
Handwriting Proficiency Screening Questionnaire for Children (HPSQ–C): Development, Reliability, and Validity

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MeSH TERMS

- handwriting
- mass screening
- questionnaires
- reproducibility of results
- self report

OBJECTIVE. To adapt the Handwriting Proficiency Screening Questionnaire (HPSQ), previously designed for adults, into a children's self-report version (the HPSQ for Children, or HPSQ–C) and to examine its reliability and validity.

METHOD. Participants included 230 children ages 7–14 yr from regular schools in Israel. The questionnaire's content validity, internal consistency, and concurrent and construct validity were assessed.

RESULTS. The tool demonstrated good internal consistency ($\alpha = .77$). We found a significant moderate correlation between final HPSQ–C scores and the HPSQ, $r = .51$, $p < .001$, establishing the HPSQ–C's concurrent validity. Construct validity was also confirmed. Results demonstrated that the HPSQ–C significantly distinguished between children with and without handwriting deficiencies on the basis of measures of handwriting product (Hebrew Handwriting Evaluation) and handwriting process (Computerized Penmanship Evaluation Tool).

CONCLUSION. The HPSQ–C is suitable for identification of handwriting deficiency among school-aged children and is appropriate for varied academic and clinical uses.

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Writing is one of the functional daily activities required of school-age children for their adequate participation in the academic process (Feder & Majnemer, 2007). In fact, writing is a complex form of language production, ranging from conceptualization to motor execution (Connelly, Dockrell, & Barnett, 2005). It has been proposed that mastery of lower level transcription skills such as handwriting and spelling is required for idea conceptualization and production of high-level content (Graham, 2009). For example, handwriting speed was found to be essential for note-taking of important information (Peverly, Garner, & Vekaria, 2014), and handwriting automaticity correlated with children's performance-level variance in composition (Medwell & Wray, 2014).

Previous studies have reported that about 50% of a child's school day is spent performing writing tasks (McHale & Cermak, 1992; Tseng & Chow, 2000). Most children can cope with their handwriting requirements and become proficient writers, their handwriting is legible, and they invest little effort in the handwriting process (Erhardt & Meade, 2005; Rosenblum, Weiss, & Parush, 2003b). However, children who are unsuccessful in developing proficient handwriting face developmental dysgraphia (Kushki, Schweltnus, Ilyas, & Chau, 2011; O'Hare, 2004), and their functional limitations manifest as inadequate speed or product illegibility (Lam, Au, Leung, & Li-Tsang, 2011; Rosenblum et al., 2003b).

Dysgraphia is found among children with at least average intelligence who have not been identified as having any obvious neurological or perceptual–motor problems. The prevalence of handwriting difficulties or developmental dysgraphia

among school-age children varies between 10% and 30% (Kushki et al., 2011). Children with neurodevelopmental disabilities are specifically at high risk for handwriting difficulties (e.g., Fuentes, Mostofsky, & Bastian, 2010).

Researchers have suggested that handwriting difficulties may result in serious consequences for the student's overall academic success, emotional well-being, attitude, and behavior (Feder & Majnemer, 2007; Pevery et al., 2013). These findings reinforce the importance of identifying handwriting difficulties as early as possible, both as a preventive and as a corrective aid (Martins et al., 2013).

The Handwriting Proficiency Screening Questionnaire (HPSQ; Rosenblum, 2008), which is completed by adults (teachers and clinicians), was thus developed in response to the need for a standardized practical tool for screening handwriting difficulties among school-age children. This reliable and valid questionnaire contains 10 items that cover three important poor handwriting-related factors: (1) legibility, (2) performance time, and (3) physical and emotional well-being. Each item is scored on a 5-point Likert scale, on which 0 = *never* and 4 = *always*. Higher scores indicate poorer performance (see Rosenblum, 2008, for more details). The HPSQ is a non-language-dependent tool used for clinical and research purposes for varied written languages worldwide (e.g., Canada [Schwellnus et al., 2012], Australia [Frohlich, Wesley, Wallen, & Bundy, 2012], and Malaysia [Khalid, Yunus, & Adnan, 2010]).

