

EASE-NL: Cross-Cultural Adaptation and Validation of the Dutch Version of the Evaluation of Ability to Sing Easily

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Summary

Objectives: The Evaluation of the Ability to Sing Easily (EASE) is a self-rating tool that is used to assess the singer's perceptions of the current singing voice status. The purpose of this study was to develop and validate a Dutch translation of the EASE.

Methods: The original version of the EASE was translated and adapted to Dutch according to the recommendations of the Quality of Life Special Interest Group - Translation and Cultural Adaptation group. Subsequently, the questionnaire was individually completed by 70 singers with a mean age of 35.2 years before and after a singing activity, together with a demographic questionnaire and the Dutch Singing Voice Handicap Index 10 (SVHI-10-NL). Two groups of singers were included between September and June 2020: a group of healthy singers (n = 54) and a group of dysphonic singers (n = 16). Internal and external consistency, construct and criterion validity, test-retest and split-half reliability were calculated using Cronbach's alpha coefficients, Student's t-test, the paired Wilcoxon tests and Pearson correlation coefficients. Furthermore, the impact of sex and age and the diagnostic accuracy of the EASE-NL was measured using the Mann Whitney U-test, the One Way ANOVA and the Brown Forsythe ANOVA-test.

Results: The internal consistency of the EASE was considered good. For the external consistency, the Pearson correlation coefficient showed a positive correlation between the total score of the EASE-NL and the SVHI-10-NL. Dysphonic singers scored significantly higher compared to singers without voice problems and no differences were found between the pre and post singing condition in both groups. Pearson correlations coefficients showed a strong positive correlation between the test and retest condition and between the subscales. A ROC-curve analysis showed a cut-off score of 12.5, with a sensitivity level of 75.0% and a specificity level of 74.1%. No differences for sex and age were found.

Conclusions:

The original English version of the EASE was translated and validated in Dutch. The EASE-NL is found to be a valid and reliable self-reported tool to assess singer's perceptions of the current status of their singing voice.

Key Words: Singing voice, EASE, Self-perception, EASE-NL

INTRODUCTION

Singers are considered elite vocal performers in which even a slight vocal difficulty can have serious professional consequences.¹ Singing is associated with complex phonatory maneuvers, and require endurance, flexibility and vocal tract control that exceed the needs of the speaking voice.^{2,3} The demands, training, and the effects of voice use vary between different types of singers.³ Literature suggests that singers are more prone to develop voice problems, no matter their singing style or skills.³ The overall prevalence of self-reported dysphonia in singers is 46.09%.³

In voice assessment, perceptual analysis has become the gold standard.⁴ Self-perception is an indispensable part of voice evaluations since it is the sole method to investigate voice-related quality of life (QoL).⁴ The perception of the singing voice plays an important role, as singers are more likely to notice subtle changes in their voices.⁵ Several self-assessment tools for singers have been developed over the years. The Voice Handicap Index is one of the most frequently used instruments to investigate the psychosocial consequences of a voice problem.⁶ However, the VHI was not sensitive enough to detect voice problems in singers.⁷ Over the years, several adaptations have been made to the original VHI (Jacobson et al., 1997) to meet the needs of the singing voice.⁸ In 2007, Cohen et al. (2007) created the singing Voice Handicap Index (SVHI) to assess the self-perceived handicap associated with singing problems. Later on, a shortened version of the SVHI was developed (SVHI-10)⁹ and translated into many different languages. However, all these instruments are designed to assess the disorder-specific health status of a dysphonic singer^{9, 10, 11} and not for assessing singers who do not experience voice problems themselves. Moreover, these instruments mostly rely on retrospection rather than the current voice status.¹⁰

Due to high vocal demands, singers can experience a range of negative and positive variabilities in vocal function across time and performances.⁵ However, differentiating between symptoms of vocal impairment and transient experiences inherent to the vocal task is difficult.⁵ Phyland et al. (2013) pointed out the need for a tool that is sensitive to detect subtle changes of the singer's voice and developed the Evaluation of Ability to Sing Easily (EASE). The EASE is a self-assessment tool that targets the singer's perception of the current status of their singing voice, and can be used to measure changes in the singing voice as indicators of the effect of vocal load.⁵ Whether the tool can also be used for the prediction or screening of singers at risk of developing voice disorders has not been investigated yet.

