*Laryngoscope Investigative Otolaryngology*


# Communication-Related Affective, Behavioral, and Cognitive Reactions in Speakers with Spasmodic Dysphonia

Christopher R. Watts, PhD, CCC-SLP; Martine Vanryckeghem, PhD, CCC-SLP

**Objectives:** To investigate the self-perceived affective, behavioral, and cognitive reactions associated with communication of speakers with spasmodic dysphonia as a function of employment status.

**Study Design:** Prospective cross-sectional investigation

**Methods:** 148 Participants with spasmodic dysphonia (SD) completed an adapted version of the Behavior Assessment Battery (BAB-Voice), a multidimensional assessment of self-perceived reactions to communication. The BAB-Voice consisted of four subtests: the Speech Situation Checklist for A) Emotional Reaction (SSC-ER) and B) Speech Disruption (SSC-SD), C) the Behavior Checklist (BCL), and D) the Communication Attitude Test for Adults (BigCAT). Participants were assigned to groups based on employment status (working versus retired).

**Results:** Descriptive comparison of the BAB-Voice in speakers with SD to previously published non-dysphonic speaker data revealed substantially higher scores associated with SD across all four subtests. Multivariate Analysis of Variance (MANOVA) revealed no significantly different BAB-Voice subtest scores as a function of SD group status (working vs. retired).

**Conclusions:** BAB-Voice scores revealed that speakers with SD experienced substantial impact of their voice disorder on communication attitude, coping behaviors, and affective reactions in speaking situations as reflected in their high BAB scores. These impacts do not appear to be influenced by work status, as speakers with SD who were employed or retired experienced similar levels of affective and behavioral reactions in various speaking situations and cognitive responses. These findings are consistent with previously published pilot data. The specificity of items assessed by means of the BAB-Voice may inform the clinician of valid patient-centered treatment goals which target the impairment extended beyond the physiological dimension.

**Key Words:** spasmodic dysphonia, behavior assessment battery, dystonia, voice handicap.

**Level of Evidence:** 2b

## INTRODUCTION

Voice disorders are often associated with a significant negative impact on quality of life. This impact affects individuals across a wide range of etiologies, suggesting that the limitations and/or participation restrictions in activities, in combination with the specific physiological impairment associated with the voice disorder, are substantial factors underlying the negative influences on quality of life in speakers with dysphonia.[1–3] The domains of life activity negatively affected by dysphonia include physical activity, social interactions, emotional well-being, and the ability to perform work-related duties.[4] The presence of handicap affecting these domains is consistently demonstrated across varied quality-of-life instruments.[5]

The effect of dysphonia on work-related activities has received substantial interest by researchers, in part because of the economic impact on employees, business, and the health care system.[6,7] Across various voice disorders, spasmodic dysphonia (SD) has been found to have considerable negative consequences for work-related quality of life associated with job performance, continuation of employment, and the pursuit of career opportunities.[8] Career advancement appears to be a substantial concern for speakers with SD, perhaps to a greater degree than for speakers with other voice disorder etiologies.[9] SD impacts the work-related activities of speakers with this voice disorder in multidimensional ways, among which include communication effort, self-perception, and the need for coping strategies to compensate for their speaking difficulties.[8]

The quality of life impact of dysphonia, and specifically SD, is not limited to those who work, however. Turley and Cohen (2009) found that dysphonia contributed to substantial detriments in quality of life ratings in more than 200 residents of a retirement community.[10] Speakers with SD who are retired are also routinely included in studies measuring self-rated perceptual variables, and these participants have contributed to the consistent findings that SD worsens perceived voice handicap and voice-related



From the Davies School of Communication Sciences & Disorders (C.R.W.), Texas Christian University, Fort Worth, TX, U.S.A; and the Department of Communication Sciences and Disorders (M.V.), University of Central Florida, Orlando, FL, U.S.A.

Editor's Note: This Manuscript was accepted for publication 11 November 2017.

Financial Disclosures: Dr. Watts has no financial disclosures to report associated with this research. Dr. Vanryckeghem has no financial disclosures to report associated with this research.

