



Initial validation of the handwriting proficiency screening questionnaire (HPSQ-C) translated to Spanish

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Abstract

Handwriting is a perceptual-motor skill encompassing a series of psychomotor skills related to academic performance. The main aim of this study was to translate and study the psychometric properties of the Handwriting Proficiency Screening Questionnaire for Children (HPSQ-C) for the Spanish population. A study was conducted on a final sample of 164 children from the 1st to 5th year of primary school (mean age 8.46 ± 1.14 years). Construct validity was examined using confirmatory factor analysis (CFA). The Spanish version of HPSQ-C required a change in items 3 and 5. The CFA showed three factors: (1) physical and emotional well-being; (2) performance time; and (3) legibility. The internal consistency of the Spanish version of the HPSQ-C was lower than satisfactory ($\omega = 0.68$). The goodness of fit measures for the factor structure of HPSQ-C's Spanish version was < 0.001 and the CFI was 1, which suggests a good fit. The psychometric analysis confirmed the HPSQ-C Spanish version's internal consistency and construct validity. HPSQ-C provides a unique opportunity to evaluate handwriting from the child's perspective.

Keywords Handwriting · Occupational therapy · Self-report · Children · School

Writing is a complex activity that demands integrating multiple cognitive, linguistic, and motor skills, including both low-level transcription and high-level composition skills (Borba et al., 2021; Planton et al., 2017; Simons & Probst, 2014). Handwriting, a form of transcription, is the act of writing by hand, encompasses a variety of psychomotor skills (Feder et al., 2000) and is essential in primary education, with 42% of school-age children's school time being allocated to this activity (Fancher et al., 2018). Its performance significantly impacts several aspects of the child, such as their self-image, academic performance, attitude, and behavior (Feder et al., 2000). During

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this developmental stage, children begin to become aware of their handwriting abilities and limitations (Vico et al., 2023). This awareness includes considerations such as speed, legibility, motivation, and confidence (Fancher et al., 2018; Rosenblum & Gafni-Lachter, 2015). While some children may feel confident and competent, others may experience insecurity or frustration due to perceived difficulties (Šafárová et al., 2020; Thichanpiang et al., 2022; Vico et al., 2023).

Handwriting difficulties are prevalent among school-aged children, potentially impacting their engagement in school activities (Vico et al., 2023) and sometimes becoming complicated and difficult to resolve (Rosenblum et al., 2003). It has been noted that 20% of students in primary school are at risk of having handwriting issues (Fancher et al., 2018). Moreover, it has been described that 13–27% of students experience difficulties in handwriting, of whom the largest proportion corresponds to boys (Karlsdottir & Stefansson, 2002). Educators and clinicians (including occupational therapists) often work with children with illegible scripts, difficulties with letter formulation, and a lack of automaticity of writing (Thichanpiang et al., 2022; Vico et al., 2023). These difficulties are the most common reasons for referral to occupational therapy (OT) among school-aged children (Kadar et al., 2020).

The evaluation of children's handwriting problems allows detecting the strengths and weaknesses of each child, knowing the spontaneous strategies that they use. The information collected, serves for establishing the objectives, selecting the most appropriate approach for each case and planning the OT intervention (Thichanpiang et al., 2022). The evaluation of handwriting has been essentially focused on two dimensions: writing speed and legibility (Simons & Probst, 2014). Many of the instruments developed to this end analyze the speed of handwriting (Rosenblum et al., 2003; Simons & Probst, 2014; Vico et al., 2023), e.g., by counting the number of words written in one minute, such as standardized tools like Detailed Assessment of Speed of Handwriting (DASH) or Handwriting Speed Test (HST; Wallen & Mackay, 1999). Legibility can be assessed by handwriting production, including letter formation, which includes letter shape, orientation, angle and size, letter spacing, word spacing and line alignment (Caravolas et al., 2020; Vico et al., 2023), e.g., the Handwriting Legibility Scale (HLS; Barnett et al., 2018; Fogel et al., 2022) or the Spelling and Handwriting Legibility Test (SaHLT; Caravolas et al., 2020). OT assessments often include the evaluation of performance components (visual perception, fine and gross motor skills, sensory processing), review of handwriting samples, direct observation of the child during a handwriting activity and interviews with teachers and students (Engel-Yeger et al., 2009; Overvelde & Hulstijn, 2011; Piller & Pfeiffer, 2016; Thichanpiang et al., 2022; Vico et al., 2023). However, few tools aim to understand the difficulties in writing from the child's perspective. These types of instruments require support for the child's self-awareness.

