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Development and Validation of the Self-efficacy for Writing and Defending Academic Texts Scale[1]

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A B S T R A C T

Writing and defending a thesis is a requirement to earn a university degree. Previous findings indicate that self-efficacy is related to academic performance. However, no existing tools register students' perception of efficacy towards writing and defining academic texts. Our purpose was to develop and validate such a scale. Scale scores content, structural, convergent, and criterion-related validity as well as the measurement invariance across sex was evaluated using data from 418 students from 23 Spanish universities. Our findings showed that the scale holds a unidimensional structure that is invariant across sex. Data also supported the convergent validity, with correlations with self-efficacy and anxiety measures. The scale could track the effect of an educational intervention designed to improve students' writing and defending academic texts skills, and the scores were related to performance on a writing task. Norms are provided to facilitate the interpretation of the scale scores.

El desarrollo y la validación de la escala de autoeficacia para escribir y defender textos académicos

R E S U M E N

Redactar y defender una tesina es un requisito para obtener un título universitario. La investigación previa indica que la autoeficacia está relacionada con el rendimiento académico. Sin embargo, no existen instrumentos que registren la percepción de la eficacia de los estudiantes para escribir y definir textos académicos. Nuestro objetivo fue desarrollar y validar una escala de este tipo. Se recopilaron pruebas de validez de contenido, estructural, convergente y de criterio y de invarianza de medida entre sexos, utilizando datos de 418 estudiantes de 23 universidades españolas. La escala presenta una estructura unidimensional invariante en cuanto al sexo. También se encontraron correlaciones con medidas de autoeficacia y ansiedad. La escala pudo seguir el efecto de una intervención educativa diseñada para mejorar las habilidades de escritura y defensa de textos académicos, y se encontró relación con el rendimiento en una tarea de escritura. Se proporcionan baremos para interpretar las puntuaciones.

Converging with the implementation of the Bologna process at European universities, the European Higher Education Area states that writing and defending a Bachelor's or Master's thesis is the last step to earning a university degree (González & Wagenaar, 2006). A Master's thesis is usually more complex and lengthier than a Bachelor's thesis, but both have multiple aspects in common: they must be individual and original pieces of work written by last-year students, they must be written using academic language, they are supervised by at least one tutor, and they must be orally presented for examination. Through writing and defending their thesis, students must prove they have achieved a series of competencies related to their academic and intellectual development (Llaurado-Serra et al., 2018).

Writing a thesis and defending it via a public examination are two of the most complex and challenging tasks university students must complete during their studies (Fidalgo et al., 2019). Students tend to face their Bachelor's or Master's thesis with a lack of skills for academic writing and oral communication of scientific work (Becerra-Traver, 2017; Lloyd, 2007). This, in turn, leads them to perceive that their efficacy towards the completion of the thesis is low and fosters negative feelings, such as anxiety (Fidalgo et al., 2019). Self-efficacy is defined as one's perception of how well s/he can conduct a specific task (Bandura, 1977). It is one of the most relevant concepts of Bandura's theory of learning, and extant evidence shows a positive link between self-efficacy and academic

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achievement (Doménech-Betoret et al., 2017). Several tools have been developed to register self-efficacy towards various, rather specific, tasks in life such as the osteoporosis self-efficacy scale (Horan et al., 1999), the infertility self-efficacy scale (Cousineau et al., 2006), or the financial self-efficacy scale (Lown, 2011). Self-efficacy scales have also been developed in academic contexts like, for instance, the self-efficacy scale for disciplinary writing (Meza & Gónzalez, 2020) or the teachings' sense of efficacy scale (Cocca & Cocca, 2022). However, to the best of our knowledge, there are no existing instruments to capture students' perception of efficacy towards the two main tasks involved in developing a thesis: writing an academic text and defending it through a public oral examination. Our aim is to fill this gap in the literature.

Students often find a variety of difficulties throughout the process of writing and orally defending their thesis, including the correct use of writing guidelines (e.g., APA guidelines), the inclusion of relevant scientific literature in their own texts (Bhargava, 2015), and the adequate presentation of results through an oral examination (Chan, 2011). Literature shows that students who are working on their thesis frequently report feeling writing anxiety and this, in turn, negatively influences their academic performance (Huerta et al., 2016; Martinez et al., 2011). It has also been seen that more than 60% of university students report a fear of speaking in public (Dwyer & Davidson, 2012). These difficulties tend to cause delays in the development of students' thesis and can even lead to the non-completion of their degrees (Nouri et al., 2019). As a result, there can be significant costs for universities, societies, and the students themselves, who can lose time, money, and energy, and experience a decrease in their wellbeing during the process (Sorrel et al., 2020).

