Development and Preliminary Validation of the EASE: A Tool to Measure Perceived Singing Voice Function

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Summary: Objectives. Most voice self-rating tools are disease-specific measures and are not suitable for use with healthy voice users. There is a need for a tool that is sensitive to the subtleties of a singer's voice and to perceived physical changes in the singing voice mechanism as a function of load. The aim of this study was to devise and validate a scale to assess singer's perceptions of the current status of their singing voice.

Methods. Ninety-five vocal health descriptors were collected from focus group interviews of singers. These were reviewed by 25 currently performing music theater (MT) singers. Based on a consensus technique, the number of descriptors was decreased to 42 items. These were administered to a sample of 284 professional MT singers using an online survey to evaluate their perception of current singing voice status.

Results. Principal component analysis identified two subsets of items. Rasch analysis was used to evaluate and refine these sets of items to form two 10-item subscales. Both subscales demonstrated good overall fit to the Rasch model, no differential item functioning by sex or age, and good internal consistency reliability. The two subscales were strongly correlated and subsequent Rasch analysis supported their combination to form a single 20-item scale with good psychometric properties.

Conclusions. The Evaluation of the Ability to Sing Easily (EASE) is a concise clinical tool to assess singer's perceptions of the current status of their singing voice with good measurement properties. EASE may prove a useful tool to measure changes in the singing voice as indicators of the effect of vocal load. Furthermore, it may offer a valuable means for the prediction or screening of singers "at risk" of developing voice disorders.

Key Words: Singing voice–Survey–Scale–Measurement–Self-report–Assessment–Music theater–Performers–Impairment–Symptoms–Voice disorders–Vocal health.

INTRODUCTION

Working singers rely on a vocal mechanism that can meet performance demands and be so-called "performance-fit." Although the singer population has not been well studied, anecdotal reports suggest that it is a normal occurrence for performance-fit singers to experience positive and negative variabilities in vocal function across time and performances and significant fatigue effects after heavy vocal load.[1–10] Whether these experiences are transient or whether, if sustained or cumulative, they can become symptomatic of vocal impairment and thereby threaten short- or long-term vocal health is not known. There is an obvious need to measure these vocal status shifts to determine vocal load thresholds and to establish normative data for working singers. Furthermore, prediction and management of vocal injury among singers is predicated on assumptions as to what constitutes normal. At present, there is an absence of normative data to support these assumptions because there are no appropriate tools to measure vocal status changes in singers or the physical effects of vocal load.

The focus of voice disorder-related quality of life (VDQoL) instruments is the evaluation of physical, mental, and social well-being consequences arising from vocal disorders or impairment, namely dysphonia.[11–17] For those voice users who experience mild impairment, but minimal or no restriction to voice activities and participation, scores on these instruments will be typically low. Similarly, VDQoL instruments will not fully detect fluctuations in vocal status that may occur in the absence of disorder or impairment. In other words, VDQoL instruments are disease-specific in the sense that they measure quality of life related to dysphonia.

There is a need for a tool that is sensitive to the subtleties of the singer's voice and to potential perceived physical changes in the singing voice as a function of load. At present, there appears to be no such instrument available. Current self-report scales that evaluate singing voice[18–24] focus on disorder and include limitations to activity and participation, but lack sensitivity to singers who continue to perform with or without impairment. To evaluate the impact of load on the voice of singers, there is a need for the development of a valid and reliable scale for singers permitting self-evaluation of vocal status. The scale needs to be clinically appropriate, valid, and reliable but also must be simple, quick to complete, easy to score, and useful.[25] The language or terminology of the scale items should be tailored to the population of respondents and the content should reflect the respondent's concerns at the time and not be reliant on recall of previous experiences.[26,27] A self-report symptom scale needs to account for both positive and negative changes in physiological aspects because singers can report positive

changes in their voice,[4] for example, after warm-up,[6,7] as well as negative changes after overuse.[8–10] In addition, the instrument development processes should comply with the guidelines for the development and evaluation of patient-reported outcome measures (PROMs) outlined by the Scientific Advisory Committee of the Medical Outcome Trust as suggested by Branski et al.[28,29] In particular, a scale should undergo a rigorous development process, comprise patient-derived items, and have strong psychometric properties so that it is valid, reliable, and responsive.

