cronbach's α* of 0,34. The total variance was 42,93 %.

The values of the overall *Cronbach's α* coefficient and the dimensions of the studies analyzed and this thesis are similar. Note that in studies conducted in Mexico and Peru, and in this research, the *Cronbach's α* value for the fourth dimension, *Perception of time control*, is below the accepted value (0,6).

In summary, the internal consistency of the TMBQ and its dimensions across the different studies conducted in Latin America and Spain was compared with that obtained in the present study, demonstrating the high reliability of the questionnaire, which was adapted and validated in the present study.

Table 2 presents *Cronbach's α* coefficients, total variance, and variance by dimension, *KMO*, and Bartlett's sphericity test for the TMBQ across studies conducted in Peru, Mexico, and Spain.

Taking into account the exploratory factor analysis carried out in the Spanish study, the first factor was made up of items 1, 5, 6, 7, 9, 13, 17, 21, 27, 31, 32, and 34, which coincide with 7 of the 10 items that make up the first latent dimension of the AFE carried out in this thesis. The second factor groups items 3, 11, 14, 18, 22, 24, 25, 28, and 33, which coincide with three of the five items in the second factor of the EFA conducted in this thesis. The third factor groups items 8, 12, 23, 26, and 30, of which two coincide with the items that make up the third factor of the AFE carried out in this thesis. The fourth factor comprises items 2, 4, 10, 15, 16, 19, 20, and 29, only one of which coincides with the seven items that make up the fourth factor of the AFE carried out in this thesis.

In the study conducted in Mexico, the first factor was made up of items 1, 5, 7, 9, 10, 13, 17, 21, 26, 27, 30, and 31, which coincide with 9 of the 10 items that make up the first latent dimension of the AFE conducted in this thesis. The second factor groups items 3, 14, 15, 23, 18, 24, and 32, which coincide with four of the five items present in the second factor of the AFE carried out in this thesis. The third factor groups items 2, 6, 19, 20, and 28, none of which coincide with the items comprising the third factor of the AFE carried out in this thesis. The fourth factor includes items 8, 12, 25, 29, and 33, coinciding with five of the seven items that comprise the fourth factor of the AFE carried out in this thesis.

Table 2. *Cronbach's α* coefficient values and AFE statistics in different studies

Test and dimensions	Countries			
	Cuba (this research) N = 131	Peru (2021) N = 217	Mexico (2020) N = 289	Spain (2012) N = 462
TMBQ	0,85	0,86	0,71	Not disclosed
Setting objectives and priorities	0,73	0,83	0,72	0,84
Time management tools	0,73	0,86	0,66	0,79
Preferences for disorganization	0,70	0,61	0,53	0,72
Perception of time control	0,55	0,34	0,55	0,71
KMO	0,73	Not applicable	0,77	0,88
Bartlett	Significant	Not applicable	Significant	Significant
Total variance	31,32 %	42,93 %	34,92 %	42,93 %
Variance Factor 1	9,76	Not applicable	15,36	24,08 %
Variance Factor 2	9,20 %	Not applicable	8,04	8,29 %
Variance Factor 3	8,98 %	Not applicable	4,91	6,35 %
Variance Factor 4	3,38 %	Not applicable	6,61	4,22

It can be seen that the items across the different theoretical dimensions are grouped into distinct factors according to the AFE, but the results do not coincide.

The *KMO* values of the studies analyzed and this thesis are similar, and Bartlett's test is significant. In addition, four factors were reported. All these elements corroborate the theory that the dimensions of the *TMBQ* are reflected in the data.

It is worth noting that although the studies mentioned above have larger samples than the present research, the total variance values are similar, indicating that two of them explain only 40 % of the questionnaire, and the other two, 30 %. This element could suggest that the dimensions are not well-defined, that the wording of the items is unclear, or that they are not located in the correct dimension.

One element that could reinforce the above is the fourth dimension, *Perception of control over time*, which has the lowest *Cronbach's alpha* values in three of the four studies analyzed. On the other hand, in this thesis, the items of the fourth factor of the AFE do not coincide with those of the theoretical dimension, and their uniqueness values are high, which could indicate that they do not measure the concept. Overall, 48,48 % of the *TMBQ.cu* items are not in the factors defined in the AFE, and 66 % of the items have high uniqueness values, confirming that the theoretical dimensions are not perfect.

Another element to take into account is the partial overlap in the grouping of items between the latent dimensions and the dimensions of the original test, which leads to an analysis of the time management construct, defined in the 1990s, making it essential to include ICT and its current impact in the evaluation.

In short, the items measure the concept. Still, the theoretical dimensions of this concept require a more detailed analysis tailored to current times, given changes in the labor market for university students and the influence of ICT on time management in this population segment.

It would be advisable to adapt the original instrument into English to address potential cultural biases or to develop a new instrument that includes items reflecting changes in the labor market for university students and the influence of ICT on the time management of this population segment.

Regarding the AFC, the study conducted in Mexico presents values similar to those reported in this thesis, which allows us to affirm that the inferential statistics indicate that the data are consistent with the theoretical structure of the *TMBQ*.

CONCLUSIONS

The reliability analysis using internal consistency yielded an adequate overall *Cronbach's alpha* coefficient. Acceptable reliability was found in all dimensions except for the *Perception of Control over Time* dimension. A factor analysis showed a partial correspondence between the factors and the original dimensions, supporting the adequate construct validity of the *TMBQ*.

The *TMBQ.cu* questionnaire has adequate psychometric properties of reliability and construct validity, indicating that it can be used to measure how university students manage their time.

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