The EASE was originally developed in (Australian) English and has been translated and adapted in three other languages: (Brazilian) Portuguese, (Chilean) Spanish and Kannada.^{11, 12, 13} Validation procedures were only performed for the EASE-Br and the EASE-K. An overview of the EASE scores in the different versions is presented in Table 1.

TABLE 1. Overview of the Results of the EASE Translation into Different Languages

Empty Cell	PRI			VF			VC			Total score EASE		
Empty Cell	EASE	EASE-Br	EASE-K	EASE	EASE-Br	EASE-K	EASE	EASE-Br	EASE-K	EASE	EASE-Br	EASE-K
<i>n</i>	270	19	104	272	25	104	281			260	44	104
<i>items</i>	10	10	10	10	10			2			22	
<i>Cut-off score</i>		4.5			4.5			1.5			6.5	
<i>Mean (SD)</i>	13.04 (3.66)	23.70 (17.04)	15.54 (4.90)	17,42 (5.80)	23,02 (14.21)	16,04 (4.44)		4,36 (5.26)			59,09 (33.41)	
<i>Median (IQR)</i>	15 (12, 21)			18 (13, 26)			2 (2, 4)			34 (26, 44)		
<i>Cronbach's alpha</i>	0.89	0.948	0.9	0.91	0.914	0.75		0.914		0.94	0.967	

Abbreviations: IQR, interquartile range; PRI, pathologic risk indicators; SD, standard deviation; VC, vocal concern; VF, vocal fatigue;

The first aim of this study was to develop and validate a Dutch translation of the EASE by measuring internal and external consistency, construct and criterion validity and test-retest and split-half reliability after the translation procedure. The second purpose was to measure the impact of sex and age and to determine the diagnostic accuracy of the EASE-NL.

METHODOLOGY

A prospective cross-sectional research design was used and approved by the Ethics Committee of Ghent University Hospital (registration number: B6702020000306). A written informed consent was signed by each participant.

Participants

In this study, 70 singers with a mean age of 35.2 years (SD: 14.51; range: 18-65 years) were included between September and June 2020. Inclusion criteria were being a singer, having a minimum age of 18 years and having Dutch as mother tongue. Different vocal styles were included: classical, contemporary (pop, jazz, rock) and musical styles. For the degree of professionalism, four degrees were distinguished: professional singers, semi-professional singers, amateurs and singing students at a conservatory. Two groups of singers were included: a group of healthy singers (n = 54) and a group of dysphonic singers (n = 16). The healthy singers without a self-perceived voice problem, were recruited via convenience sampling using e-mail and social media of choirs, conservatories, music academies, and vocal coaches. The dysphonic singers were recruited in the treatment-seeking population of the voice clinic of Ghent University Hospital undergoing a multidimensional logopaedic and laryngological voice assessment.

Procedures

Original EASE

The EASE consists of 20 items of physical descriptors related to perception of sound or feel of the voice.⁵ The items are categorized into two subscales addressing two major issues: vocal fatigue and pathological risk factors. All items are scored on a 5-point Likert scale ranging from “not at all” to “extremely”. Of the 20 items, 17 were negatively worded and three were positively worded. Later on, two additional items labeled Vocal Concern (VC) were included to assess the singers’ overall concern about their vocal health.¹⁰

Translation and cultural adaptation

The first part of the research process was the development and translation of the EASE-NL. The original version of the EASE was translated and adapted according to the recommendations of the Quality of Life Special Interest Group - Translation and Cultural Adaptation group.¹⁴ The following steps were taken during the developmental phase. Firstly, permission to use the original EASE was obtained from the developers.⁵ Secondly, the EASE was translated into Dutch by two independent native speakers of Dutch, one with professional knowledge of English and expertise in the singing voice and one with a Master degree in English linguistics. Both translations were merged by a third, native speaker of Dutch with professional knowledge of English and expertise in the singing voice (Appendix A). This merged version was back-translated into English by a fourth native speaker of Dutch with a Master degree in English linguistics who was not previously involved in the translation

process (Appendix A). A comparison was made between the back-translated English version and the original English version by the last author and this resulted in the final version of the EASE-NL (Appendix A).