Different studies, most of them conducted with PhD students, have focused on exploring the factors that can contribute to explaining students' academic performance when facing their thesis. Some of these determinants are students' previous performance in similar tasks (Nouri et al., 2019), students' communication and language skills (Jiranek, 2010), students' independence (Castro et al., 2011), the relation between the student and the tutor (Sorrel et al., 2020), and the supervisor's experience and workload (Jiranek, 2010; Nouri et al., 2019). Of relevance to the current study, students' self-efficacy is related to how well they perform in academic tasks (Callinan et al., 2018). As proposed by Bandura (1977), self-efficacy is a good predictor of a person's performance on a task, especially when the perception of efficacy refers to that specific task at hand. In the context of completing a thesis, there are two areas in which self-efficacy can be considered: writing the thesis and its public oral defense.

The term "writing self-efficacy" is used to refer to the level of one's confidence to write in a particular situation (Huerta et al., 2016). Writing self-efficacy is crucial for students who are writing their thesis, which is usually a self-scheduled, and highly demanding activity that requires a significant amount of effort (Callinan et al., 2018). It is one of the best predictors of successful academic writing (Bruning et al., 2013; Huerta et al., 2016; Pajares & Johnson 1996; White & Bruning, 2005), and perceiving oneself as able to write in an academic context contributes to decreasing writing anxiety (Huerta et al., 2016; Martinez et al., 2011). Consequently, different authors have pointed out the importance of promoting writing self-efficacy at a university level, especially when writing a thesis (Huerta et al., 2016). Self-efficacy seems equally important for the public oral defense of the thesis. Previous studies have shown that self-efficacy significantly impacts the student's oral performance in academic contexts (e.g., Saimovna et al., 2019). It also influences students' overall academic success and their ability to transfer oral communication skills from academic to professional settings (Cavanagh et al., 2019). Thus, researchers agree that students' self-efficacy towards defending their thesis in an oral examination should also be promoted (Fidalgo et al., 2019; Ramos-Villagrasa et al., 2018).

Given the relevance of self-efficacy for academic achievement, an effort has been made to develop tools to register perception of efficacy in this context (Chemers et al., 2001; Elias & Loomis, 2000). However, following an extensive literature review, we found no instruments to assess self-efficacy towards writing an academic text and defending it in an oral examination. Multiple instruments have been developed to measure writing self-efficacy (Bruning et al., 2013; Schmidt & Alexander, 2012; Shell et al., 1989), and some of them have been validated in university students (Kavanoz & Yüksel, 2016; Prat-Sala & Redford, 2010; Ramos-Villagrasa et al., 2018). For example, Meza and González (2020) recently developed the self-efficacy scale for disciplinary academic writing, aimed at measuring self-efficacy when writing academic texts in specialized disciplines. The instrument includes items registering students' self-efficacy when producing disciplinary texts and some of them could also be used when measuring writing self-efficacy in relation to writing a thesis (e.g., "I am able to organize my ideas in a text so that they are easily understood"). However, the scale does not include some of the key competencies needed to complete a thesis, such as following specific writing guidelines, not committing plagiarism, and presenting the work before an evaluating committee. Similarly, Mitchell et al. (2021) developed the situated academic writing self-efficacy scale, which measures self-efficacy in academic writing while considering contextual factors of the specific situation. Similar to Meza and González's scale, this instrument includes an item that could be directly related to self-efficacy when writing a Bachelor's or Master's thesis (i.e., "I can combine or synthesize multiple sources I've read to create an original work product or text"). However, as in the previous case, most items do not specifically relate to the competencies needed to complete a thesis. In other words, the content validity of these instruments with respect to the construct of self-efficacy towards writing and defending academic texts may be compromised.

Instruments aimed at measuring students' self-efficacy for public speaking (Frey & Vallade, 2018; Herrero et al., 2007) are even more scarce than those registering writing self-efficacy. To our knowledge, no tools have been developed to measure self-efficacy towards presenting an academic piece of work before an examining committee. This involves very specific tasks, such as answering the questions made by the members of the committee. Moreover, while the combination of writing and oral skills is needed to successfully complete a thesis (Castelló & Iñesta, 2012), and students need to perform relatively well in both areas (Fidalgo et al., 2019), there are no tools designed to simultaneously register students' self-efficacy towards these two aspects. Given the above, our goal is to develop and validate a self-efficacy scale for writing and defending academic texts. The development of this tool is key for future research exploring the self-efficacy towards this specific task and its correlates (e.g., academic success) in university contexts.

Method

Participants

A total of 418 students – 96 Master students and 320 undergraduates, 72% women, mean age 21.72 years (*SD* = 5.73) – from 23 Spanish universities participated in this study. Table 1 shows the distribution of the sample according to some variables of interest. This information is available in the open access database included in the online repository indicated below. The most represented institutions were Universidad de Zaragoza (67.5%), Universidad Europea de Madrid (9.8%), and Centro de Enseñanza Superior Cardenal Cisneros (8.4%). The studies with the highest representation were the Degree in Psychology (34.7%), the Degree in Primary Education (33%), and the Master's Degree in General Health Psychology (13.6%).