Self-awareness is defined as the ability to perceive and understand one's own strengths and limitations (Josman & Rosenblum, 2018), and has been related to metacognitive skills and, therefore, to executive functioning (Cermak & Toglia, 2018). Although it is known that middle childhood is a key period for the development of metacognitive skills and strategies, thus improving the ability to recognize and correct one's own errors between the ages of 5 and 8 years (Cermak & Toglia, 2018), few studies have been conducted on the self-awareness of children regarding writing

(Fogel et al., 2022). By the age of 6 years, self-awareness comes predominantly from external sources, such as observing others and comparing oneself to external reference points, including the abilities of peers or the expectations of adults. Around the age of 10 years, children start developing a more internalized and self-referential awareness of themselves (Damon & Hart, 1988). However, several authors have highlighted that school-aged children have knowledge of their writing difficulties, which serve as valuable sources of information about their performance on this task (Engel-Yeger et al., 2009; Sarsak, 2018), particularly when provided with an age-appropriate questionnaire (Mather & Rule, 2017). One of these tools is the Handwriting Proficiency Screening Questionnaire for Children (Rosenblum & Gafni-Lachter, 2015).

The Handwriting Proficiency Screening Questionnaire for Children (HPSQ-C) is a 10-item scale, with five response options, with 0=never, 1=rarely, 2=sometimes, 3=frequently, 4=always; and good reliability (Rosenblum & Gafni-Lachter, 2015). It was written and developed for this purpose in Hebrew, and it shows two factors, i.e., performance time and well-being, and legibility (Rosenblum & Gafni-Lachter, 2015), although its adaptation to the Czech children (Šafářová et al., 2020) showed three factors: legibility; performance time; and emotional and physical well-being. According to Rosenblum and Gafni-Lachter, the construct of HPSQ-C is non-language-dependent (Rosenblum & Gafni-Lachter, 2015), although it also takes into account other aspects involved in the writing process, such as coordination and neuromotor control. Like drawing, handwriting requires rapid and precise bilateral coordination (Hong et al., 2020), maintaining proper posture (Pade et al., 2018), accurately controlling wrist and finger movements, adjusting the pencil grip, integrating visual and motor skills (Tse et al., 2019), regulating pressure, and receiving kinesthetic feedback (Simons & Probst, 2014; Truxius et al., 2024). This perspective has also been reinforced by the findings of several neuroimaging studies showing that, during writing, there is greater activation of brain areas associated with motor learning, such as the superior parietal cortex, the supplementary motor area, the dorsal premotor cortices, the ventral premotor cortices and the cerebellum (Planton et al., 2017; Truxius et al., 2024).

One of the aims of the Language and Literature curriculum of the Spanish educational system in Primary Education (Real Decreto 126/2014 on February 28) is to promote the acquisition and improvement of communication skills, covering linguistic, sociolinguistic, and literary elements (Sánchez-Rivero et al., 2021). However, reports commissioned by the Spanish Ministry of Education have highlighted students' inadequate writing performance, both at the Primary and Secondary levels, although, following the orthographic depth hypothesis (Katz & Frost, 1992; Richlan, 2014; Schmalz et al., 2015), Spanish can be considered a language with little orthographic depth or high transparency. To the best of our knowledge, there are no self-reported assessments available for Spanish children to understand handwriting difficulties from their perspective. To address this gap, the present study aimed to adapt the HPSQ-C questionnaire to the Spanish population, in addition to examining its internal consistency and structural validity, providing a new evaluation resource for educators and clinicians (including occupational therapists) that allows them to

capture the children's self-perceived difficulties of handwriting. In light of the above, we hypothesized that:

1. The Spanish version of HPSQ-C will maintain a three-factor structure: legibility, performance time, and well-being, as shown in another adaptation study of the original HPSQ-C to the Czech population (Šafářová et al., 2020).
2. The internal consistency values of the Spanish version of HPSQ-C will be similar to those obtained in other studies (Rosenblum & Gafni-Lachter, 2015; Šafářová et al., 2020).

Materials and methods

Participants

The participants in the study were children ≥ 6 and < 11 years old (1st to 5th grade) and were recruited through two Spanish schools. The inclusion criteria to be part of this study were: 1) typically developing children and children with special educational needs, without behavioral difficulties; 2) children with sustained silent reading and demonstrating at least a literal comprehension of the text, according to the teacher's report; 3) knowing how to use the writing tool (pen or ballpoint pen); and 4) having obtained written informed consent from the parents of those children who voluntarily wished to participate. The exclusion criteria of the study were: (1) difficulties in understanding oral and written instructions; and (2) low self-report ability, based on the report of the teachers and the psychologists of the schools.