Conflict of Interest: M. Vanryckeghem is the co-author of the tests described in this article

Send correspondence to Christopher R. Watts, PhD, Department of Communication Sciences & Disorders, Texas Christian University, TCU Box 297450, Fort Worth, TX 76129. Email: c.watts@tcu.edu

**DOI: 10.1002/lio2.128**

quality of life.[11,12] However, the question of whether work status differentially effects the behaviors, affective, and cognitive reactions thought to influence qualify of life of individuals with SD has not been prospectively investigated. Knowledge of work-related effects on perceived vocal behaviors and reactions has the potential to inform how healthcare professionals best assess and treat speakers with SD, specifically enabling them to implement these assessments and treatment processes and strategies with greater specificity toward the individual.

One tool that might be utilized to assess these effects in speakers with SD is the Behavior Assessment Battery (BAB). The BAB is a standardized instrument originally developed to assess dimensions of stuttering affect, behavior and cognition.[13,14] A recent study by Vanryckeghem, Ruddy, and Lehman (2016) utilized the BAB to investigate perceived voice-related phenomena in speakers with SD and non-dysphonic control speakers.[15] The BAB consists of four subtests: the Speech Situation Checklist-Emotional Reaction (SSC-ER), which assesses the extent to which specific situations elicit negative emotion (e.g., anxiety, fear, worry); the Speech Situation Checklist-Speech Disruption (SSC-SD), which investigates the extent to which these same situations cause disruptions in speech production; the Behavior Checklist (BCL), which inventories avoidance and escape responses secondary to speaking difficulties; and the Communication Attitude Test for Adults (BigCAT), which assesses speech-associated beliefs. Vanryckeghem and Brutten adapted the instrument for speakers with SD (BAB-Voice), validating the tool for assessment of voice-related affective, behavioral, and cognitive reactions in this population. Vanryckeghem et al.'s (2016) pilot study found that speakers with SD scored significantly greater than non-dysphonic controls on all four subtests of the BAB. Specifically, the authors noted that speakers with SD reported a substantial use of coping behaviors during speaking situations in an attempt to compensate for or react to the dysphonia, along with a high degree of voice-associated negative emotional reaction and attitude.[15]

The purpose of the present study was to utilize the BAB-Voice to investigate self-perceived affective, behavioral, and cognitive reactions associated with communication of speakers with SD as a function of employment status. The study purpose was driven by the belief that such data would complement and expand discipline knowledge related to factors influencing the communication experiences of speakers with SD in a broader context beyond that which is only associated with voice quality. While speakers with SD have manifested significantly greater negative perceptions of work-related quality of life in addition to affective, behavioral, and cognitive reactions than non-dysphonic speakers, it is not clear if SD populations who are not working (e.g., retired) are impacted during speaking situations to a similar degree. The specific research question was as follows: does employment status, defined as working versus retired, affect voice-related affective, behavioral, and cognitive reactions as measured by the BAB-Voice? Based on previous reports of quality of life in younger and older dysphonic populations, including retirees, it was hypothesized that scores on the BAB-Voice subtests would be much greater than in previously published non-dysphonic speakers, but not be significantly different between speakers with SD who were working and those who were retired.

TABLE I.
Demographic Characteristics of the Participants with SD who were Employed (Working) and who were Retired at the Time of Study Participation.

| Group | Age (mean yrs, sd) | Level of Education |
|---|---|---|
| **Working** | | 1 = 17 (18%) |
| Male (n = 15) | 52.1 (8.9) | 2 = 50 (53%) |
| Female (n = 83) | 52.6 (10.4) | 3 = 26 (28%) |
| **Total (n = 96)** | **52.3 (10.1)** | 4 = 1 (1%) |
| **Retired** | | 1 = 8 (17%) |
| Male (n = 8) | 66.4 (5.2) | 2 = 28 (58%) |
| Female (n = 44) | 70.0 (6.59) | 3 = 10 (21%) |
| **Total (n = 52)** | **69.4 (6.4)** | 4 = 2 (4%) |

Level of education: 1 = grade through high school; 2 = some college through bachelor's degree; 3 = post-undergraduate through master's degree; 4 = doctorate. (Level of education data were missing for 2 participants in the working group and 4 participants in the retired group).