However, in recent years, adults' reports on children's performance ability have appeared to be insufficient. Legal, social, ethical, and philosophical viewpoints state that children have the right to express their opinions and ideas (e.g., Mazefsky, Kao, & Oswald, 2011). Moreover, when children engage in a specific activity, they can in many cases best judge the quality of their performance (Fram, Frongillo, Draper, & Fishbein, 2012; Petersson, Simeonsson, Enskar, & Huus, 2013). Child self-reports are the gold standard for child assessments and only moderately correlate with parental proxy reports because parents do not have exhaustive information about their children's experiences or their internal processes (Fram et al., 2012). Therefore, involving the child in the evaluation process may contribute meaningful information as well as influence the determination of intervention goals and processes. Such child and parent-teacher cooperation can increase the child's motivation and lead to successful outcomes (Missiuna & Pollock, 2000). Consequently, a self-report can be a practical, inexpensive method for examining a child's sense of self-efficacy about a particular activity (Missiuna, 1998) in a wide variety of settings, such as clinics, schools, pediatricians' offices, or the home (Danielson & Phelps, 2003).

The necessity for a children's self-report tool like the HPSQ became apparent to the researchers after encounters

with many school-age children in previous studies (e.g., Rosenblum, Epszstein, & Josman, 2008; Rosenblum & Livneh-Zirinski, 2008; Rosenblum, Parush, & Weiss, 2003a) who wanted to express their feelings concerning their own handwriting performance. Moreover, when listening to these children's accounts, the researchers recognized that important information was omitted because of the absence of a valid standardized tool applicable for this purpose. Hence, in this article, we present an adaptation of the HPSQ to a children's self-report on handwriting performance, as well as details of its standardization process.

The study consisted of two phases: (1) modifying the HPSQ to a children's self-report version, the Handwriting Proficiency Screening Questionnaire for Children (HPSQ-C), establishing expert validity, and trialing the tool's administration among children and (2) analyzing the HPSQ-C's internal reliability, as well as its concurrent and construct validity, using in-depth handwriting processes and product assessments.

Method

Phase 1

In the first phase, we changed the HPSQ item wording from the third person to the second person to address the children directly, but item content remained the same. For example, the fourth item of the HPSQ, which was worded as "Does the child often erase while writing?" was altered to "Do you often erasing while writing?" After the wording change, seven expert consultants, including five experienced pediatric occupational therapists and two experienced teachers, were asked to rate whether each of the 10 questionnaire items was clear enough for school-age children to comprehend and respond to. We found 100% agreement on the clarity of the 10 items.

After the content validation process, a secondary qualitative evaluation process was performed in which the questionnaire was given to 10 school-age children ages 8 and 9 yr. Five had been diagnosed by their teachers as poor writers and 5 as proficient writers, based on the HPSQ. The children were asked to complete the questionnaire and then to rate each item for clarity and ease of response. They were then asked to rate on a scale ranging from 1 (*not satisfied at all*) to 10 (*very much satisfied*) their general satisfaction with the questionnaire as a tool to express their handwriting performance.

We found 100% agreement on item clarity. However, 2 of the 10 children remarked that Item 3 ("whether the child needs to look at the paragraph repeatedly when copying from the blackboard") was not easy for them to

rate. The children were not sure what was considered “repeatedly” and what was considered “not repeatedly” in comparison with other children’s performance. After examination of this item’s clarity with 10 additional children who indicated no problem understanding the item, we decided to retain the original wording. Children’s mean satisfaction rating for the questionnaire was 8.9, and all the children completed it very quickly, in <5 min.

Phase 2

Once the final version of the HPSQ–C was determined, we investigated its internal reliability, interrater reliability, and test–retest reliability, as well as concurrent and construct validity, using a full-length handwriting process and product tests.

Participants

Included in this study were 230 children recruited as a convenience sample from regular public schools located in four different types of municipality in northern Israel (large town, small town, kibbutz, and community village). As shown in Table 1, the children were in second through eighth grade and ranged in age from 7 to 14 yr (mean [*M*] = 10.11, standard deviation [*SD*] = 1.9). Participants had no documented developmental delays and no neurological or physical impairments.