Validation procedure

The second part of the research process was the validation of the newly developed EASE-NL. All questionnaires were administered using an online form via Google Forms. In this phase of the study, the Dutch questionnaire EASE-NL was interdependently completed by the voluntary respondents before and after singing. The singing activity consisted of a 1 hour performance, rehearsal or lesson. Prior to completing the EASE-NL, a socio-demographic questionnaire was conducted including questions regarding the medical history, sex, age, vocal styles, genres, level of professionalism, and amount of singing. After the singing activity, a short questionnaire regarding the content of the singing activity was administered.

In 30% of the participants (n = 21, random selection), the questionnaire was conducted a second time after 14 days, to measure *test-retest reliability*. *Split-half reliability* was determined by comparing the results of the subscales of vocal fatigue (VF) and pathologic risk indicators (PRI) before the singing activity. Homogeneity of items was rated by measuring the *internal consistency* of the EASE-NL. All participants completed a second questionnaire, the Dutch version of the singing Voice Handicap Index-10⁹: sVHI-10-NL¹⁵ before the singing activity. The *external consistency* was determined by comparing the results of the EASE-NL to the results of the SVHI-10-NL. *Construct validity* was measured by comparing the results of the EASE-NL before and after the singing activity. To determine *criterion validity*, the total scores of the EASE-NL were compared between the dysphonic group and the healthy group of singers.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics 26 software (SPSS, Inc. Chicago, IL) and the significance level was set at $\alpha = 0.05$. *Test-retest reliability* was evaluated using the paired Student's T-test, the paired Wilcoxon test and the Pearson correlation coefficient. The Pearson correlation coefficient was also used to determine the *split-half reliability*. *Internal consistency* was calculated using the Cronbach's alpha coefficient and interpreted following the classification proposed by Terwee et al. (2007), with a value between 0.70 and 0.95 considered good. *External consistency* was measured by the Pearson correlation coefficient between the results of the EASE-NL and the sVHI-10-NL. For the *construct validity*, the paired Student's T-test was used to compare the results before and after the singing activity. To determine the *criterion validity*, the results of the two groups of singers were compared using the independent Student's T-test. The effect of sex and age on the EASE-NL scores were investigated using the Mann Whitney U-test, the One Way ANOVA and the Brown Forsythe ANOVA-test.

In order to evaluate the *diagnostic accuracy* of the EASE-NL, sensitivity and specificity were estimated by constructing the Receiver Operating Characteristic-curve (ROC-curve). The area under the curve (AUC) was interpreted as follows: $AUC \geq 0.90$ “high diagnostic accuracy”; $0.90 \geq AUC > 0.70$ “moderate diagnostic accuracy”; $AUC \leq 0.70$ “low diagnostic accuracy”.¹⁶ Based on this ROC curve, the optimal cut-off score was determined to distinguish between dysphonic and normophonic singing voices.

RESULTS

Demographic characteristics

The characteristics of the participants are presented in Table 2. The mean duration of the singing activity was 73.5 minutes (SD: 25.14, range: 28-150 minutes). The content of the singing activity was a performance in 2.9% (n = 2), a singing class in 18.6% (n = 13) and a rehearsal or other singing tasks in 78.5% (n = 55).

TABLE 2. Characteristics of the Singers (n = 70)