Table 1. Distribution of the Sample according to Sex, Educational Level, Studies, and University

Sex	Educational Level	Studies	University
310 Woman	320 Undergraduates	145 Degree in Psychology	282 Universidad de Zaragoza
116 Man	96 Master students	110 Degree in Primary Education	41 Universidad Europea de Madrid
1 Missing		57 Master's degree in General Health Psychology	35 Universidad Cardenal Cisneros
		39 Degree in Early Childhood Education	18 Universidad Autónoma de Madrid
		31 Master's degree in Teaching	14 Universidad de Extremadura
		6 Degree in Nursing	3 Universidad Nacional de Educación a Distancia
		23 Other	3 Universidad de Vigo
		7 Missing	20 Other
			2 Missing

Instruments

Self-efficacy Scale for Writing and Defending Academic Texts

The proposed instrument consists of eight items: five of them related to writing self-efficacy and three of them to self-efficacy in relation to the public defense of academic work. The teaching guides for the Bachelor's and Master's theses specify a series of competencies students must demonstrate to complete their thesis. The items were developed based on Bandura's theory of learning and on these competencies. To test the content validity of the scale, these items were independently evaluated by a group of four educational psychology experts. They were asked to report using a five-point scale (from 1 = none to 5 = very high) whether they thought the items measured self-efficacy, as described by Bandura (1997), as well as whether they thought the items were comprehensive. The items were also assessed by 10 Master students who had recently submitted their thesis and gone through the oral examination. Participants were asked whether they thought the items reflected the competencies they needed to acquire to complete their Master's thesis and whether the items were clear. There was an agreement that the items fully covered the basic competencies needed to succeed in the completion of a Master's thesis. Specifically, the average of the evaluations made for the 8 items for relevance and clarity was 4.97/4.80 and 4.81/4.79 for experts/students, respectively. As can be seen, the scores were always very close to the upper limit of the scale, which implies minimal variability in the ratings, i.e., high agreement. In all cases, although the response scale ranged from 1 to 5, the judges assigned only scores 4 (high) or 5 (very high). In all cases there was a majority of fives when all ratings were considered. To illustrate this, note that the item for which there were the greatest discrepancies was item 6, where three of the experts indicated "high" clarity and the other expert "very high" clarity, while nine of the ten students indicated "very high" clarity and only one indicated "high" clarity. In all cases the item is therefore considered clear. Considering the item content, it could be the case that the experts anticipate a slight difficulty in understanding the concept "scientific record", although taking into consideration the judgment of the students we see that this aspect does not represent a problem. Item content can be seen in Table 2. In accordance with previous scales registering self-efficacy (Meza & González, 2020), the response format was a five-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

General Self-Efficacy Scale (Baessler & Schwarzer, 1996)

The scale registers an overall perception of efficacy. We used the Spanish adaptation by Sanjuán-Suárez et al. (2000), consisting of 10 items on a Likert scale from 0 (*completely disagree*) to 10 (*completely agree*). A sample item is "Thanks to my qualities and resources I can overcome unforeseen situations". In the Spanish validation, the authors reported a high internal consistency of the scale scores (α = .87) and adequate predictive capacity.

Self-Efficacy for Writing Scale (SEWS; Bruning et al., 2013)

The instrument consists of 16 items registering an individual's perception of efficacy for writing. The response format uses a sliding scale from 0 (I'm not sure I could do it) to 100 (I'm completely sure I could do it). A sample item is "I can think of a lot of original ideas". The Spanish adaptation of the scale (Ramos-Villagrasa et al., 2018) was used in this study. The authors identified three highly correlated factors (Ideation, Conventions, and Self-regulation) and high internal consistency values (≈ .90).

Self-efficacy for Public Speaking Scale (Herrero et al., 2007)

The instrument is formed by 10 items in a Likert scale response format from 1 (*I cannot do it*) to 5 (*I can do it*). A sample item is "Ask a question or speak in class, even though I might be nervous". Previous studies have shown that the scale has an adequate internal consistency (α = .84-.85) and is able to detect changes in perception of efficacy for public speaking after an educational intervention (Orejudo et al., 2012).

Personal Report of Confidence as a Speaker (Paul, 1966)

The scale examines the affective, cognitive, and behavioral responses that a person may experience when speaking in public. We used the Spanish adaptation of the scale by Méndez et al. (1999). It consists of 12 items in a Likert scale response format from 1 (*completely disagree*) to 5 (*completely agree*). A sample item is "I'm not afraid of speaking in front of a large audience". The authors reported a high internal consistency of the scale (α = .91) and good support for the unidimensional factor solution.

Anxiety towards Writing and Defending Academic Texts

This instrument was designed ad hoc for this research. It consists of 8 items: 5 of them related to writing anxiety and 3 of them to public speaking anxiety. The content of each item matches that of the self-efficacy towards writing and defending academic texts scale, but referring to anxiety levels. Students were asked the extent to which they would feel anxious in a certain situation, from 1 (*I would not feel anxious at all*) to 5 (*I would feel very anxious*).