All participants were Israeli-born White Jews of either Ashkenazi or Sephardic origin and used Hebrew as their primary means of verbal and written communication. Boys constituted 54% of the children. Most participants were right handed (91%). (For more details about the sample, see Rosenblum, 2008.)

Instruments

Computerized Penmanship Evaluation Tool. The Computerized Penmanship Evaluation Tool (ComPET; Rosenblum et al., 2003a), previously called the Penmanship Objective Evaluation Tool, is a standardized and validated handwriting assessment using a digitizing tablet and online data collection

and analysis software. It was developed to collect objective measures of the handwriting process (see Rosenblum et al., 2003a, for more details). In this study, a paragraph copying task was performed on A4-sized lined paper affixed to the surface of a Wacom Intuos2 x-y digitizing tablet (404 mm × 306 mm × 10 mm; Wacom Technology Corporation, Vancouver, WA) using a wireless electronic pen with a pressure-sensitive tip (Model GP-110). Displacement, pressure, and pen-tip angle were sampled at 100 Hz via a 1300-MHz Pentium® M laptop computer (Intel Corporation, Santa Clara, CA).

The ComPET system enables dynamic handwriting evaluation while analyzing temporal, spatial, and pressure measures for each writing stroke. The stroke is the sequential written line from the point at which the pen touches the paper (applying pressure of more than 50 nonscaled units as measured on a range of 0–1,024) until the point at which it leaves the paper.

The temporal measure included the mean time taken to write each stroke in seconds. The spatial measure included width and height of mean strokes and total path length on the paper (in centimeters). In addition, the ComPET computes the mean pressure applied to the paper over the entire task, as measured in nonscaled units from 0 to 1,024, the pressure standard deviation, and the mean writing velocity (in centimeters per second). Previous studies established the ComPET’s discriminant validity with a control group and children with dysgraphia (e.g., Rosenblum et al., 2003a), attention deficit hyperactivity disorder (Rosenblum et al., 2008), and developmental coordination disorder (Rosenblum & Livneh-Zirinski, 2008).

Hebrew Handwriting Evaluation. The Hebrew Handwriting Evaluation (HHE; Erez & Parush, 1999) was used to examine the handwriting product, assessing legibility through both global and analytic measures. It contains a standardized paragraph for assessing writing performance through a copying mode, which we used in this study for both product and process evaluation. The text contains all the letters of the Hebrew alphabet, including 30 words and 107 letters (Erez & Parush, 1999). The HHE’s reliability and validity have previously been established (Dvash, Levi, Traub, & Shapiro, 1995). All 230 handwriting products were analyzed by the same evaluator, who was certified in HHE administration and was blinded to the group membership of each child.

Although the HHE was developed to evaluate handwriting products of school-age children, norms as yet exist only for children ages 8–10. Despite this limitation, we used the tool’s criteria for all age groups in this study because of the absence of any other standardized assessment tool for Hebrew handwriting.

Table 1. Distribution of Participants, by Grade

Grade	Total	Boys	Girls
Second	26	16	10
Third	30	18	12
Fourth	36	20	16
Fifth	39	20	19
Sixth	33	16	17
Seventh	33	19	14
Eighth	33	16	17
Total	230	125	105

The outcome measures of the written product of the HHE assessment included global legibility (scored on a 4-point Likert scale ranging from *most legible* [1] to *least legible* [4]), which refers to the overall clarity of the handwriting. Number of letters written in the 1st minute was also recorded.

In addition, the analytic measurement of legibility used in the HHE examined the following three component variables: (1) the number of letters erased or written over; (2) the total number of letters that were unrecognizable because of the quality of letter closure, rounding of letters, or letter reversals; and (3) spatial arrangement of the written text, including vertical alignment of letters on the line, spacing of words and letters, and letter size. The minimum score for spatial arrangement was 6 (*best performance*), and the maximum was 24 (*worst performance*). On all four HHE outcome measures, a low score indicates good performance and a high score indicates poor performance.