## MATERIALS AND METHODS

### *Participants*

The methodology was approved through the Institutional Review Boards of the authors' respective institutions. Speakers with SD were recruited to participate using national databases of the National Spasmodic Dysphonia Association (www.dysphonia.org) and regional support groups. Potential participants were made aware of the study via email communication. Inclusion criteria specified a diagnosis of SD made by an otolaryngologist and English language proficiency, which were self-reported by the participants. This resulted in a study sample of 148 individuals who completed the BAB-Voice. SD subtype (Adductor/Abductor), race/ethnicity, age of diagnosis, duration of disease, and time since last botulinum toxin injection were not controlled for in this study. Participants were stratified into working (n = 96, mean = 52.3 yrs, sd = 10.1yrs) and retired (n = 52, mean = 69.4 yrs, sd = 6.4yrs) groups based on pre-test demographic responses. Additional mean demographic data for the two groups are provided in Table I.

### *Materials/Tools*

The BAB-Voice (Vanryckeghem & Brutten, 2016), consisting of four self-report subtests, was used to collect data for the study.[15] The SSC-ER subtest consists of 38 items asking participants to rate their degree of negative emotional reaction (anxiety, worry, fear) to speak in particular situations, using a five-point scale ranging from "not at all" (rating of 1) to "a great extent" (rating of 5) of negative emotional reaction The range of scores possible for this subtest is between 38 and 190. The SSC-SD subtest consists of the same 38 speech situations; however, this time participants are asked to rate their degree of voice problem in those situations, using the same Likert scale, 1 indicating "no trouble," whereas 5 means "very much trouble" with voice. The possible score range is again between 38 and 190. The BigCAT subtest is made up of 34 items inquiring about whether or not a particular statement regarding speech-associated attitude applies to an individual by indicating "true" or "false." Responses

TABLE II.
Measures of Central Tendency and Variation for Each of the BAB Sub-Tests.

| Statistic | SSC-ER | BCL | BigCAT | SSC-SD |
|---|---|---|---|---|
| Mean | 142.91 | 15.28 | 31.17 | 145.41 |
| Standard Deviation | 30.96 | 3.62 | 2.99 | 29.55 |
| Median | 146 | 15 | 32 | 148 |
| Mode | 190 | 9/16 | 33 | 190 |
| Min | 72 | 3 | 16 | 47 |
| Max | 190 | 30 | 34 | 190 |

SSC-ER = Speech Situation Checklist - Emotional Reaction; BCL = Behavior Checklist; BigCAT = Communication Attitude Test for Adults; SSC-SD = Speech Situation Checklist - Speech Disruption.

that reflect a negative attitude or negative thinking are scored as 1 point, whereas positive attitudinal responses are scored as 0 points. The potential range of scores for this subtest is between 0 and 34. Finally, the BCL, containing 34 items, inquires about the specific coping strategy a participant might use prior to or during speaking situations by indicating "yes" or "no," depending on whether or not a behavior is used to cope with the anticipation or occurrence of voice problems. If answered "yes," the BCL item (scored as 1) is followed by a second prompt which requires the participant to indicate the frequency with which that particular coping strategy is used. The possible range of scores for this subtest is between 0 and 34.

### *Procedures*

Participants volunteering for the study were provided a link via email which allowed them access to a password protected online version of the BAB-Voice. Test administration began with a consent process, followed by completion of demographic questions. The order of subtest administration was held constant for all participants, and consisted of the following order: 1) SSC-ER, 2) BigCAT, 3) BCL, and 4) SSC-SD. Participants were presented with and responded to subtest items one at a time, in consecutive order (e.g., item 1 first, followed by item 2, 3, etc.). Test response data were downloaded by the first author (CRW) for statistical analyses. The response data included a unique identifier enabling the investigators to verify that a data set originated from one computer (via IP Address).