The estimation of the sample size for conducting a confirmatory factor analysis (CFA) has been a subject of controversy, and no definitive conclusions have been established (Wolf et al., 2013). The original HPSQ-C consists of 10 items grouped into two factors (Rosenblum & Gafni-Lachter, 2015), although, in other populations, it has been found that they were grouped into three factors (Šafářová et al., 2020). Some authors suggest that the number of participants to conduct a CFA is between 5 and 10 for each item (Argimon-Pallás & Jiménez Villa, 2013; Hernández-Sampieri, 2014), while others consider that an adequate sample size for a measure containing three or more items per factor would be 100–200 participants (Anderson & Gerbing, 1984; MacCallum et al., 1999).

From an initial non-probabilistic sample of 173 children in 1st–5th grade (93 girls and 80 boys; mean age of 8.51 ± 1.14 years), 13 (7.9%) had special educational needs. Within this sample, nine children without special educational needs (5.2%) refused to participate in the study, opting instead to attend another class to complete their homework. Consequently, the final sample was composed of 164 children (89 girls and 75 boys; mean age of 8.46 ± 1.14 years). All the children with special educational needs completed the study (Table 1).

Table 1 Sociodemographic, learning difficulties and clinical characteristics of children by educational level

Grade level	1st	2nd	3rd	4th	5th
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age	6.67 (0.49)	7.38 (0.49)	8.32 (0.48)	9.21 (0.41)	10.11 (0.32)
Gender	n (%)	n (%)	n (%)	n (%)	n (%)
Girls	14 (77.80)	17 (50)	19 (51.35)	30 (53.77)	9 (47.37)
Boys	4 (22.20)	17 (50)	18 (48.65)	26 (46.23)	10 (52.63)
Learning difficulties					
No	18 (100)	32 (94.12)	31 (83.78)	53 (94.64)	17 (89.47)
Yes	0 (0)	2 (5.88)	6 (16.22)	3 (5.36)	2 (10.53)
Diagnosis					
ADHD	0	1	5	3	2
ASD	0	0	1	0	0
Dyslexia	0	1	0	0	0

Measure

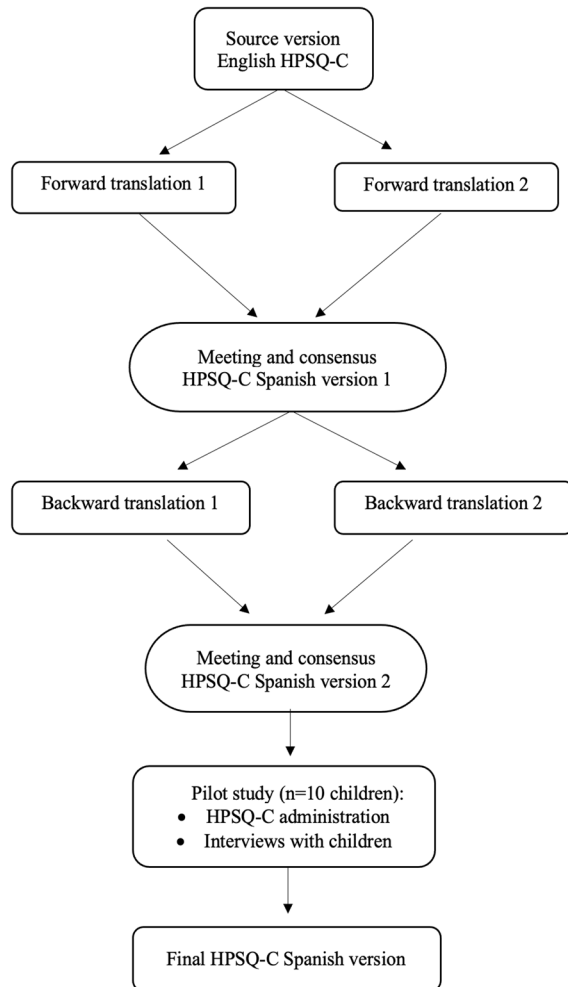
The tool used in this study was the HPSQ-C (see [appendix](#)), a self-evaluation questionnaire, translated into Spanish from its original version. The original instrument has two factors (performance time and well-being, and legibility) and good psychometric properties, in addition to good validity and internal consistency, with a Cronbach's alpha of 0.77 (Rosenblum & Gafni-Lachter, 2015). One of the characteristics of the HPSQ-C is that it is a brief questionnaire, consisting of 10 items, each scored from 0 ("Never") to 4 ("Always"). The total score is obtained by summing the scores obtained for each item and dividing by the number of items, that is, by 10. According to the original authors, a high average score (3–4) indicates significant difficulty in the various writing skills (Rosenblum & Gafni-Lachter, 2015).

