A Shortened Version of the Children's Voice Questionnaire (CVQ-10): Development and Validation

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SUMMARY: OBJECTIVE. This study introduces a new 10-item, self-administered children's voice questionnaire (CVQ-10), designed to quantify children's voice handicap and assess its validity and reliability.

Study design. Observational, prospective, cross-sectional study.

Methods. The 10 items that comprise the new CVQ-10 were extracted from the full CVQ. The selected items were chosen based on their Cohen's *d* scores. The new questionnaire was administered to 208 children (80 dysphonic and 128 nondysphonic), aged 6–17 years. In addition, the parents of these children completed the Pediatric Voice Handicap Index (pVHI) and a brief anamnesis questionnaire. Furthermore, after 2 weeks, a subset of 30 randomly selected children (15 dysphonic and 15 nondysphonic) completed the CVQ-10 again, to examine test-retest reliability. At that time, another subset of 30 children was randomly selected to complete the full CVQ questionnaire to evaluate validity.

Results. The CVQ-10 demonstrated high reliability (Cronbach's $\alpha = 0.94$). Test-retest reliability yielded a Pearson correlation coefficient of $r = 0.91$ ($P < 0.001$). A highly significant group difference was found between the dysphonic and nondysphonic groups of children ($t[206] = 17.00$, $P < 0.001$), with a calculated cutoff of nine points. A significant positive correlation was found between children's subjective self-evaluation on the CVQ-10 and their parents' responses on the pVHI questionnaire ($r = 0.766$, $P < 0.001$).

Conclusions. The CVQ-10 is shown to be a valid and reliable instrument. Data confirms its single factor contract. This demonstrates that children are capable of providing a reliable and consistent description of their subjective voice handicap. The CVQ-10 differentiates dysphonic from nondysphonic children and can serve as a brief and easy to-use instrument for evaluating dysphonic children in clinical and research settings.

Key Words: Dysphonia–Pediatric–Children–Voice handicap–Self-assessment.

INTRODUCTION

Voice disorders are a common phenomenon in children. Previous studies have reported a wide range of prevalence rates among children, extending from 2% to 53%.[1–4] A recent systematic review and meta-analysis of a large body of studies in the field concluded that, in general, the prevalence of voice disorders in children is approximately 19%.[5] Yet, that review has also demonstrated that different methodologies yielded different prevalence estimates. For example, the prevalence of *perceived dysphonia* in children was estimated at 15%, while the prevalence of *laryngeal pathologies* was estimated as high as 29%. In comparison, the prevalence of *self-reported dysphonia* in children was estimated at 10%.

As in adults, pediatric voice disorders can have a negative impact on social, educational, and overall personal capabilities.[6,7] Research has shown that listeners evaluate dysphonic children negatively, compared to nondysphonic children.[8] Furthermore, in contrast to the common misconception that dysphonic children are unaware or indifferent to their dysphonia,[9] data show that children and teenagers with dysphonia often show heightened awareness and are genuinely concerned about their voices.[10,11]

Self-assessment voice questionnaires are intended to capture how dysphonic people perceive their voice handicap, and are now accepted as an integral component in the multidimensional evaluation of voice disorders.[12] However, while many self-assessment questionnaires for evaluating voice handicap are available for dysphonic adults, only a few attempts were made to present such questionnaires to children. Since children are traditionally considered less reliable than adults in providing medical information, several attempts have been made to develop questionnaires in which *parents* report on their perception of their dysphonic child. Such questionnaires include, for example, the pVHI,[13] which consists of 23 items intended to assess the physical, functional, and emotional aspects of the child's voice handicap. The Pediatric Voice Outcome Survey (pVOS)[14] used a similar approach, consisting of 10 items and covering two domains: physical-functional and social-emotional. The Pediatric Voice Symptom Questionnaire (pVSQ)[15] is another example. It consists of 15 items that aim to evaluate the frequency and impact of dysphonia on the child. Noteworthy is another questionnaire, which has attempted to modify and adapt the

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commonly used Voice Handicap Index (VHI)[16] into an alternative version suitable for children. The Children's Voice Handicap Index (CVHI-10)[17] consists of 10 items extracted from the original VHI and slightly modified for use by children. Admittedly, while it is an adaptation of the original VHI, this instrument should be credited for being the first attempt to present a questionnaire intended for dysphonic children, rather than their parents.