Characteristics	n (%)
<i>Age (in years)</i>	
18-20	8 (11.4%)
21-30	28 (40.0%)
31-40	10 (14.3%)
41-50	9 (12.9%)
51-60	9 (12.9%)
61-65	6 (8.6%)
<i>Sex</i>	
Men	16 (22.9%)
Women	54 (77.1%)
<i>Level of professionalism</i>	
Professional	9 (12.9%)
Semi-professional	3 (4.3%)
Amateur	51 (72.9%)
Student conservatory	7 (10.0%)
<i>Genre (multiple genres are possible)</i>	
Classic	26 (37.1%)
Contemporary	
Pop	44 (62.9%)
Jazz	10 (14.3%)
Rock	13 (18.6%)
Musical	35 (50.0%)
Other	7 (10.0%)
<i>Singing type</i>	
Bass	4 (5.7%)
Baritone	5 (7.1%)
Tenor	5 (7.1%)
Alt	8 (11.4%)
Mezzo-soprano	27 (38.6%)
Soprano	18 (25.7%)
Other	3 (4.3%)
<i>Voice problems</i>	
Yes	16 (22.9%)
No	54 (77.1%)

Results of the EASE-NL and the sVHI-10-NL

The results of the EASE-NL total scores and subscale scores before and after singing and of the SVHI-10-NL scores before singing are presented in Table 3.

TABLE 3. Total and Sub Scores of the EASE-NL and SVHI-10-NL

	SVHI-10-NL	EASE-NL		
	Total Score	Total Score	VF	PRI
<i>Pre singing</i>				
Mean (SD)	14.8 (5.4)	11,64 (8.5)	6.2 (4.2)	5.4 (4.8)
Median (IQR)	14.0 (11.8-19.3)	10.0 (5.0-15.0)	5.5 (3.0-8.0)	4.0 (2.0-8.0)
Range	4-26	0-36	0-16	0-20
<i>Post singing</i>				
Mean (SD)		13.0 (10.7)	7.4 (5.5)	5.6 (5.6)
Median (IQR)		10.5 (5.0-18.3)	7.0 (3.8-10.0)	4.0 (1.0-8.3)
Range		0-44	0-22	0-22

Abbreviations: EASE-NL, Dutch version of the Evaluation of Ability to Sing Easily; PRI, pathologic risk indicators;

SVHI-10-NL, Dutch version of the Singing Voice Handicap Index 10; VF, vocal fatigue;

Reliability measurements

The results of the EASE-NL before and after a singing activity in the retest condition in 21 singers are presented in Table 4. The mean duration of the singing activity was 78.7 minutes (SD: 23.5, range: 50-120). In the group of 21 singers, 2.9% (n = 2) followed a singing class, 2.9% (n = 2) had a singing performance, and 80.9% did a rehearsal or other singing exercises (n = 17%). No differences were found in mean duration of the singing activity between the test and retest condition (Paired Sample T-test ($t(20)=0.660$, $P= 0.517$)).

TABLE 4. Results of the EASE-NL in the Retest Condition

	EASE-NL		
	Total Score	VF	PRI
<i>Test</i>			
Mean (SD)	12.2 (9.7)	6.8 (5.1)	5.4 (4.9)
Median (IQR)	9.0 (3.5-20.5)	6.0 (2.0-11.5)	3.0 (2.0-9.5)
Range	0-32	0-17	0-15
<i>Retest</i>			
Mean (SD)	14.5 (13.3)	8.1 (7.1)	6.4 (6.4)
Median (IQR)	10.0 (3.0-23.0)	6.0 (2.0-12.0)	5.0 (1.0-11.0)
Range	0-46	0-23	0-23
P- value	0.229	0.232	0.020*
t(20)	-1.240		-2.540
Z		-1.196	

Pearson correlations coefficients were calculated for the total EASE score ($r = 0.899$, $P < 0.001$) and for the subscales VF ($r = 0.810$, $P < 0.001$) and PRI ($r = 0.912$, $P < 0.001$), showing a strong positive correlation between the test and retest condition. The paired Student's *t*-test showed no significant differences between the test and retest for the total EASE scores. For the VF subscale, the paired Wilcoxon test was used and showed no significant differences between the two conditions. For the PRI subscale, the paired Student's *t*-test revealed a significant difference. During the retest condition, singers scored significantly lower compared to the first test (mean difference: 1.2; 95% confidence interval: -2.255,-0.221).

Concerning the *split-half reliability*, the Pearson correlation coefficient was determined to measure the relation between the VF and PRI scores of the EASE, obtained before the singing activity ($r = 0.779, P < 0.001$).