Procedure

The study was designed on the basis of University of Haifa Ethical Committee instructions. Approval was obtained from the Israeli Ministry of Education's institutional review board. After the children's parents signed an informed consent form, their teachers were asked to complete the HPSQ for each of their students. All children were then asked to complete the HPSQ-C. The children were unaware of the HPSQ scores given by the teacher. The children were then tested with the CompET (Rosenblum et al., 2003a) while performing a paragraph-copying task that was selected to represent a typical handwriting task required of children. The copying task was presented visually on the screen in Hebrew in 20-point Guttman Yad-Brush. The same evaluator carried out all computerized data collection sessions with the children under similar environmental conditions. In the third phase, we anonymously evaluated the children's handwriting product according to the HHE criteria (Erez & Parush, 1999).

Data Analysis

Descriptive statistics were used to describe the study participants and main variables. Cronbach's α coefficient was used to examine the HPSQ-C final score as well as the internal consistency scores of the three categories (performance time, legibility, and quality of life). Paired t tests were conducted to compare the teacher's (HPSQ) and the child's (HPSQ-C) scores. Spearman rank order correlations were computed to analyze the correlations between the HPSQ-C and HPSQ scores to check the HPSQ-C's concurrent validity. Mann-Whitney U tests were used to

establish the HPSQ-C's construct validity with the HHE and CompET measures because the HHE data represented an ordinal scale and because both HHE scores and CompET scores did not follow a normal distribution. Finally, a principal-components factor analysis was conducted to test the hypothesis that the construct of handwriting deficiency might be multidimensional in terms of its significance with respect to the three factors delineated previously (i.e., legibility, time and speed of performance, and physical and emotional well-being).

Results

Internal Consistency

The α reliability of the 10-item scale was .77, indicating moderate reliability. Scale reliability was not improved by deleting any of the 10 items.

Concurrent Validity

The means and standard deviations of the children's HPSQ-C scores and their teachers' HPSQ scores for each grade and for the entire sample are presented in Table 2. As a whole, children rated their handwriting performance as less proficient than did their teachers. The mean final HPSQ-C score for the entire sample was 11.73 ($SD = 5.93$), whereas the mean final HPSQ score was 5.89 ($SD = 6.53$). This tendency was similar in all grades, as shown in Table 2.

We found a significant moderate correlation between the HPSQ-C and HPSQ final scores ($r = .51, p < .001$) for the entire sample. When analyzing the correlations between the HPSQ and HPSQ-C scores for each grade, we found significant correlations ($r = .41-.63, p < .01$) only for second through fifth graders, and we found no significant correlations for the sixth through eighth graders.

Construct Validity

To examine construct validity, we divided the study participants into two groups on the basis of their HPSQ-C scores. With respect to the 230 participants making up the entire study sample, the mean total score on the HPSQ-C was 11.73 ($SD = 5.93$), with scores ranging from 0 to 32. With respect to the overall distribution of the participants' total scores, 75% scored between 0 and 15. Of these children, the lower 10% scored between 0 and 5, and the lower 25% scored between 0 and 7.6. The upper 25% scored >15 . Of these children, 10% scored ≥ 20 .

On the basis of these findings, we divided the participants into two groups: Group 1 consisted of children

Table 2. Means and Standard Deviations for the HPSQ and the HPSQ-C Final Scores for Each Grade

Grade	HPSQ Final Score, <i>M (SD)</i>	HPSQ-C Final Score, <i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>p</i>
Second (<i>n</i> = 26)	8.04 (7.17)	13.04 (6.47)	3.76	25	.001
Third (<i>n</i> = 30)	7.85 (7.68)	10.11 (6.77)	1.59	29	<i>ns</i>
Fourth (<i>n</i> = 36)	4.88 (7.09)	12.47 (6.47)	7.05	35	<.0001
Fifth (<i>n</i> = 39)	5.48 (6.86)	11.07 (5.54)	5.11	38	<.0001
Sixth (<i>n</i> = 33)	5.31 (5.60)	11.75 (6.20)	4.87	32	<.0001
Seventh (<i>n</i> = 33)	6.21 (5.36)	12.77 (5.20)	5.79	32	<.0001
Eighth (<i>n</i> = 33)	4.45 (5.47)	11.50 (4.65)	6.53	32	<.0001
Total (<i>N</i> = 230)	5.87 (6.51)	11.26 (5.76)	13.29	226	<.0001