Acknowledging the need for a valid voice handicap questionnaire for children and recognizing the methodological constraints and limitations of the few available instruments, a new questionnaire was recently developed and presented. The CVQ[11] consists of 18 items divided into three domains: physical, functional, and emotional. It was developed using a meticulous procedure in which groups of dysphonic children, parents, teachers, and voice clinicians were initially interviewed. The responses from these interviews were arranged into a list of 175 items. This exhaustive list was systematically reduced to 18 items to construct the final version of the CVQ. After administering the CVQ to 342 dysphonic and nondysphonic children, it was shown to be valid, reliable, and consistent. Data demonstrated that the CVQ reliably differentiates between dysphonic and nondysphonic children. Results also confirmed that responses on the questionnaire were not affected by the children's age and gender.

Yet, while the CVQ demonstrates significant advantages both methodologically and clinically, it has a fundamental constraint that remains unaddressed. Specifically, the CVQ was initially designed to capture three domains of the children's voice handicap (i.e, physical, functional, and emotional), similarly to the VHI and other instruments. Nonetheless, data have shown that the children's scores on the CVQ converged into a single factor. This was interpreted as indicating that children subjectively perceive their voice handicap as a unified, holistic experience and do not differentiate among the three theoretical domains evident in several of the adult questionnaires.[13,16]

Because the original CVQ was shown to consist of a single factor, the present study was intended to examine whether reducing its item count from 18 would yield a comparable version of the questionnaire while improving simplicity and efficiency. Moreover, it was also noted that previous studies have shown that even well-established instruments, such as the VHI,[16] do not consistently maintain their 'theoretical' three-factor structure across different follow-up studies and translations into other languages.[18–22] Therefore, simplifying and shortening the new questionnaire was warranted. This study was conducted to develop a shortened version of the CVQ and to examine its validity and reliability.

MATERIALS AND METHODS

Instrument development

The shortened version of the CVQ was derived from the original 18-item CVQ.[11] 10 items of the CVQ were selected for inclusion in the shortened version, which demonstrated the highest values of Cohen's *d* for comparison between dysphonic and nondysphonic children (i.e, group discrimination). Table 1 presents the 18 items of the original CVQ, along with their Cohen's *d* scores as previously reported. As shown, the selected 10 items had d scores ranging from 0.67 to 0.98. Moreover, although the CVQ scores did not conform to the intended three-factor design and yielded a single factor, the 10 selected items for the

TABLE 1.
The 18 Items of the Original CVQ,[11] Their Reported Cohen's d Scores, and the Criterion for Inclusion in the Shortened Version of the Questionnaire

Domain	Item	Cohen's *d*	Shortened version
Physical	My throat hurts when I speak	0.747	+
	My throat burns when I speak	0.576	-
	My throat feels scratchy when I speak	0.707	-
	I run out of air when I speak	0.913	+
	My voice breaks when I speak	0.839	+
	My voice runs out on me when I speak	0.752	+
Functional	I participate less in class, because of my voice	0.589	-
	I speak less with other kids, because of my voice	0.518	-
	It is hard to hear me, because my voice is weak	0.753	+
	I strain my voice when speaking	0.721	+
	Other kids notice the problems in my voice	0.671	+
Emotional	I worry because of my voice	0.646	-
	I don't like my voice	0.980	+
	My voice frustrates me	0.742	+
	I am embarrassed because of my voice	0.587	-
	My voice makes me angry	0.578	-
	I wish I had a different voice	0.896	+
	I am ashamed of my voice	0.571	-

shortened version were drawn from all three domains. Specifically, four items originated in the physical domain, three in the functional domain, and three in the emotional domain (see appendices A and B).

Participants

After obtaining approval from our institutional ethics committee (#0008786–3), the study cohort consisted of 208 Hebrew-speaking children aged 6–17 years and one of their parents (158 mothers and 50 fathers). All children reported that they could read, and their parents corroborated this, describing them as fluent readers. Of the children, 80 were identified as having a voice disorder (dysphonic group), while 128 were typically developing children without reported voice issues (nondysphonic group). For the purpose of this study, and in accordance with the procedure used in the original CVQ study, children were defined as 'dysphonic' based on a positive response from the parents to one or both questions: "Does your child have a hoarse voice?" and "Does your child have a voice problem?", as well as a response from the children to one or both questions: "Is your voice hoarse?" or "Do you have a voice problem?".

Participants were recruited from voice clinics, public schools, and online platforms. Before participating, parents signed an informed consent form, and children provided assent. Exclusion criteria for the children included reported hearing loss, known cognitive impairments, prior voice therapy, or difficulties with reading comprehension.

Procedures

After signing the informed consent form, all parents completed a brief anamnesis questionnaire and the Hebrew version of the pVHI.[23] The children completed the assent form, then a brief anamnesis questionnaire, and the shortened questionnaire (CVQ-10) separately from their parents. All forms were completed using an online platform (Google Forms) on a smartphone, computer, or tablet. The average participation time per individual was approximately ten minutes.