For the *internal consistency*, a Cronbach's alpha coefficient of 0.801 was found for the VF subscale and 0.857 for the PRI subscale. For the *external consistency*, the Pearson correlation coefficient showed a positive correlation ($r = 0.685, P < 0.001$) between the total score of the EASE-NL and the SVHI-10-NL.

Validity analysis

Criterion validity was determined by comparing the total EASE-NL scores of the dysphonic and healthy group. Dysphonic singers scored significantly higher compared to singers without voice problems for the total EASE-NL score and the subscales (Table 5).

TABLE 5. Comparison of the EASE-NL Scores in the Healthy and Dysphonic Group

	Healthy group		Dysphonic group		t	95% Confidence interval	P-Value
	Mean	SD	Mean	SD			
VF	5.19	3.817	9.69	3.722	-4.155	-6.665; -2.340	< 0.001 *
PRI	4.23	3.926	9.31	5.486	-4.096	-7.488; -2.582	< 0.001 *
Total	9.46	7.223	19.00	8.587	-4.441	-13.823; -5.251	< 0.001 *

Abbreviations: SD: Standard deviation; VF: vocal fatigue; PRI: pathologic risk indicators.

* $p < 0.05$.

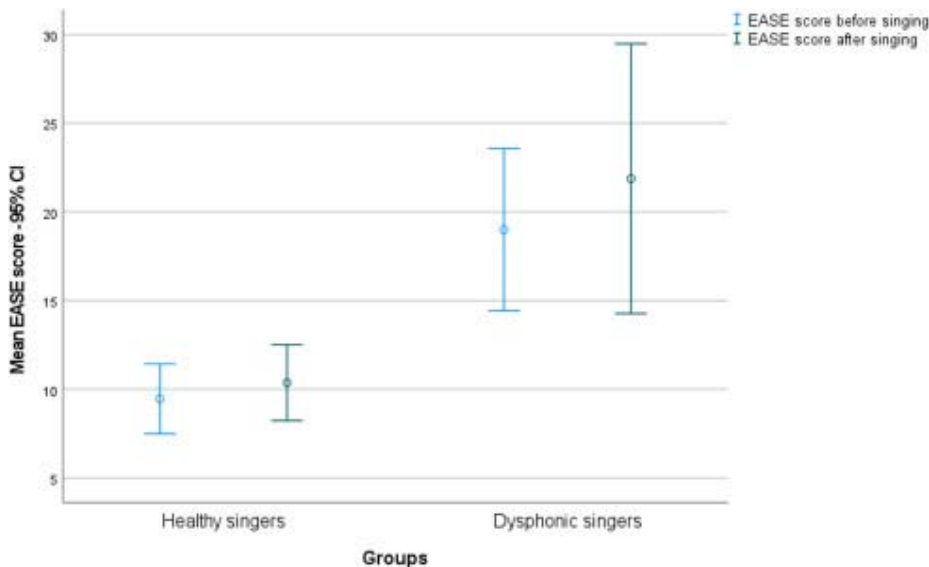


FIGURE 1. Error bar chart of the total EASE score in healthy and dysphonic singers before and after the singing activity.

Construct validity was measured by comparing the total EASE-NL scores before and after the singing activity in both groups. In the healthy group ($t(53) = -1.184, P = 0.242$), as well as in the dysphonic group ($t(15) = -1.191, P = 0.252$) no differences were found between the pre and

post singing condition. The mean scores of the EASE in both groups before and after the singing activity are presented in Figure 1.

Effect of sex and age

For the total group, no significant differences were found between men and women for the total EASE-NL score ($U = 425.500, P = 0.927$), and for the subscales VF ($U = 467.000, P = 0.623$) and PRI ($U = 386.000, P = 0.518$). Also for age, no significant differences were found for the total EASE-NL score ($F(5, 64) = 1.087, P = 0.376$), and for the subscales VF ($F(5, 33.764) = 1.753, P = 0.149$) and PRI ($F(5, 64) = 0.650, P = 0.662$).

Sensitivity and specificity

ROC-curve analysis was performed presented in Figure 2. The optimal cut-off score was determined to be 12.5, with a sensitivity level of 75.0% and a specificity level of 74.1%.