Procedure

This study was approved by the Ethics and Research Committee of the local University (code: 2370/CEIH/2021). The parents of children in 1st to 5th grade received written information about the study's objectives and procedures. Those who consented to their children's participation provided written informed consent. However, children who declined to participate were excluded from the study, despite having parental consent.

We obtained consent from the author of the original HPSQ-C. After that, two translators independently performed the forward translation, and subsequently, an initial meeting among experts was conducted to reach a consensus, obtaining the Spanish HPSQ-C version 1 (Fig. 1). Subsequently, a backward translation was performed, followed by a second meeting to identify discrepancies between the two back-translations of the Spanish version 1 and the original version of the HPSQ-C. As a result of this second meeting, item 5 "¿No quieres escribir?"; item 7 "¿Te quejas de dolor mientras escribes?"; and item 8 "¿Te cansas cuando escribes?" from version 1, were modified as follows: item 5 "¿Sientes que no quieres escribir?"; item 7 "¿Te

Fig. 1 Translation process of the handwriting proficiency screening questionnaire for children (HPSQ-C) for the Spanish population



quejas de dolor al escribir?"; and item 8: "¿Te cansas al escribir?", resulting in the Spanish HPSQ-C version 2 (Fig. 1; Table 2).

Subsequently, authorization was requested from the principals of each school to conduct the study. The teachers were contacted, and four occupational therapists specialized in child evaluation planned the date to perform a pilot study to administer the HPSQ-C Spanish version 2 to a group of 10 children, who were not included in the final sample (5 girls and 5 boys; mean age of 8.3 ± 1.42 years), with the aim of testing the comprehension of its items, performing cognitive interviews (Beaton et al., 2000; Devine et al., 2018; Irwin et al., 2009; Willis, 2004). It has been demonstrated that younger children and those with lower reading skills might have difficulty responding appropriately to negative items in questionnaires (Mellor & Moore, 2014). This could potentially introduce bias into the interpretation of their answers. Therefore, it

Table 2 Modified items in the Spanish HPSQ-C versions along the translation process

Item	Original HPSQ-C	Spanish HPSQ-C Version 1	Spanish HPSQ-C version 2	Spanish HPSQ-C final version
3	Do you not have enough time to copy tasks from the board?		¿No tienes tiempo suficiente para copiar tareas de la pizarra?	¿Necesitas más tiempo para copiar las tareas de la pizarra?
5	Do you feel you do not want to write?	¿No quieres escribir?	¿Sientes que no quieres escribir?	¿No te gusta escribir?
7	Do you complain about pain while writing?	¿Te quejas de dolor mientras escribes?	¿Te quejas de dolor al escribir?	
8	Do you get tired while writing?	¿Te cansas cuando escribes?	¿Te cansas al escribir?	

is essential to consider the children's perspective to facilitate their clear comprehension of each item (Chambers, 2002).

To ensure this comprehension, each time the children read an item, they were asked whether they understood it well or had any questions. If they had no questions, they were instructed to proceed with answering. In case of any doubts, clarification was provided, and they were subsequently asked to express the item in their own words (Cella et al., 2007; Devine et al., 2018). Furthermore, the children were asked to indicate whether they perceived the question as related to handwriting. Items requiring clarification were re-read, and understanding was confirmed. The children indicated that 8 of the 10 items were easy and understandable (Table 2). In addition, the items that were written in the negative form were especially discussed, specifically items 3, 6, and 10. Of these, item 3 “¿No tienes tiempo suficiente para copiar tareas de la pizarra? (*Don't you have enough time to copy assignments from the whiteboard?*)” was modified for “¿Necesitas más tiempo para copiar las tareas de la pizarra? (*Do you need more time to copy the tasks from the whiteboard?*)”. In addition, the comprehension of item 5 “¿Sientes que no quieres escribir?” (*Do you feel like you don't want to write?*) was discussed, which seemed to refer to a specific and current feeling about writing, and the translation uses an infrequent verb concerning handwriting. Therefore, it was replaced with “¿No te gusta escribir?” (*Don't you like writing?*), which refers to whether the child does or does not like writing in general. Likewise, it was also discussed whether to express items 6 and 10 in the affirmative form; eventually, it was decided to keep them in the negative form, as in the original version. After this, the Spanish HPSQ-C final version was obtained (Fig. 1; Table 2).