### *Analyses*

The study design consisted of one factor (group—working vs. retired) and four dependent variables corresponding to the total scores of the four BAB subtests. Each participant contributed one data point to each BAB subtest, which consisted of their total score for that section. A multivariate analysis of variance (MANOVA) was applied to the data with group as a between-subjects factor and scores from the SSC-ER, BigCAT, BCL, and SSC-SD as within-subject variables in the statistical model. To control for outliers, any data point greater than 3 standard deviations from the group mean was removed prior to application of the statistical analysis. An alpha level of 0.05 was set for the omnibus MANOVA, with a Bonferonni adjustment applied to any post-hoc analyses.

## RESULTS

Table II provides an overview of measures of central tendency and variation for each of the BAB sub-tests for the total group of individuals with SD, while Figures 1–4 illustrate box and whisker plots comparing the two groups on each subtest (the dependent variables) of the BAB-Voice. It is clear from Table II that the total scores for each subtest for the entire sample are on the high end of the possible distribution of scores.

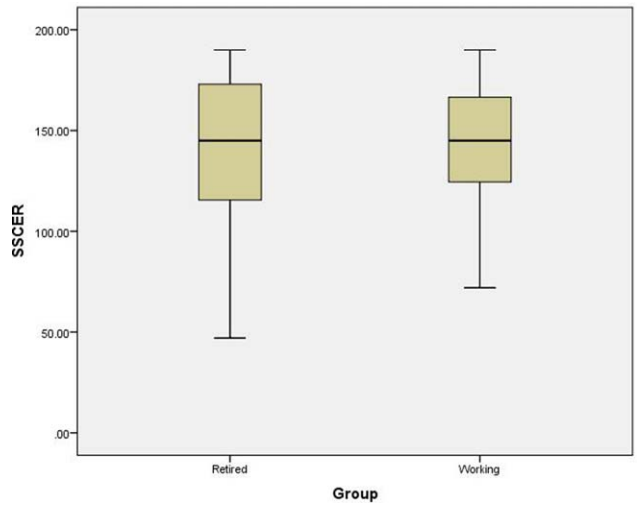


Fig. 1. Box and whisker plot showing median (horizontal line within box), interquartile range (total area of box), and scores on the Speech Situation Checklist–Emotional Reaction (SSC-ER) falling within 1.5x the interquartile range (the whiskers extending from the box) for the retired and working speakers with spasmodic dysphonia.

Mean scores on the SSC-ER were nearly identical for the retired (mean = 141.7, sd = 35.0) and working (mean = 142.5, sd = 30.3) groups. The means of both SD groups were substantially greater than previously published means in non-dysphonic controls by Vanryckeghem et al.[15] In their previous study, a group of 32 non-dysphonic adults (15 men, 17 women, mean age = 58.7 years) demonstrated a mean SSC-ER score of 69.18.[15] A similar pattern was evident for the BigCAT scores of the SD groups (retired mean = 31.24, sd = 1.9; working

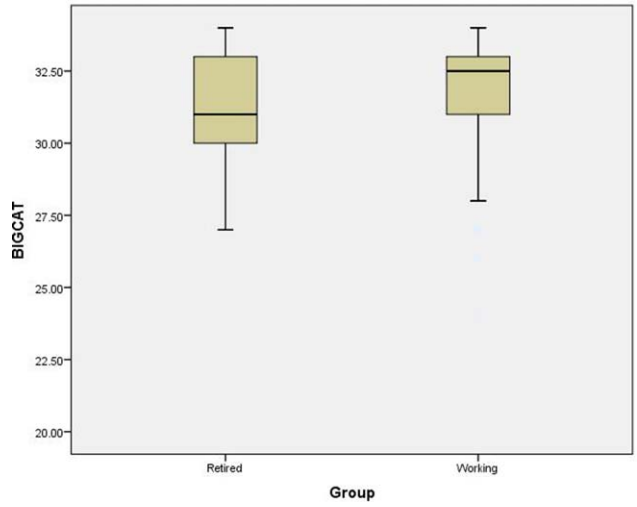


Fig. 2. Box and whisker plot showing median, interquartile range, and scores on the Communication Attitude Test for Adults (BigCAT) falling within 1.5x the interquartile range for the retired and working speakers with spasmodic dysphonia.