State-Trait Anxiety Inventory (Spielberger et al., 1970)

This instrument evaluates the current level of anxiety a person suffers (state anxiety) and the predisposition of the person to suffer anxiety (trait anxiety). We used the Spanish short version described in Buela-Casal and Guillén-Riquelme (2017). It consists of 10 items (5 items measuring each dimension). The response format is a Likert scale from 1 (*not at all*) to 4 (*a lot*). A sample item is "I feel tense".

Procedure

Data were collected through an online sampling. Participants were contacted by email and social networks (Facebook, Instagram, Twitter, LinkedIn), following a snowball approach. Respondents provided informed consent prior to accessing the questionnaire. After filling in the questionnaire, students were offered to participate in an eight-week long educational intervention aimed at increasing their competencies to successfully complete their Bachelor's or Master's thesis. Participation was voluntary, and 128 students (29 Master students and 99 undergraduates) enrolled in the intervention. They were asked to complete the survey a week after the intervention finished. There were almost no missing values (0.00021%).

The educational intervention consisted of five, two hours-long sessions that combined a theoretical introduction and a practice session. Once enrolled in the program and before the sessions started, students had to autonomously work on an essay called "mini-thesis", which consisted in writing a short essay using an academic discourse and following APA guidelines. The essays were graded by a professor. At the beginning of the first session, students received feedback about their performance on the writing task. The written task was repeated after the last session of the intervention, and the same professor graded students' performance a second time. The professor was not involved in the intervention and was blind to the study procedure.

The teaching guide for Bachelor's and Master's theses specifies the competencies and skills students should show to complete their thesis, and the sessions included in the educational program were based on these competencies. Specifically, in session 1, students received feedback about their "mini-thesis" essay and learned about the different types of theses they could develop, the general thesis's structure, and the competencies needed to successfully complete their thesis. In session 2, students learned about how to carry out a bibliographic search, how to select information, and APA guidelines. Session 3 was dedicated to learning about plagiarism and how to avoid it in their thesis. Sessions 4 and 5 were dedicated to oral communication skills (e.g., verbal and non-verbal communication, synthesis of ideas, how to provide adequate answers during a public defense).

Data Analysis

All analyses were conducted using R. First, we assessed some statistics for item analysis. We then checked the scale structural validity through an exploratory factor analysis using the psych package (Revelle, 2020) based on the Pearson correlation matrix. To determine the scale dimensionality, the results of the parallel analysis were explored using the cdmTools package (Nájera et al., 2021), Velicer's MAP using psych, and the Bootstrap exploratory graph analysis procedure (Golino & Christensen, 2021) using the EGAnet package. Considering that the response format was ordered in categories, the unweighted least squares estimator was chosen and oblimin was used as the rotation method. In addition, the sirt package (Robitzsch, 2021) was used to calculate indices to assess whether the test could be considered essentially unidimensional. Specifically, this package returns the indices DETECT [dimensionality evaluation to enumerate contributing trait], ASSI [approximate simple structure index], and RATIO (ratio index). Values of DETECT < .20, ASSI < .25 and RATIO < .36 indicate essential unidimensionality (Jang & Roussos, 2007; Zhang, 2007). A DETECT value between .20 and .40 would indicate weak multidimensionality, greater than 0.40 moderate multidimensionality, and greater than 1.00 strong multidimensionality. The reliability indicators Cronbach alpha and omega were obtained using the semTools package (Jorgensen et al., 2021). Second, convergent validity was explored by examining the correlations between the scale and the different self-efficacy and anxiety scales. Third, to determine criterion-related validity, we examined the ability of the scale to predict students' performance on the writing tasks (mini-thesis) included in the educational program. We also assessed the scale's ability to capture changes in students' self-efficacy due to participation in the educational intervention. We checked whether the expected improvement differed across grades (undergraduates/Master students). We did this by means of a two-way mixed ANOVA using the rstatix package (Kassambara, 2021). The generalized eta squared was computed to determine the effect sizes. An a priori power analysis using the G*Power program (Erdfelder et al., 1996) shows that to detect a small effect size with this design, 98 participants would be needed for a power of .80, and 158 for a power of .95. Considering this, the power for our sample (128 participants) is expected to result in adequate power values. Finally, the factorial invariance by sex was evaluated using the full sample. For this, the R package lavaan (Rosseel, 2012) with the WLSMV estimator to evaluate the configurational, metric, and scalar, and strict invariance models was used. The different models were compared using the likelihood ratio test. It is necessary to achieve at least the level of scalar invariance to make comparisons of means using the scores observed on the scale. Finally, we calculated the norms to make it easier for future users of the scale to interpret the scale scores. Data is available at https://osf.io/7bv3a/?view_only=4343ded187e84646908daae7366a6591 along with the R scripts.