Note. HPSQ = Handwriting Proficiency Screening Questionnaire; HPSQ-C = HPSQ for Children; *M* = mean; *ns* = not significant; *SD* = standard deviation.

who achieved a score of 0–18 ($M + 1 SD$; proficient handwriting), and Group 2 included those who achieved a score of ≥ 19 (nonproficient handwriting). On examination, we found that 84% ($n = 194$) of the participants were included in the proficient handwriting group (Group 1) and 16% ($n = 36$) were included in the nonproficient handwriting group (Group 2), based on their self-rating. Table 3 shows the means and standard deviations of the HPSQ final scores and the HHE and CompPET scores for these two groups.

The Mann–Whitney U test revealed significant differences between the two groups' HPSQ final scores, such that the participants in Group 2 scored significantly higher (i.e., performed consistently worse) than those in Group 1 ($U = 1,380, p < .001$).

We saw a similar trend when comparing both groups' main HHE handwriting product scores. We found significant between-group differences for three of the five measures. The children in Group 2 wrote less legibly ($U = 2,164, p = .005$), managed to write fewer letters in the 1st minute ($U = 1,639, p < .001$), and had more unrecognizable letters ($U = 2,261, p = .02$).

We also found significant differences between groups on part of the CompPET. Group 2 invested significantly more time for each stroke ($U = 1,253, p = .024$), and their strokes were significantly higher and longer than those of Group 1 (Group 1, $U = 1,162, p = .008$; Group 2, $U = 1,294, p = .037$). The standard deviation of the pressure Group 2 applied to the paper was significantly higher than that of Group 1 ($U = 1,117, p = .005$).

Finally, the principal-components factor analysis yielded results similar to those found previously for the HPSQ. We initially extracted only two factors with eigenvalues equal to or greater than 1.00. Orthogonal rotation of the factors yielded the factor structure presented in Table 4. The first factor includes Items 3 and 5–9 (performance time and well-being) and accounted for 33% of the variance. The second factor includes Items 1, 2, 4, and 10 (legibility) and accounted for 12% of the variance. Thus, the two factors together explain

45% of the variance. The reliabilities for those two factors are as follows: for performance time and well-being (six items), $\alpha = .74$; for legibility (four items), $\alpha = .56$.

Discussion

HPSQ-C as a Self-Report Scale for Children

In light of the emerging perceptions concerning the importance of children's self-reporting (Engel-Yeger, Nagauker-Yanuv, & Rosenblum, 2009; Taylor, 2000), the aim of this study was to develop a practical questionnaire to enable school-age children to express their feelings about their handwriting performance. Although the HPSQ-C is still being researched, this study's results showed it to be reliable and valid and indicated that the tool's items successfully reflect the overall constellation of handwriting problems in children. Specifically, the HPSQ-C's internal reliability was found to be .77, an acceptable value in light of the reliability values found for most full-length in-depth handwriting assessments (see Rosenblum et al., 2003b, for more details).

Interestingly, the children as a whole evaluated their handwriting as less proficient than did their teachers (HPSQ-C, $M = 11.73, SD = 5.93$; HPSQ, $M = 5.89, SD = 6.53$). However, we found a significant moderate correlation between the HPSQ-C and the HPSQ ($r = .51, p < .001$). Indeed, previous studies revealed disparities in the way in which children evaluate themselves and how teachers or parents evaluate them (e.g., Bouman, Koot, Van Gils, & Verhulst, 1999; Petersson et al., 2013; Sturgess & Ziviani, 1996). Begly (2000) indicated that adults provide an opinion about how they think a child feels. This opinion may unwittingly be contaminated by the adult's view of how the child should feel, which is probably more congruent with how the adult would feel in a similar situation (Fram et al., 2012).