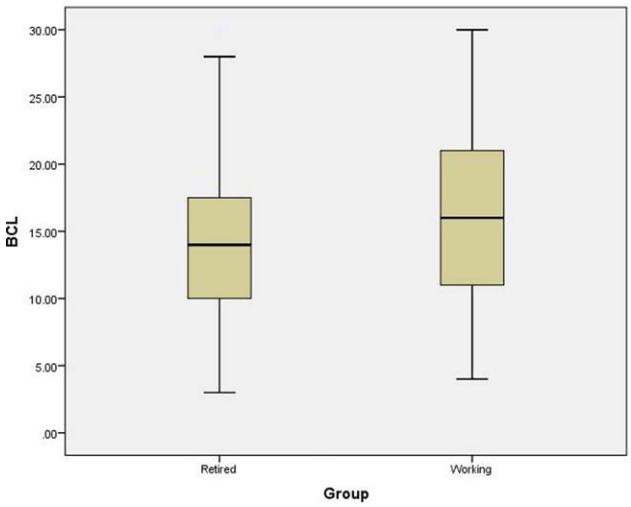


Fig. 3. Box and whisker plot showing median, interquartile range, and scores on the Behavior Checklist (BCL) falling within 1.5x the interquartile range for the retired and working speakers with spasmodic dysphonia.

mean = 31.29; sd = 3.1), which also were substantially greater than previously published non-dysphonic scores on the BigCAT (mean = 3.53).[15] The working group manifested higher total scores on BCL (mean = 16.0; sd = 6.0) compared to the retired group (mean = 13.9, sd = 6.0), but again scores from both groups were substantially greater than previously published non-dysphonic mean BCL scores (mean = 5.13).[15] Scores on the SSC-SD were slightly greater for the working group (mean = 146.6; sd = 27.6) compared to the retired group (mean = 143.1; sd = 33.2), while both groups' scores were much greater than those of previously published non-dysphonic speakers (mean = 63.66).[15]

Results of the primary statistical analyses revealed no significant group effect on measures of SSC-ER ($F[1,138] = 0.003$, $p = 0.95$), BigCAT ($F[1,138] = 0.397$, $p = 0.53$, BCL ($F[1,138] = 3.76$, $p = 0.055$), or SSC-SD ($F[1,138] = 0.152$, $p = 0.69$). The largest F-value, in the initial statistical testing was found for the BCL scores. Because this approached statistical significance, we further investigated this variable. An ad-hoc Pearson correlation was conducted to determine the strength of relationship between age and BCL scores, irrespective of group assignment (e.g., pooling all participants together). Results indicated a weak negative relationship ($r = -0.284$), which was statistically significant ($p < 0.001$). This finding suggested that approximately 8% ($r^2 = 0.081$) of the variability in BCL scores was explained by participant age.

## DISCUSSION

The purpose of this study was to utilize the BAB-Voice to investigate self-perceived affective, behavioral, and cognitive reactions associated with communication of speakers with SD as a function of employment status, defined as those currently employed (working) and those currently retired. Results of the analyses generally supported our study hypothesis, in that scores on BAB-Voice subtests were not significantly different between speakers with SD in the two groups. This finding holds substantial implications for clinical management of speakers with SD and our understanding of how this voice disorder impacts the voice-related reactions in varied populations of speakers with SD. More specifically, the impact of SD on affective, behavioral, and cognitive reactions remains similar across an individual's working and retired life phases.

Taken in context with two previous studies of the BAB-Voice, our findings are in agreement with scores from other samples of SD speakers.[15,16] For example, scores from the speakers with SD for the four subtests of this study are in near perfect alignment with data from Vanryckeghem et al. (2016), who found that speakers with SD exhibited significantly greater BAB-Voice scores than non-dysphonic speakers.[15] The present investigation clearly indicates that the individuals with SD score on the high end of the possible distribution of BAB test scores. Specifically, as it relates to the SSC and BigCAT sub-tests, the participants' modal scores were close to the possible maximum score of 190 and 34, respectively, for those tests. Future investigations will, once again, shed light on the extent to which the current test results differentiate from those of typical speakers

In addition, the current data expand our understanding of SD by demonstrating that individuals who are retired manifest similar coping strategies, affective and cognitive reactions as those currently working to support their income. Among the coping behaviors which were cited as being used with high frequency by both groups of SD speakers were: omission of particular words, speaking as little as possible, and using different pitches when communicating. Presumably these strategies were used to mitigate the negative effects of SD during speaking situations. The degree to which these coping strategies are effective, however, needs to be the focus of future research.