Later, the occupational therapists went to the schools and, for a week, they went to the different classrooms of the schools, from 1st to 5th grade, to administer the final questionnaire to the children of the final sample. In these classrooms, each child was given a paper-pencil form, which they filled out independently. Any queries that the children had before beginning to fill out the questionnaire were answered by the researchers.

Data analysis

The Kolmogorov-Smirnov test ($D_{164}=0.060$; $p=.200$) confirmed the normal distribution of the HPSQ-C total score. For each item of the questionnaire, values of

skewness (Sk) and kurtosis (Ku) were calculated, with all values being within the acceptable limits (± 2) (Field, 2013), except for item 2 (Table 3).

The internal consistency of the HPSQ-C questionnaire was calculated using McDonald's Omega (Hayes & Coutts, 2020; McDonald, 1999). Omega values > 0.69 are considered adequate to guarantee the internal consistency of a questionnaire (Ventura-León & Caycho-Rodríguez, 2017). To assess sampling adequacy, the Kaiser–Meyer–Olkin (KMO) Index and Bartlett's Test of Sphericity were conducted (Sharif Nia et al., 2019). KMO values between 0.8 and 1 indicate that the sampling is adequate, and values < 0.6 indicate that the sampling is not adequate (Pett et al., 2003).

The construct validity of the questionnaire was determined through confirmatory factor analysis (CFA) to verify that the dimensions identified by the authors of the original tool were valid in the translated version of the questionnaire. The maximum likelihood method (ML) was used to estimate the goodness of fit parameters. To this end, the measures of the quality of the fit of the model were evaluated through the following indices: Tucker Lewis Index (TLI) and Comparative Fit Index (CFI), considering values close to 0.95 indicative of a good fit, Root Mean Square Error of Approximation (RMSEA), with values close to 0.06, and the Standardized Root Mean Square Residual (SRMR), with values close to 0.08, considered as indicators of a good fit (Hu & Bentler, 1999). Unpaired t-test and ANOVA were conducted to determine the existence of differences by sex and education level, respectively, in HPSQC's total score. The statistical significance was set at a p -value < 0.05 . Statistical analysis was performed using the IBM SPSS version 28, and the IBM AMOS extension (version 28.0) was used to conduct CFA.

Results

Construct validity

The sampling adequacy (KMO) was calculated as 0.728 and Bartlett's test was calculated [$\chi^2 (45) = 1995.663$, $p < .001$]. The global model fit of HPSQ-C was not statistically significant [$\chi^2 (32) = 29.446$, $p < .596$], obtaining the following index

Table 3 Skewness (Sk) and kurtosis (Ku) values of each HPSQ-C item

Item	Min.	Max.	Mean	SD	Sk	SD	Ku	SD
1	0	4	1.15	1.282	0.774	0.186	-0.474	0.369
2	0	4	0.56	1.068	2.090	0.187	3.648	0.371
3	0	4	1.38	1.219	0.515	0.187	-0.540	0.371
4	0	4	1.58	1.100	0.406	0.187	-0.139	0.371
5	0	4	1.26	1.374	0.689	0.186	-0.722	0.370
6	0	4	0.78	1.259	1.537	0.186	1.154	0.369
7	0	4	1.22	1.384	0.948	0.186	-0.317	0.370
8	0	4	1.70	1.307	0.340	0.186	-0.848	0.369
9	0	4	2.01	1.323	0.056	0.186	-1.002	0.370
10	0	4	1.42	1.601	0.578	0.186	-1.286	0.369

values: CFI=1, TLI=1.02, RMSEA=0 with 90% CI [0, 0.052] and SRMR=0.077. The CFA confirmed a 3-factor structure for HPSQ-C (Fig. 2; Table 4). The factor loading explained 50.19% of the variance and it was distributed in the 3 factors of the HPSQ-C (Fig. 2): the first factor, named “Emotional and physical well-being”, explained 19.48% of the variance; the second factor, named “Performance time”, explained 15.96% of the variance; and the third and last factor, named “Legibility”, explained 14.75% of the variance. Table 5 shows the comparison between factor models. All factor loadings were <0.45 and significant ($p<.001$). The correlations