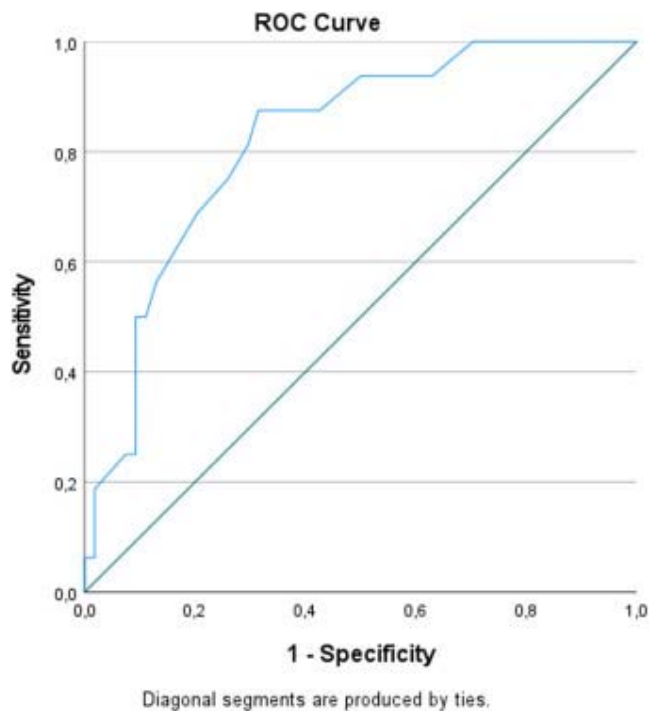


FIGURE 2. ROC-curve analysis of the EASE-NL.

DISCUSSION

The first purpose of this study was to develop and validate a Dutch translation of the EASE by measuring internal and external consistency, construct and criterion validity and test-retest and split-half reliability after the translation procedure. Secondly, the impact of sex and age and the diagnostic accuracy of the EASE-NL was determined. The internal consistency of the VF scale ($\alpha = 0.801$) and the PRI scale ($\alpha = 0.857$) of the EASE-NL is good. This indicates that the different items on the subscales are likely to measure the same intended concept.¹⁷ The internal consistency is comparable to the original Australian version of the EASE, the Kannada version EASE-K and the Brazilian version EASE-Br .

Convergent validity, congruent with external consistency of a scale, is tested by comparing scores on similar scales. In this study, the results of the EASE-NL were compared with the results on the SVHI-10-NL. However, a major difference between these two symptom scales is the surveyed period.¹⁰ In the SVHI-10-NL, singers are required to evaluate their voice based on their experiences during the last month. On the contrary, in the EASE, respondents evaluate their voice based on their current perception rather than relying on recall of previous experiences.¹⁰ Nevertheless, a strong positive correlation was found between the results of the EASE-NL and the SVHI-10-NL and external consistency and convergent validity was considered good.

Criterion validity was investigated by comparing the scores between the healthy and dysphonic singers. The total EASE-NL scores, as well as the scores of both subscales were significantly different between the two groups. Diagnostic accuracy was then further investigated for the total EASE-NL score by a ROC-curve analysis showing a cut-off score of 12.5, with a sensitivity level of 75.0% and a specificity level of 74.1%. This study is the first attempt to investigate diagnostic accuracy of the instrument. Further research in larger sample sizes of dysphonic and healthy singers is necessary. Cut-off scores in the EASE-Br were set at 4.5 for the VF and PRI subscale.¹² Comparison with clinical cut-off scores in other versions of the EASE is not yet possible. Whether higher EASE scores constitute risk of laryngeal pathology should be further investigated. This study showed that both subscales were able to distinguish between healthy and dysphonic singers. According to the developers, the VF scale is designed to be more sensitive to measure vocal load effects, whereas the PRI scale would be able to differentiate between singers with and without a voice problem.¹⁰ Whether the two subscales are clinically distinguishable and predictive of vocal fatigue and/or specific vocal conditions is subject for further research. Limitations of the comparison between the healthy and dysphonic group in this study that should be addressed in future research are the unequal sample sizes in both groups (54 vs 16 respectively), differences in recruitment strategy (convenience sampling vs a treatment seeking population), and differences in laryngological information (as a videolaryngostroboscopy was only performed in the dysphonic group).