When focusing on each grade, significant correlations between the children's and the teacher's scores were found

Table 3. HPSQ, HHE, and CompPET Outcome Measures for Proficient and Nonproficient Groups

Measure	Proficient Group (<i>n</i> = 194), <i>M</i> (<i>SD</i>)	Nonproficient Group (<i>n</i> = 36), <i>M</i> (<i>SD</i>)
HPSQ (0 = lowest score, 32 = highest score)	4.84 (5.34)	12.61 (9.08)
HHE outcome measures		
Global legibility (1 = most legible, 4 = least legible)	1.58 (0.77)	2.06 (0.96)
No. of letters written in the 1st min	63.75 (20.21)	46.51 (19.41)
No. of letters erased and/or overwritten	4.15 (3.85)	4.70 (5.01)
No. of unrecognizable letters	3.31 (7.82)	4.61 (4.27)
Spatial arrangement (6 = best performance, 24 = worst performance)	7.18 (1.84)	7.25 (1.56)
CompPET outcome measures		
Time per stroke, s	0.44 (0.23)	0.56 (0.30)
Stroke height, cm	0.26 (0.08)	0.31 (0.09)
Stroke width, cm	0.17 (0.04)	0.18 (0.04)
Stroke length, cm	0.54 (0.16)	0.61 (0.17)
Mean pressure, 0–1,024 nonscaled units	723.78 (126.63)	708.57 (83.86)
Velocity, cm/s	2.69 (0.68)	2.66 (0.72)

Note. The proficient group scored 0–18 on the HPSQ–C, and the nonproficient group scored ≥ 19 . CompPET = Computerized Penmanship Evaluation Tool; HHE = Hebrew Handwriting Evaluation; HPSQ = Handwriting Proficiency Screening Questionnaire; HPSQ–C = HPSQ for Children; *M* = mean; *SD* = standard deviation.

only for second through fifth graders but not for sixth through eighth graders. This finding requires further investigation to discover the cause. Two possible reasons can be suggested. First, teachers of higher grades may be less familiar with their students' handwriting features and assume that the handwriting production skill has already been acquired. Another explanation could relate to the children's age (10–13 yr). Adolescents may feel embarrassed to report on their handwriting deficiency, resulting in a report that possibly does not reflect their true performance deficits. Therefore, at this stage, the HPSQ–C's concurrent validity was established only for children in the second through fifth grades.

On the basis of the HPSQ–C, 16% of the entire sample was defined as dealing with handwriting deficiencies. This prevalence is in accordance with previous reports that 10%–30% of school-age children confront handwriting difficulties (Kushki et al., 2011; Ratzon, Efraim, & Bart,

2007; Smits-Engelsman, Niemeijer, & van Galen, 2001; Smits-Engelsman, van Galen, & Michels, 1995).

Reliability and Validity of the HPSQ–C

The results for construct validity indicate reasonable distribution into groups of proficient and nonproficient handwriters on the basis of HPSQ–C scores. We found significant differences between the groups in HPSQ scores, meaning that the teacher indeed evaluated handwriting performance of the children in both groups as different in relation to product legibility, performance time, and well-being. Moreover, we found significant differences between groups on the HHE (Erez & Parush, 1999). Children in the nonproficient group, as determined by the HPSQ–C, wrote significantly less legibly, produced fewer letters in the 1st minute, and had significantly more unrecognizable letters in their handwriting product.

Further support for reasonable differentiation found by the HPSQ–C arose from the CompPET (Rosenblum et al., 2003a) of both groups' writing process. Children in the nonproficient group required significantly more time per writing stroke, and their strokes were significantly higher and longer than those of the children in the proficient group.