A subset of 30 children (15 dysphonic and 15 nondysphonic) was randomly selected and completed the CVQ-10 again 2 weeks later to evaluate test-retest reliability. Another subset of the 30 children was randomly selected and completed the CVQ (original 18-item version) 2 weeks after their initial participation, to evaluate validity. Before completing the CVQ-10 for the second time or completing the full CVQ, we confirmed that none of these children had received any voice therapy or related medical treatment during the period between the two sessions.

Statistical Analysis

Descriptive statistics, principal component analysis (PCA) and receiver operating characteristic (ROC) analysis for computing Youden's index reliability coefficients (Cronbach's alpha and McDonald's), Pearson correlations, and independent samples t tests, were conducted using *SPSS* version 28.[24] Test-retest reliability was evaluated with Pearson correlation coefficients. Concurrent validity was examined through correlations with the full CVQ and the pVHI.

RESULTS

Table 2 presents the age and gender distribution of the participating children.

No significant differences were found for age ($t_{[206]}$ = 0.88, P = 0.633) and gender (χ^2 = 0.79, P = 0.381) between dysphonic and nondysphonic children.

Dimensionality and reliability

A PCA of the CVQ-10 items yielded a first component with an eigenvalue of 6.55 and a second component with an eigenvalue close to unity, 1.15. According to the accepted Cattell's criterion (scree test), this finding supports a unidimensional structure of the CVQ-10. In a one-factor solution, all items were loaded on the single general factor with loadings ranging between 0.78 and 0.87. The scale demonstrated excellent internal consistency across the entire sample, with Cronbach's α = 0.94 and composite reliability, McDonald's ω = 0.94. Test-retest reliability, assessed over a 2-week interval in a subset of 30 children, yielded a Pearson correlation coefficient of r = 0.91 (P < 0.001), demonstrating high temporal stability of the instrument.

Concurrent validity

As the CVQ-10 comprises 10 items, each scoring 0–4, the maximum score is 40. After obtaining the individual score for each child, group means were calculated. An independent samples t test revealed a significant difference in CVQ-10 scores between dysphonic (M = 17.10, SD = 8.37) and nondysphonic children (M = 3.07, SD = 3.36), t[206] = 17.00, P < 0.001, Cohen's d = 2.42). These results indicate that the CVQ-10 discriminates well between dysphonic and nondysphonic children. Table 3 summarizes the results for

TABLE 2.
Age and Gender Distribution of the Participating Children and Their Parents

Group	n	Age range	Mean age (SD)	% Girls (n)	% Women among parents (n)
Dysphonic	80	7-17	13.33 (3.47)	45.0 (36)	72.5 (58)
Nondysphonic	128	6–17	12.94 (3.25)	52.3 (67)	78.1 (100)
All	208	6–17	11.74 (3.19)	49.5 (103)	76.0 (158)

TABLE 3.
Mean Values, Standard Deviations (SD), *t* Values, and Cohen's *d* Obtained for the Two Groups for all CVQ-10 Items

Item	Group	Mean	SD	*t*	Cohen's *d*
My throat hurts when I speak	Nondysphonic	0.30	0.49	11.53*	1.64
	Dysphonic	1.64	1.16		
I run out of air when I speak	Nondysphonic	0.29	0.54	11.93*	1.70
	Dysphonic	1.57	1.02		
My voice breaks when I speak	Nondysphonic	0.24	0.51	10.80*	1.54
	Dysphonic	1.50	1.15		
My voice runs out on me when I speak	Nondysphonic	0.18	0.41	13.29*	1.89
	Dysphonic	1.61	1.11		
It is hard to hear me, because my voice is weak	Nondysphonic	0.27	0.57	12.98*	1.85
	Dysphonic	1.82	1.15		
I strain my voice when speaking	Nondysphonic	0.17	0.44	16.34*	2.33
	Dysphonic	2.05	1.18		
Other kids notice the problems in my voice	Nondysphonic	0.07	0.26	13.70*	1.95
	Dysphonic	1.54	1.17		
I don't like my voice	Nondysphonic	0.57	0.91	8.89*	1.27
	Dysphonic	1.94	1.31		
My voice frustrates me	Nondysphonic	0.28	0.70	8.93*	1.27
	Dysphonic	1.45	1.19		
I wish I had a different voice	Nondysphonic	0.70	0.95	8.19*	1.17
	Dysphonic	2.02	1.39		

*$P < 0.001$.

both groups on all items of the CVQ-10, with the results of the independent samples *t* tests for each item. As shown, significant group differences were observed across all items, supporting the CVQ-10's concurrent validity.