Results

Item Analysis and Structural Validity Evidence

Table 2 shows the descriptive statistics, the results of the one- and two-factor structures, and the validity index of the items. In general, the items showed high internal consistency (= .56 and α = .83). Parallel analysis and Velicer's MAP, and EGA recommended extraction of one factor. All items had a high factor loading in the one-factor solution and when two factors were extracted, the items were grouped according to their theoretical content in a "writing" self-efficacy factor (items 1 to 5) and a "public defense" self-efficacy factor (items 6 to 8). These two factors were found to be highly correlated (r_{F1F2} = .65). There were no relevant cross-loadings. Although each of the two factors separately achieved an adequate internal consistency (α = .80 and .71, respectively), we opted for the more parsimonious structure considering the limited number of items. This decision was also supported by the essential unidimensionality indices (DETECT = .292, ASSI = .071, and RATIO = .181). All the items showed a significant correlation with the criterion anxiety related to writing and defending academic texts (= .38).

Convergent Validity Evidence

Table 3 shows the convergent validity evidence of the scale scores. Overall, the scales showed good reliability indicators. As expected, the proposed self-efficacy scale correlated significantly and positively with the rest of the self-efficacy measures and significantly and negatively with the anxiety measures. The correlations ranged from .24 to .56 in absolute value indicating that the different scales assess related but distinguishable concepts. The measure of anxiety towards writing and defending academic texts was the one most strongly related to the new scale (r = -.56), followed by writing efficacy (r = .49) and general efficacy (r = .45). The rest of the variables were also significantly related to scale scores. The lowest correlation was between the proposed scale and trait anxiety (r = -.24).

Table 2. Descriptive Statistics and Factor Structure

Item	*M* (*SD*)	r_{pBis}	Factor Loadings			r_{jANS}
			F1	F1	F2	
Writing skills						
1. I can search for bibliographic sources with scientific rigor (up-to-date, in Spanish and in English, contrasted, etc.) [*Puedo buscar fuentes bibliográficas con rigor científico (actualizadas, en castellano e inglés, contrastadas, etc.)*]	3.50 (0.93)	.59	0.66	0.72	-0.02	-.43
2. When writing a text, I can synthesize and integrate ideas obtained from multiple scientific sources to support my arguments [*Puedo sintetizar e integrar ideas obtenidas de diversos textos científicos para apoyar mis argumentos en lenguaje escrito*]	3.61(0.94)	.61	0.68	0.62	0.10	-.41
3. I can use APA guidelines [*Puedo manejar la normativa APA*]	3.32 (0.97)	.53	0.59	0.74	-0.12	-.47
4. I can write and structure a scientific text [*Puedo escribir y estructurar un texto científico*]	3.20 (0.92)	.62	0.70	0.61	0.13	-.39
5. I can write a scientific text while being certain that I am not committing plagiarism [*Puedo escribir un texto científico con la seguridad de no estar cometiendo plagio*]	3.18 (1.01)	.56	0.62	0.48	0.18	-.47
Oral presentation skills						
6. I can deliver an oral presentation in line with the standards of an academic discourse [*Puedo hacer una presentación oral siguiendo un registro científico*]	3.12 (0.97)	.54	0.59	0.07	0.63	-.30
7. I can adjust my oral presentation to the established time limit, without rushing through my words and without forgetting important ideas [*Puedo ajustarme al tiempo establecido para una presentación oral, sin atropellar las palabras y sin dejarme ideas importantes*]	3.38 (0.95)	.53	0.58	-0.04	0.75	-.27
8. I can adequately answer and discuss the questions of the examining committee [*Puedo contestar y argumentar de manera adecuada las preguntas de los miembros del Tribunal*]	3.09 (0.88)	.51	0.55	0.08	0.56	-.31

Note. Skewness ranged from -0.46 to 0.08 (*M* = -0.12); kurtosis ranged from 2.57 to 2.99 (*M* = 2.75); r_{pBis} = corrected point-biserial correlation; r_{jANS} = correlation with anxiety scale for writing and defending academic texts score.