The aim of the study was, therefore, to develop a vocal function self-report instrument that is sensitive to the subtleties of the singer's voice and adhered to the aforementioned recommendations for scale development and testing.

METHOD
Approval for the conduct of this study and subject recruitment was obtained from the Monash University Human Ethics Committee (Approval CF11/0298-2011000103).

Phase 1: Item generation
The initial content of the proposed instrument was generated from a previously reported series of four focus groups (n = 43) and written survey responses (n = 36) of professional music theater (MT) singers.[4] All these singers were currently performing in professional productions of over 1-year duration and averaged eight shows per week of performance, in Melbourne or Sydney, Australia. The singers were asked to describe how their voice typically felt or sounded after performing and singing. Their responses generated a total of 95 positive and negative descriptors related to the physical functioning of the singing voice.

Phase 2: Item review
The 95 items were presented to 25 performer reviewers and refined using a consensus technique via two rounds of online survey following the Delphi Method.[30,31] The Delphi Method is a group facilitation technique that seeks to obtain consensus on the opinions of "experts" through a series of structured questionnaires (commonly referred to as "rounds"). Responses are summarized between rounds and communicated back to the participants through a process of controlled feedback. This process is repeated until consensus is reached or until the number of returns for each round decreases. The process gathers opinion without the need to bring panelists together physically. In this study, the experts were MT singers who had performed professionally over the past 12 months and had not participated in the previously described focus group interviews.

The initial 95 items were presented in a written list and performers were asked to assess each item using the following options: "I like the descriptor," "I don't like the descriptor," "I am not sure," or "I don't understand the descriptor." The top scoring items were retained, excluding any items that were responded to by two or more respondents with either "I don't understand …"or "I don't like the descriptor." A list of 60 items was then represented to the same 25 singers and they were asked to rank their top 40 and to identify any items they consid-

ered redundant or ambiguously worded. Review of responses was undertaken to eliminate redundant or inappropriate items and decrease the number to a total that was feasible to administer. Finally, a consensus set of 42 items was achieved, based on importance of rankings. The final 42 items are provided in Appendix A.

Phase 3: Item evaluation phase
In the next phase of this study, the reliability and internal validity of the refined instrument, the Evaluation of the Ability to Sing Easily (EASE), were tested using the initial list of 42 items. Invitations to participate were sent to 10 company managers of professional MT productions in Australia and were also posted on a "member-only" professional MT performers' Web site. Over a period of 8 weeks, a total of 284 professional MT singers (157 females and 127 males) from Australia, Asia, London, and the United States completed an online survey. This comprised demographic and singer background questions as well as the initial list of 42 vocal descriptors. Nearly half (48.2%) of the respondents were aged between 21 and 29 years. One hundred sixty-five of the respondents were currently performing in an MT production at the time of survey completion (participant characteristics are listed in Table 1). For each of the descriptors, respondents were required to choose from five response options "not at all, slightly, mildly, moderately, and extremely" describing how their voice felt or sounded at the time of survey completion.

Statistical analysis
Thirteen of the 42 items were worded positively (eg, "my voice feels strong"). These were reverse scored so that high scores indicated a negative change in voice function. The evaluation and refinement of the 42-item pool was undertaken in two stages. Exploratory factor analysis was conducted initially to assess the

TABLE 1.
Participant Characteristics

MT Singer Characteristics	(N = 284)
Age (y)	
≤17	5 (1.8%)
18–20	12 (4.2%)
21–29	137 (48.2%)
30–39	79 (27.8%)
40–49	41 (14.4%)
50–59	10 (3.5%)
Gender	
Female	157 (55.3%)
Male	127 (44.7%)
Currently performing in an MT production	
Yes	165 (58.1%)
No	119 (41.9%)
Country where living or performing	
Australia	219 (77.1%)
Asia	29 (10.2%)
UK	15 (5.3%)
USA	21 (7.5%)