Pearson correlation analyses revealed a nearly perfect correlation between CVQ-10 and the original CVQ total scores ($r = 0.99$, $P < 0.001$), confirming that the new shortened version captures the same construct as the full version. In addition, the CVQ-10 total score correlated moderately strongly with the total pVHI score reported by parents ($r = 0.77$, $P < 0.001$), further supporting the new instrument's external validity.

Group Differences

While minor numerical differences in CVQ-10 scores were observed between boys and girls and across age groups, no significant age- or gender-related differences were found. Specifically, a two-way ANOVA was conducted, with CVQ-10 scores as the dependent variable and age group and Gender as the independent variables. Results indicated no significant main effect for age group ($F[11, 204] = 0.03$, $P = 0.858$) and gender ($F[1204] = 0.010$, $P = 0.989$). In addition, no significant age group X gender interaction was found ($F[1204] = 0.89$, $P = 0.347$).

Cutoff points

ROC analysis revealed a bimodal distribution of Youden's index, yielding two candidate cutoff points. A cutoff of five yielded a sensitivity of 0.99 and specificity of 0.80 ($J = 0.78$), indicating that nearly all dysphonic children scored above this threshold, though at the cost of a higher false-positive rate. A cutoff of nine produced a marginally higher Youden's index ($J = 0.80$), with sensitivity of 0.86 and specificity of 0.94, reflecting a more conservative threshold that substantially reduces false positives while retaining good sensitivity.

DISCUSSION

The primary goal of this study was to develop and validate a shortened version of the CVQ.[11] The motivation was twofold. First, we were driven by the scarcity of voice handicap assessment questionnaires for children. As noted above, while numerous questionnaires for dysphonic adults were developed and adapted to many languages, very few such attempts have been made for dysphonic children. Second, the full 18-item CVQ was initially intended to capture three domains of the children's voice handicap (physical, functional and emotional), like other available questionnaires designed for adults. However, data revealed that children's responses do not support a three-factor design. Instead, children reported their subjective perception of voice handicap similarly across all three domains, yielding a single, holistic factor. Therefore, in the current study, we were interested in whether a shortened version of the questionnaire could provide equivalent representation of this single factor with fewer items.

Our results demonstrated that children's responses on the CVQ-10 converged into a single factor. This finding is of special interest because the items comprising the shortened version represent the three theoretical domains (physical, functional and emotional) typically included in voice handicap questionnaires designed for adults. Yet, although the new questionnaire was carefully designed to

cover the three domains, the children responded similarly to items across all domains. This result is reminiscent of that obtained for the full-length CVQ,[11] and confirms that children perceive their subjective voice handicap holistically, and do not differentiate among the three theoretical domains. This single factor construct also supports the rationale for shortening the questionnaire to its current 10-item format.

The CVQ-10 demonstrated strong reliability and strong temporal stability. Beyond the fact that these results support its theoretical and clinical merit, it also demonstrates that children can reliably and consistently report on their subjective experience and voice handicap. This finding is of special importance to clinicians who treat dysphonic children. Dysphonic children are often thought to be unconcerned about their voice and, therefore, low motivated to actively participate in voice therapy.[9,10,25] However, our findings show that children are well aware of their voices and, given the appropriate setting, reliably and consistently report their concerns and subjective experiences. In other words, the common misconception that children are not concerned about their voices may result from the way that the question is presented to them, rather than from their true attitude toward their dysphonia. Therefore, incorporating the questionnaire into the initial evaluation or into the follow-up process may help children disclose specific aspects of their voice problem and provide an opportunity for an open discussion between the clinician and the child. In our clinical experience, while administering the questionnaire, we have encountered many cases in which, after completing it, the children themselves initiated a discussion with the clinician, sharing their views of their own voices, personal anecdotes about other children's reactions to their voice, and related personal experiences.