Criterion-Related Validity Evidence

The scale criterion-related validity was first examined by evaluating the results of participating in the educational intervention. As indicated above, 128 participants were evaluated with the different scales before (T0) and after the educational intervention (T1). In both cases, they also had to perform a writing task that was then rated on a scale of 0 to 10. Before the intervention (T0), students' average score in the writing task was 3.19 (SD = 1.96), and after the intervention (T1) it was 5.27 (SD = 2.61). This represented a significant increase, t(235.44) = 7.20, p < .001. Figure 1 (Panel A) depicts the relationship between participants' self-efficacy towards writing and defending academic texts and their score in the writing task by time. At T0, the correlation between self-efficacy scores and the writing task's score was .16 (p = .08). At T1, the correlation between these two variables was .37 (p < .001). This suggests that those participants with higher self-efficacy scores generally performed better in the writing task. This increase in the correlation can be explained by the fact that, after the educational intervention, the variability in the writing task was higher (SD = 3.82 and 6.81 for T0 and T1, respectively). The results of the ANOVA evaluating the effect of the educational intervention on self-efficacy considering the effects of group (Master students/undergraduates) and time (T0/T1) are described in Figure 1 (Panel B). The interaction between group and time had a small but statistically significant effect (p = .04, = .01). The main effects of group and time were also statistically significant, with a medium effect size (p < .001 in both cases and = .08 and = .09, respectively). To interpret the interaction effect, the effect of each factor was contrasted under the levels of the other factor. With respect to group, when correcting for multiple comparisons, there were significant differences only at T1 ($p_{adjusted}$ < .001, = .143). However, both undergraduates and Master students significantly increased their mean self-efficacy when comparing T0 and T1 ($p_{adjusted}$ < .001, = 0.048 and 0.290, respectively). That is, the interaction implies that the perception of efficacy increased in both groups, but the increase was larger for Master students.

Measurement Invariance across Sex and Norms

We used the full sample to evaluate measurement invariance across sex and obtain the scale norms. In relation to the results of

Table 3. Convergent Validity Results

Scale	*M* (*SD*)	Min-Max	α	ω	2	3	4	5	6	7	8
1-Self-efficacy writing and defending academic texts	26.4 (5.13)	11-40	.83	.83	.45	.49	.37	.33	-.56	-.27	-.24
2-Overall self-efficacy	709.32 (143.89)	10-1000	.85	.86	-	.63	.44	.34	-.26	-.07^{ns}	-.30
3-Writing self-efficacy[1]	1125.35 (244.63)	16-1600	.89	.89		-	.34	.26	-.33	-.13	-.23
4-Public speaking self-efficacy	33.94 (8.2)	10-50	.92	.92			-	.65	-.10	-.04^{ns}	-.20
5-Confidence as a speaker	34.97 (9.35)	12-60	.92	.92				-	-.18	-.16	-.31
6-Anxiety writing and defending academic texts	23.83 (8.35)	8-40	.94	.94					-	.54	.39
7-State anxiety	8.47 (6.48)	1-25	.95	.96						-	.57
8-Trait anxiety	6.27 (3.99)	0-19	.82	.82							-

Note. Otherwise indicated by *ns*, the correlation was statistically significant at .05; [1]correlations of the scale scores with the three dimensions identified in Ramos-Villagrasa et al. (2018) were .43 (ideation), .35 (conventions), and .43 (self-regulation).

factorial invariance by sex, a marginally acceptable fit was found for the one-factor configurational model (CFI = .883, RMSEA = .102, and SRMR = .060). Factor loadings were set to be equal, and no significant loss of fit was found, (7) = 9.69, p = .21, thus the scale showed metric invariance. Likewise, imposing that the intercepts of the items were equal did not significantly worsen the fit, (7) = 12.29, p = .09. That is, the scale showed scalar invariance and therefore the observed scores can be used to explore sex differences. Imposing strict invariance did not worsen model fit, (8) = 7.59, p = .47. Differences by sex were then explored using the observed scores, and no significant differences were found, t(200.74) = -0.25, p = .81, with the mean for males and females being 26.48 (SD = 5.29) and 26.34 (SD = 5.06) respectively. Figure 2 provides norms to facilitate the interpretation of the scores obtained with the scale for researchers and professionals who use it.

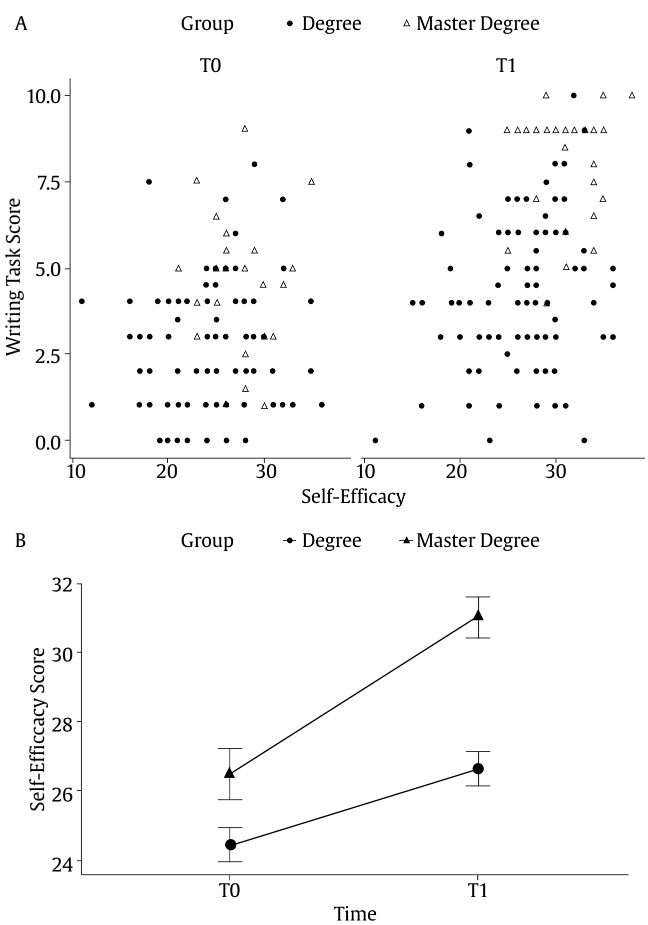


Figure 1. Results of the Intervention Program.