The EASE is developed as a self-report tool to evaluate perceived current singing function and quantify vocal fatigue, vocal changes across time and vocal load effects in a singer without the assumption of disorder.^{5,10} Therefore, according to the developers, the purpose is not to measure vocal capability, satisfaction or technical ability, but to potentially detect subtle changes in voice function perceived by singers. Secondly, the tool is designed to be sensitive to subtle levels of emerging vocal pathology.^{5,10} Consequently, construct validity was checked by comparing the EASE-NL scores before and after a singing activity. However, no significant changes in EASE-NL scores were found after the singing activity in both groups. For the total group, a mean increase of 2.3 was found. Remarkably, the mean increase in the total EASE-NL score after singing was higher in the dysphonic group compared to the healthy group, with a high degree of uncertainty as demonstrated by a larger confidence interval. The large inter-individual variability in EASE-NL results after singing can be possibly explained by the heterogeneous dysphonic group consisting of different types of singers, different vocal pathologies and different singing tasks. In future research, it will be interesting to study changes in the EASE-NL in different subgroups of singers. To further investigate construct validity, longitudinal changes in the EASE-NL over a longer period of vocal loading can be measured. Marchand et al. (2019) investigated changes in the EASE-Br in singers with and without the implementation of a vocal warm-up program before a singing

rehearsal and found significant differences in favor of the warm-up group. They concluded that the EASE-Br is a tool that enables monitoring voice changes in singers.¹⁸

According to Phyland et al. (2014), the EASE might be used for tracking the perceived immediate, short-term and long-term effects of singing but the authors recommended to further investigate test-retest reliability. In this study, two types of reliability were investigated for the EASE-NL. For the test-retest reliability analyses, strong positive correlations were found for the total score, the VF score and the PRI score. No significant differences were found between the two time points for the total score and for the VF-score. However, for the PRI subscale, a small difference of 1.2 was found between the first and the second test. Given the idea that the EASE is developed to measure the current status of the voice function, the period of 14 days between the two test moments that was chosen in this study might have been too long. Further exploration of test-retest reliability in future studies is therefore recommended. A strong linear positive correlation between the VF-scores and the PRI-scores was found demonstrating a good split-half reliability of the test. This result is consistent with the findings of the developers of the EASE.¹⁰ They reported that although strongly correlated, the two subscales measure different aspects of the perceptions of vocal function in (musical theater) singers.

The second purpose of this study was to investigate the impact of sex and age. Comparable to the original EASE¹⁰ and the EASE-K,¹¹ no significant differences were found between men and women in this study. However, Phyland et al. (2014) did find significantly higher scores for females in a subgroup of singers, currently performing in a musical theater show. Currently performing female singers were more likely to report vocal fatigue symptoms and voice problems, hypothetically due to differences in laryngeal response to vocal load.¹⁰ The authors are aware of the methodological limitation of the binary characteristic sex implemented in this study, as gender is a far more complex and diverse construct. Future studies investigating the impact of gender should account for gender diversity and include larger sample sizes. For age, no differences were found in EASE-NL and the EASE-K¹¹ scores and sub scores. Only in the study of Phyland et al. (2014), younger professional singers were more likely to record higher PRI scores compared to older singers. However, the sample size of the older age groups was too small to draw valid conclusions regarding the impact of age.

The original Australian English version of the EASE is currently translated in four languages: (Brazilian) Portuguese (EASE-Br),¹² Kannada (EASE-K),¹⁸ (Chilean) Spanish (EASE-CL)¹³ and Dutch (EASE-NL). The EASE, the EASE-CL, and the EASE-BR consist of 22 items and three subscales: VF subscale, PRI subscale and VC (Vocal Concern) subscale. The EASE-K and the EASE-NL consist of 20 items and two subscales (VF and PRI). Phyland et al. (2014) added the two additional items labeled “Vocal Concern” to assess the singer's overall concern about his/her vocal health. These two items are scored separately as an additional EASE subscale to provide an indicator of the level of singers’ concern regarding their voice.¹⁰ Further research should investigate the potential added value of including the VC subscale in the EASE-NL.