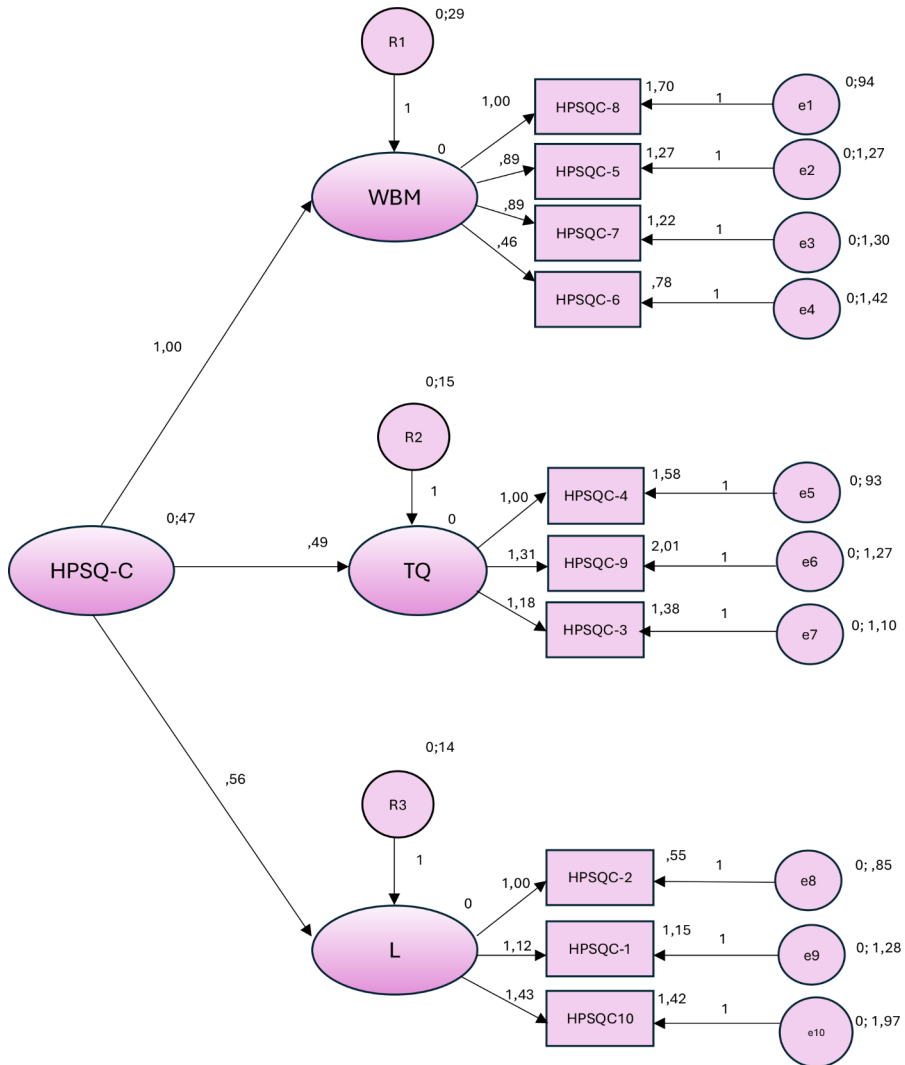


Fig. 2 Factorial confirmatory analysis of handwriting proficiency screening questionnaire for children (HPSQ-C) translated to Spanish. WBM: Well-being and motivation for handwriting; TQ: Time and Quality of handwriting; L: Legibility

Table 4 Items' distribution in the original hebrew HPSQ-C, Czech HPSQ-C and Spanish HPSQ-C

Hebrew HPSQ-C	Items	Czech HPSQ-C	Items	Spanish HPSQ-C	Items
		Emotional and physical well-being	5,6,7,8	Emotional and physical well-being	5,6,7,8
Performance time and well-being	3,5,6,7,8,9	Performance time	3,4,9	Performance time	3,4,9
Legibility	1,2,4,10	Legibility	1,2,10	Legibility	1,2,10

Table 5 Goodness of fit measures for different factor structures of HPSQ-C

Structure HPSQ-C	χ^2	p	df	CMIN/DF	CFI	TLI	RMSEA	AIC
2 Factors	46.882	.070	34	1.379	0.917	0.891	0.048	88.882
3 Factors	29.446	0.596	32	0.920	1	1.023	0	75.446

χ^2 : Chi-square; RMSEA: Root mean square error of approximation; CFI: Comparative fit index; AIC: Aiken information criteria

Table 6 Latent factor correlations in HPSQ-C

Factors	Correlation
Emotional and physical Well-being - Performance Time	0.494
Emotional and physical Well-being - Legibility	0.545
Performance Time - Legibility	0.482

among all three latent factors were all weak, positive, and highly statistically significant ($p < .001$) (Table 6).