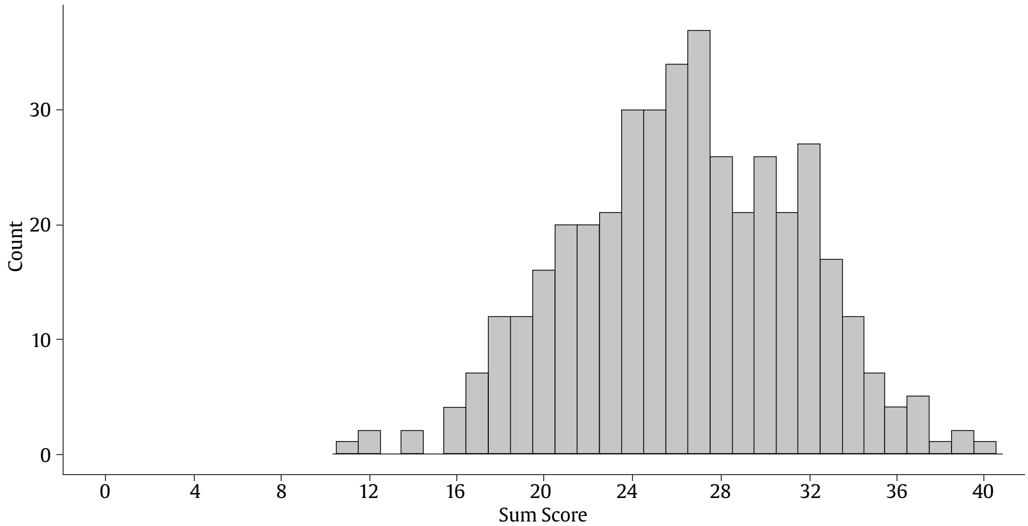
Discussion

Writing and defending a Bachelor's or Master's thesis is a compulsory requirement to earn a degree. Such a task involves very specific competencies needed to write and defend an academic piece of work before an examining committee. These include using writing guidelines, expressing ideas based on previous studies while not committing plagiarism, and discussing the results with an evaluating audience. One of the variables most strongly related to academic performance is self-efficacy (Komarraju & Nadler, 2013). However, the perception of efficacy that students have towards writing and defending academic texts has scarcely been studied. One of the reasons for this is the lack of instruments to evaluate students' efficacy in relation to this specific task. To fill this gap in the literature, we developed the self-efficacy towards writing and defending academic texts scale and evaluated its psychometric properties. The items were generated following the teaching guides for Bachelor's and Master's theses and Bandura's theory. To determine content validity, the relevance and clarity of the items generated were assessed by a group of 14 experts and Master students who showed high agreement that both relevance and clarity were high for all items. The following text describes the results referred to the rest of the validity and reliability evidences contrasted.

Our results indicate that the scale holds a unidimensional structure, with adequate structural, convergent, and criterion-related validity evidence. The scale's unidimensional structure was supported by the results of the factor analysis model, indicating that students' self-efficacy in relation to their thesis involves both writing and oral skills. This is in accordance with previous studies (Fidalgo et al., 2019) as well as with the European Higher Education Area (European Commission, 2006) that point out the relevance of a combination of writing and oral skills to successfully complete a thesis. The relations between self-efficacy towards writing and defending academic texts and theoretically related constructs were in the expected directions. Previous studies found a positive relation between perception of efficacy towards a specific task and overall self-efficacy (Ramos-Villagrasa et al., 2018). In line with this, students' perceptions about their own ability to write and defend academic texts were positively related to their general self-efficacy. As expected, we also found a negative relation between students' anxiety towards writing and defending academic texts and their perceptions of efficacy towards the same task. This is in accordance with previous research showing that anxiety levels tend to decrease when a person feels capable of successfully carrying out a task (Huerta et al., 2016; Wu et al., 2020).

The scale also showed adequate criterion-related validity. In accordance with previous studies showing a positive relation between self-efficacy and academic achievement (Doménech-Betoret et al., 2017; Komarraju & Nadler, 2013), participants with a higher perception of efficacy for writing and defending academic texts obtained higher scores in the writing task. Our results also indicated that participating in the educational intervention increased students' self-efficacy towards writing and defending academic texts. As proposed by Bandura (1997) and in line with previous findings (Foulstone & Kelly, 2019; Greneer et al., 2021), self-efficacy is malleable and can improve through educational interventions. The proposed scale was able to detect changes in self-efficacy.