CONCLUSION

The original English version of the EASE was translated and validated to a Dutch EASE-NL version. Internal and external consistency, construct and criterion validity and test-retest and split-half reliability were investigated and results suggest that the EASE-NL is a valid and

reliable tool to assess singer's perceptions of the current status of their singing voice. Diagnostic accuracy was investigated showing a cut-off score of 12.5, with a sensitivity level of 75.0% and a specificity level of 74.1%. Further research should investigate the possible differences between different types of singers, roles and genders and the long-term changes in EASE scores within singers across different tasks.

CONFLICT OF INTEREST

None.

APPENDIX A: Translation of the EASE

<i>Original EASE</i>	<i>Forward translation</i>	<i>Back translation</i>	<i>Finale version EASE-NL</i>
My voice is husky	Mijn stem is schor/hees	My voice is hoarse	Mijn stem is schor/hees
My voice is dry / scratchy	Mijn stem is droog/kriebelend	My voice is dry / scratchy	Mijn stem is droog/kriebelend
My throat muscles are feeling overworked	De spieren in mijn keel voelen overwerkt	The muscles in my throat feel overworked	De spieren in mijn keel voelen overwerkt
My voice feels good	Mijn stem voelt goed	My voice feels good	Mijn stem voelt goed
My top notes are breathy	Er is wilde lucht hoorbaar in mijn hoge tonen	There is 'wild air' audible in my high notes	Er is wilde lucht hoorbaar in mijn hoge tonen
The onsets of my notes are delayed or breathy	De aanzet van mijn noten is vertraagd of bevat wilde lucht	The onset of my notes is delayed or contains 'wild air'	De aanzet van mijn noten is vertraagd of bevat wilde lucht
My voice sounds rich and resonant	Mijn stem klinkt rijk en resoneert	My voice sounds rich and resonates	Mijn stem klinkt rijk en resoneert
My voice is ready for performance if required	Indien nodig is mijn stem klaar voor een optreden	If necessary, my voice is ready for a performance	Indien nodig is mijn stem klaar voor een optreden
My voice is tired	Mijn stem is vermoeid	My voice is tired	Mijn stem is vermoeid
My voice is worse than usual	Mijn stem is slechter dan gewoonlijk	My voice is worse than usual	Mijn stem is slechter dan gewoonlijk
My voice cracks and breaks	Mijn stem kraakt en breekt	My voice cracks and breaks	Mijn stem kraakt en breekt
My voice is breathy	Er is wilde lucht hoorbaar in mijn stem	There is 'wild air' audible in my voice	Er is wilde lucht hoorbaar in mijn stem
I am having difficulty with my breath for long phrases	Ik heb moeite met mijn ademhaling bij lange uitingen	I struggle with my breathing during long phrases	Ik heb moeite met mijn ademhaling bij lange uitingen
My voice is cutting out on some notes	Mijn stem valt weg bij bepaalde noten	My voice drops out on certain notes	Mijn stem valt weg bij bepaalde noten
I am having difficulty changing registers	Ik heb moeite om van register te veranderen	I am having difficulties changing registers	Ik heb moeite om van register te veranderen
Today I am having difficulty with my high notes	Vandaag heb ik moeite met mijn hoge noten	Today, I'm struggling with my high notes	Vandaag heb ik moeite met mijn hoge noten
I am having difficulty projecting my voice	Ik heb moeite om mijn stem te projecteren	It's hard to project my voice	Ik heb moeite om mijn stem te projecteren
I am having difficulty singing softly	Ik heb moeite om zacht te zingen	I am having difficulty singing softly	Ik heb moeite om zacht te zingen
Singing is hard work	Zingen vraagt veel inspanning	Singing requires a lot of effort	Zingen vraagt veel inspanning
I am having difficulty sustaining long notes	Ik heb moeite om lange noten aan te houden	It's hard to sustain long notes	Ik heb moeite om lange noten aan te houden

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