Internal consistency

The overall reliability was McDonald's $\omega = 0.68$. The *emotional and physical well-being* subscale had $\omega = 0.65$; the *performance time* subscale had $\omega = 0.51$; and the *legibility* subscale had $\omega = 0.47$. Based on the unpaired t -test, sex difference was not observed for HPSQ-C total score (boys: $M = 1.24$, $SD = 0.67$ girls: $M = 1.36$, $SD = 0.645$; $t(162) = 1.228$, $p = .221$). Similarly, there were no differences in the HPSQ-C score when compared by age, $F(4, 164) = 1.879$, $p = .117$.

Discussion

The primary aim of this study was to adapt and assess the psychometric properties of the HPSQ-C among children in Spain. This study is relevant, as it represents the initial effort to present a Spanish version of this tool, which provides rapid identification of children who perceive themselves to have difficulties in handwriting. Some authors have reported that understanding children's perceptions is crucial to realizing their sense of confidence, as well as their behavior at school (Spilt et al., 2010). This

contributes to the establishment of objectives for interventions centered on the child's perspective.

To the author's knowledge, this is the first study conducted on the translation of the HPSQ-C to Spanish and its initial validation for Spanish school-aged children. Adapting existing measures is often more time- and cost-effective than developing entirely new measures (Arestad et al., 2017). Furthermore, adapting an existing instrument to a new population can facilitate the comparison of data across different populations, which is useful for establishing consistent trends and patterns in research (Beaton et al., 2000; Wild et al., 2005). Moreover, the conceptualization and underlying theory supporting the original instrument are preserved, which is important for maintaining consistency in measuring specific constructs over time and in different contexts (Beaton et al., 2000). In some cases, the translation process may reveal differences in how items are perceived in different languages, due to the presence of idiomatic and metaphorical expressions that may hinder their understanding (Devine et al., 2018). However, in the case of the HPSQ-C, the absence of idiomatic and metaphorical expressions simplified this process. For all the reasons mentioned above, we preferred to translate an existing instrument instead of creating a new one.

Construct validity

Unlike the original study (Rosenblum & Gafni-Lachter, 2015), in which two factors were found (factor 1: performance time and physical and emotional well-being; and factor 2: legibility), in the Spanish version of the HPSQ-C, three factors were obtained (factor 1: physical and emotional well-being; factor 2: performance time; and factor 3: legibility), as shown in Table 4.

The difference in the number of factors between the Spanish final version of the HPSQ-C and the original instrument could be due to the fact that some of the items in the Spanish version were modified (items 3 and 5; Table 3). In our version 2, item 3 was worded in the negative sense: “¿No tienes tiempo suficiente para copiar tareas de la pizarra?” (Don't you have enough time to copy assignments from the whiteboard?), while in the Spanish final version of the HPSQ-C, it was written in the affirmative form: “¿Necesitas más tiempo para copiar las tareas de la pizarra?” (Do you need more time to copy the tasks from the whiteboard?). Regarding item 5, in version 2, the question included the verbs “feel” and “want” (in Spanish: *querer*): “¿Sientes que no quieres escribir?” (Do you feel like you don't want to write?). In contrast, in the Spanish final version of the HPSQ-C, the question included the verb “like” (in Spanish: *gustar*): “¿No te gusta escribir?” (Don't you like writing?), with the terms “feel”, “want” and “like” representing different feelings. This three-factor structure was identified in a previous study on the psychometric properties of the HPSQ-C in the Czech child population (Šafářová et al., 2020). These authors suggested that the difference from the factor structure described by the authors of the original instrument could be due to the reversal in the meaning of certain items, as occurred in item 3 of the Spanish final version of the HPSQ-C.

The correlations of the latent factors were stronger between the well-being factor and the legibility factor, as was also the case with the data provided by Šafářová et al. (Šafářová et al., 2020). However, in our case, the results showed slightly higher scores

than this previous study. This suggests that older children grant more importance to handwriting legibility, have developed automated motor patterns, and acquired greater muscle strength and motor skills in the hand, and this could be related to higher motivation and well-being associated with handwriting (Thibon et al., 2018).