Results demonstrated that the CVQ-10 reliably differentiated between dysphonic and nondysphonic children. Specifically, the dysphonic group had a mean score of 17.10, while the nondysphonic group had a mean score of 3.07, yielding a difference of approximately 14 points. The statistical analysis yielded two alternative cutoff points: five and nine. Although both thresholds demonstrate strong diagnostic utility, the cutoff of nine is recommended as the primary criterion, as it achieves the highest overall discrimination and markedly superior specificity. Nevertheless, in contexts where missing a dysphonic child carries greater clinical cost than a false referral, such as initial broad screening, the lower cutoff of five may be preferable given its near-perfect sensitivity (0.99). Still, while cutoff points are commonly reported for voice handicap questionnaires,[26] it should be noted that such questionnaires are not meant to differentiate between dysphonic and healthy speakers. Instead, voice handicap questionnaires are designed to capture and quantify the subjective experience as perceived by the speakers themselves. Therefore, patients with noticeable, and even severe, voice disorders who are not concerned about their voices might score low on a voice handicap questionnaire. Alternatively, a person whose voice is judged as normal by listeners may be highly concerned about it due to various occupational, cultural or personal factors.[27–30] Because of that, voice handicap questionnaires indeed provide invaluable insight into the speaker's subjective experience, as an essential part of the holistic and multidimensional evaluation of voice disorders. However, using them in isolation, as a means to differentiate between dysphonic and normophonic speakers, could lead to erroneous conclusions and should be conducted with caution.

As noted, the correlation between the children's CVQ-10 scores and their parents' pVHI scores ($r = 0.77$, $P < .001$) supports the validity of the new children's questionnaire. Yet, while the children's and the parents' responses are strongly related, they are not interchangeable. In other words, the children's responses provide additional valuable information beyond what their parents provide. This may be applied in clinical settings to promote an open discussion with children and their parents about the impact of the voice disorder on the children's quality of life, daily activities and communication. Beyond its diagnostic value, such mutual discussion may promote children's participation and involvement in the therapeutic process, thereby increasing their engagement and motivation.

Finally, administering the CVQ-10 requires basic reading capabilities. Therefore, a possible future direction could be to examine the possibility of a combined written and audio-recorded version of the questionnaire. This way, a child who has difficulty reading the statements can choose to listen to the recordings before responding. Clearly, such a modification of the administration format should be tested and evaluated against the written version before it is applied in clinical practice.

CONCLUSION

The CVQ-10 is a reliable and valid instrument for quantifying how children perceive their dysphonia. In addition, the CVQ-10 is brief and easy to complete, intended for children aged 6–17 to complete themselves. Furthermore, as it was originally developed in Hebrew, we also provide an English version, translated and adapted from the original, to facilitate its future assimilation in clinical and research settings among speakers of other languages.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

The Children's Voice Questionnaire (CVQ) – (Hebrew version)

הוראות: עבור כל משפט, הקיפו בעיגול את התשובה המתארת עד כמה המשפט נכון.

תמיד	לעיתים קרובות	לפעמים	לעיתים רחוקות	אף פעם		
4	3	2	1	0	כואב לי בגרון כשאני מדבר	1.
4	3	2	1	0	נגמר לי האוויר כשאני מדבר	2.
4	3	2	1	0	הקול שלי נשבר כשאני מדבר	3.
4	3	2	1	0	הקול נגמר לי באמצע הדיבור	4.
4	3	2	1	0	קשה לשמוע אותי, בגלל שהקול שלי חלש	5.
4	3	2	1	0	אני צריך להתאמץ לדבר, בגלל הקול שלי	6.
4	3	2	1	0	ילדים אחרים שמים לב לבעיית הקול שלי	7.
4	3	2	1	0	אני לא אוהב את הקול שלי	8.
4	3	2	1	0	הקול שלי מתסכל אותי	9.
4	3	2	1	0	הייתי רוצה שיהיה לי קול אחר	10.

APPENDIX B

The shortened Children's Voice Questionnaire (CVQ-10) – (English version)*

		Never	Almost never	Sometimes	Almost always	Always
1.	My throat hurts when I speak	0	1	2	3	4
2.	I run out of air when I speak	0	1	2	3	4
3.	My voice breaks when I speak	0	1	2	3	4
4.	My voice runs out on me when I speak	0	1	2	3	4
5.	It is hard to hear me, because my voice is weak	0	1	2	3	4
6.	I strain my voice when speaking	0	1	2	3	4
7.	Other kids notice the problems in my voice	0	1	2	3	4
8.	I don't like my voice	0	1	2	3	4
9.	My voice frustrates me	0	1	2	3	4
10.	I wish I had a different voice	0	1	2	3	4

Instructions: Circle the response that best describes how often you experience the following

* The English version of the CVQ-10 was extracted from the full 18-item English version of the CVQ. The translation and adaptation of the questionnaire items from Hebrew to English were described previously.[11] In essence, a standard two-way translation procedure was applied. Specifically, three native English speakers, who are also fluent readers and writers of Hebrew, independently translated the original Hebrew version into English. The resulting three translations were then translated back into Hebrew by three native Hebrew speakers who are also fluent English speakers and readers. Then, the final English version, presented here, consists of the items that were translated back and forth most accurately.

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