On the other hand, measurement invariance across sex was supported, and mean differences were explored according to this factor. Like previous studies examining college students' self-efficacy (Huerta et al., 2016; Ramos-Villagrasa et al., 2018), we did not find differences regarding self-efficacy across sex. This suggests that both males and females hold similar levels of confidence towards writing and defending academic texts. Differences were found, however, between Master students and undergraduates. Although both groups increased their self-efficacy levels after the educational program, Master students were the ones who benefited the most. It should be noted, however, that the number of Master students was small. Bandura (1997) argues that previous experience with a task leads to feeling confident about conducting that specific task at hand. No differences were found in terms of self-efficacy between undergraduates and Master students at T0, but differences were found at T1. At the descriptive level, higher means were observed at T0 and T1 for Master students. It may be that having already completed a Bachelor's thesis provides Master students with an experiential foundation that helps them improve their self-efficacy levels through the educational program. Future studies could use the self-efficacy towards writing and defending academic texts scale to examine the evolution of self-efficacy through different levels of schooling, from undergraduate to PhD students and to more senior academics.



Sum Score	11	12	14	16	17	18	19	20	21	22	23	24	25	26
Centil	1	1	1	2	3	5	8	11	16	21	25	32	39	46
Z-Score	-3	-2.81	-2.42	-2.03	-1.83	-1.64	-1.44	-1.25	-1.05	-0.86	-0.66	-0.47	-0.27	-0.08
T-Score	20	22	26	30	32	34	36	38	39	41	43	45	47	49

Sum Score	27	28	29	30	31	32	33	34	35	36	37	38	39	39
Centil	55	62	68	74	79	85	90	94	96	97	98	99	99	99
Z-Score	0.12	0.31	0.51	0.7	0.9	1.09	1.28	1.48	1.67	1.87	2.06	2.26	2.45	2.65
T-Score	51	53	55	57	59	61	63	65	67	69	71	73	75	76

Figure 2. Norms for Self-efficacy Scale for Writing and Defending Academic Texts.

Limitations

Our results support the validity and reliability of the scale scores, but some limitations of this study should be considered. First, the majority of our participants were women and, thus, the sample is not sex-balanced. This is congruent with the demographic characteristics of the university degrees and Masters that took part in the study (e.g., Psychology degree). Also, even though more than 20 universities participated in the study, a large portion of students came from one university. An effort should be made in future studies to collect data with students from a more diverse sample. Second, our study includes longitudinal data, which allowed us to examine the effect of an educational program on students' self-efficacy and verify that by intervening on the contents evaluated in the scale, the scores after the intervention were significantly higher. However, it should be noted that even though we found increases in students' self-efficacy and performance on the writing task from T0 to T1, we did not include a control group. Thus, we cannot rule out alternative explanations of the results. Despite this, students who participated in the intervention were enrolled in different degrees and Masters, which hinders the possibility of a common factor influencing their perception of efficacy and writing scores. Third, we did not include a measure of students' performance in an oral examination task. As a pilot, for a very small subset of the students (13 out of 128) in the intervention group, the scores obtained in an oral defense task were assessed before and after the intervention. The mean score on the oral task was statistically higher after the intervention (7.31 vs. 8.69, $t(12) = -3.73$, $p = .003$). This could be taken as tentative evidence that improving self-efficacy through the intervention also improved students' performance on the oral defense task. This possibility should be addressed more comprehensively and systematically in the future. All these suggestions, as well as other aspects deemed necessary, can be addressed in future studies aimed at building up evidence of reliability and validity of the proposed scale in other independent samples, in line with current recommendations on developing and validating scales (Franco-Martínez et al., 2022; Muñiz & Fonseca-Pedrero, 2019).

Conclusions

To conclude, our findings support that the scale is a reliable and valid tool to measure university students' self-efficacy for writing and defending academic texts. We believe the scale is useful to guide educational interventions aimed at increasing students' self-efficacy towards this specific task. Providing students with strategies that build their confidence in writing and defending academic texts will most likely boost their self-efficacy. Our findings and those of previous studies show that the higher the self-efficacy towards a specific task, the lower the anxiety levels, and the better the academic results. Hence, the assessment and promotion of self-efficacy towards writing and defending academic texts will not only increase the likelihood of students completing their thesis but also have a positive impact on their wellbeing. The latter line of work is crucial if the data on mental health in university students are considered (Sorrel et al., 2020).

Conflict of Interest

The authors of this article declare no conflict of interest.

Note

[1]The data that support the findings of this study are openly available in the Open Science Framework repository at https://osf.io/7bv3a/?view_only=4343ded187e84646908daae7366a6591

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