Our results partially support recent findings that showed the interest of school-aged children in writing pressure, writing time, and writing accuracy (Watanabe et al., 2020). According to Watanabe et al. (2020), the objective assessment of writing should encompass three crucial factors: pressure, accuracy, and speed. Their findings suggest a developmental asymmetry in various writing skills. Initially, pressure control and writing accuracy undergo development up to the age of 7 years, while writing speed continues to evolve beyond this age. Our study, focusing on the children's perspective, identified three primary factors. Foremost among these was physical and emotional well-being, which might correlate with pressure (and speed) control. Subsequently, speed (or performance time) emerged as the second factor, followed by legibility. Consequently, in both objective and subjective evaluations, the considered aspects are complementary, encompassing speed and legibility in each case.

Internal consistency

The internal consistency of the Spanish version of the HPSQ-C was lower than satisfactory (Ventura-León & Caycho-Rodríguez, 2017). This finding is not in line with that shown in the study of the original version of the HPSQ-C, which was higher. This could be due to the different ages of the participants, since our study included children younger than those in the study of Rosenblum et al. (Rosenblum & Gafni-Lachter, 2015), which could be related to a lower ability to make reliable self-reports and self-assessments (Conijn et al., 2020).

Limitations and future studies

The present study has some limitations. Firstly, the participants were recruited by convenience sampling. Secondly, the vast majority of the participants of this study were neurotypical children. Future studies should examine the ability of the Spanish version of the HPSQ-C to distinguish between students with and without handwriting difficulties, as well as its specificity and sensitivity in identifying children with handwriting difficulties. Furthermore, given the comorbidity of learning disabilities such as dysgraphia and dyslexia with some diagnoses like, for example, attention deficit hyperactivity disorder, autism spectrum disorder, or motor coordination disorder, as a future line of research, the authors propose to expand and compare different diagnoses and learning difficulties, to describe handwriting profiles and create specific interventions.

Considering the level of internal consistency of the HPSQ-C Spanish version, it is recommended to continue examining its reliability, while examining whether there are age differences in it. Additional research could explore the test-retest reliability. Likewise, it would be interesting to develop future studies with the Spanish children population combining the HPSQ-C and tests based on handwriting performance, to

determine whether the results could be related to age (Rosenblum & Gafni-Lachter, 2015).

There is controversy regarding the relationship between difficulties in drawing at pre-school age and potential difficulties with handwriting in later stages. However, several authors have suggested that the skills required for drawing might be related to those necessary for handwriting, such as fine motor skills, visuomotor skills, eye-hand coordination motor planning, and kinaesthesia (Planton et al., 2017; Shooman & Rosenblum, 2014; Vico et al., 2023). Therefore, it could be of interest to conduct studies to validate, for the Spanish children population, drawing evaluation tools that have already been developed, such as the Drawing Proficiency Screening Questionnaire – DPSQ (Shooman & Rosenblum, 2014). Lastly, we believe it would be useful to conduct a cohort study starting at the preschool stage to explore whether children with difficulties in drawing are at a greater risk of having difficulties with handwriting during the school stage.

Implications for practice

This study is relevant, as it is the first to provide a Spanish version of the HPSQ-C. This enables the screening of legibility, performance time, and dimensions of physical and emotional well-being in handwriting from the child's perspective. It also facilitates the initial identification of children within the Spanish population who perceive themselves as having difficulties in handwriting. The availability of quick, reliable, and valid instruments, such as the HPSQ-C, may be of interest to educators and clinicians (including occupational therapists) in the school setting, given the lack of time and instruments for the Spanish children population.

Conclusions

The results of the initial validation and the psychometric analysis confirm the internal consistency and construct validity of the Spanish version. The HPSQ-C provides a unique opportunity to assess writing from the child's perspective. It has the potential to assist in developing educational and intervention goals; however, it would be advisable to carry out further research that expands the study of the psychometric properties of the Spanish version of the HPSQ-C, providing a solid basis for its application in educational and clinical practice.

Appendices

Original	Version	HPSQ-C:	https://chap.haifa.ac.il/en/2022/01/12/handwriting-proficiency-screening-questionnaire-for-children-hpsq-c/
Spanish HPSQ-C final version			

	Nunca 0	Rara- mente 1	A veces 2	Frecuent- emente 3	Siem- pre 4
1. ¿Es difícil leer tu letra?					
2. ¿Tienes dificultades para leer tu propia letra?					
3. ¿Necesitas más tiempo para copiar las tareas de la pizarra?					
4. ¿Borras mucho mientras escribes?					
5. ¿No te gusta escribir?					
6. ¿No haces los deberes?					
7. ¿Te quejas de dolor al escribir?					
8. ¿Te cansas al escribir?					
9. ¿Necesitas mirar a menudo la página o pizarra al copiar?					
10. ¿No estás satisfecho con tu letra?					

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