From a developmental point of view, as children grow their letter size decreases (Puranik, Petscher, & Lonigan, 2013). This decrease manifests the development of good motor control in the distal areas of the hand and wrist, enabling the performance of smaller movements (Accardo, Genna, & Borean, 2013). Yet deficits in manual function may cause deterioration in the control of finger pinch (finger pinch strength and steady precision finger pinch

Table 4. Orthogonal Factor Loading Matrix for the 10 HPSQ–C Items

No. and Item	Factor 1	Factor 2
1. Illegible handwriting		0.71
2. Unsuccessful in reading his or her own handwriting		0.72
3. Not enough time to copy	0.71	
4. Often erases		0.50
5. Does not want to write	0.75	
6. Does not do homework	0.67	
7. Complains of pain	0.54	
8. Tired while writing	0.62	
9. Needs to look repeatedly when copying	0.50	
10. Not satisfied with his or her handwriting		0.67

Note. HPSQ–C = Handwriting Proficiency Screening Questionnaire for Children.

posture; Ranganathan, Siemionow, Sahgal, Liu, & Yue, 2001), and these changes may lead to an increase in letter size, as found in this study with the nonproficient group.

Hence, the results support the benefits of the HPSQ-C in screening for handwriting legibility and performance time, which are both considered significant measures with respect to handwriting evaluation (Graham, Weintraub, & Berninger, 1998; Karlsdottir & Stefansson, 2002; Wallen, Duff, Goyen, & Froude, 2013). Specifically, the results obtained via the questionnaire correlated well with the HHE measures of handwriting legibility and with handwriting performance time, as determined with the CompET. These findings indicate that the HPSQ-C has good construct validity.

The results of the principal-components factor analysis were in accordance with our previous findings for the HPSQ. Internal consistency was found to be sufficient (.77). Although this value may indicate that the questionnaire contains several consistent dimensions that inflate the reliability estimate, results revealed two main factors. Specifically, performance time and physical and emotional well-being, which appeared in the HPSQ as two separate factors, were found to reflect one factor ($\alpha = .74$), and legibility appeared as a second, separate factor ($\alpha = .56$).

This finding is of interest and may indicate that from both the children's and the teacher's point of view, children who are unsuccessful in fulfilling time requirements in class experience a greater lack of physical and emotional well-being than children with illegible handwriting products. Research is required to examine this issue in greater depth.

Future Academic and Clinical Use

The HPSQ-C is a first step toward receiving information from the child's point of view that might identify his or her handwriting deficiency. The results of this study revealed that the HPSQ-C had sufficient internal consistency and good ecological, concurrent, and construct validity. Hence, the tool may be used as a standardized tool among school-age children. This is meaningful in light of Hammerschmidt and Sudsawad's (2004) findings that the majority of teachers included in their study (72.7% of 314 teachers) reported that they graded students' handwriting on the basis of their subjective judgment of the students' handwriting quality (i.e., legibility, neatness, writing between the lines) rather than on the basis of a standardized handwriting test. Thus, the advantage of the HPSQ-C lies in its ability to provide a format to enable teachers to gather this important information from the child while using a standardized tool in the natural

classroom environment. This feature seems to support the tool's ecological validity.

With respect to potential clinical applications, recommendations are to use the HPSQ and the HPSQ-C concurrently. Possible individual differences between the child's and the teacher's perception may serve as a good starting point for dialogue concerning the child's handwriting deficiency. An interview with the child, based on the questionnaire's results, may enable the teacher or occupational therapist to hear the child's perspective on his or her handwriting status. In this manner, children can be helped to understand their difficulties, why their handwriting needs improvement, and what the education system can provide for them, and it can lead to focused intervention.

This study has two main limitations. First, the sample was a convenience sample, and second, the HPSQ-C's reliability and validity process has been established only for the Hebrew version, although a validated translation of the scale to English was conducted.

In sum, the HPSQ-C enables identification of handwriting deficiency and is appropriate for varied academic and clinical uses. Further studies with larger samples of varied ages and in different languages are required to further support the questionnaire's reliability and validity.

Implications for Occupational Therapy Practice

This study's findings suggest several important implications for occupational therapy practice and research:

- The HPSQ-C is a quick and practical tool to be used by occupational therapists to identify children with self-reported handwriting difficulties.
- The HPSQ-C may serve as a tool for raising children's awareness concerning daily confrontations with handwriting difficulties as well as for creating a dialogue with the occupational therapist about those difficulties.
- Early identification of children with handwriting difficulties, focusing on the difficulties' characteristics (time, legibility, well-being), may prevent further emotional and academic consequences and lead to focused intervention. ▲

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