Results of the ad-hoc correlation analysis suggested a subtle trend for BCL scores to decrease as participant

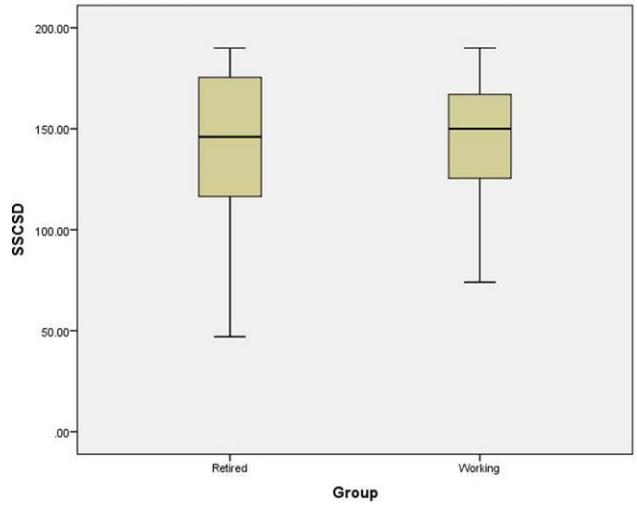


Fig. 4. Box and whisker plot showing median, interquartile range, and scores on the Speech Situation Checklist–Speech Disruption (SSC-SD) falling within 1.5x the interquartile range for the retired and working speakers with spasmodic dysphonia.

age increased. This might allude to the fact that younger participants in this study utilized a descriptively greater number and frequency of coping behaviors during speaking situations. However, while the working group manifested a mean age which was significantly younger than the retired group, ($t = 12.37$, $p < 0.001$), the overall relationship between age and BCL scores was weak when pooling across the entire study sample. This interpretation was supported by the small coefficient of variation ($r^2 = 0.081$). Though we found that the relationship between age and BCL scores was small in this study sample, the data trends support the need for more detailed investigations on the influence of age on BCL scores, and the specific strategies that older and younger speakers might use.

Collectively, speakers with SD in this study manifested high total scores on all four subtests of the BAB-Voice. Compared to previous BAB reports of typical speakers, it is apparent that SD has a significant impact on affective, behavioral, and cognitive reactions to speaking.[13–16] The participants in this study clearly reported being anxious and experiencing voice problems when speaking in particular situations, thinking negatively about their voice quality, and using behaviors to cope with their voice problem. It is likely that these factors are associated with the significant negative impact that SD has on quality of life.[1,2] As such, the findings from this study support the inclusion of assessment strategies and specific treatment targets for these factors as part of an overall management plan for speakers with SD. Specifically, based on a person's assessment results, treatment targets might include addressing anxiety of speaking in particular speech situations, building a positive speech-related attitude and reducing the use of coping strategies during communication.

A number of methodological limitations warrant guarded generalizations from this study. The primary factors of interest in this study was employment status. However, it is likely that many different factors influence BAB-Voice scores in multidimensional ways. Further studies are needed to investigate the influence of these other factors on BAB-Voice scores in speakers with SD. We asked participants to self-report a diagnosis of SD made by an otolaryngologist. However, the methodology did not allow for independent verification of those diagnoses. The SD subtype (adductor versus abductor), presence of tremor, and additional neurological or psychiatric problems were likewise not controlled for in this study, and should be a focus of future investigations.

## CONCLUSIONS

This study attempted to investigate the effect of employment (working versus retired) on affective, behavioral, and cognitive reactions in speakers with SD. Collectively, the results indicated that speakers with SD experience a substantial impact of their voice disorder on their affective and behavioral reactions to speaking situations, and their cognitive response. This supposition is supported by data from previously published studies investigating similar samples of SD speakers and speakers without SD. Results also indicated that speakers with SD who presently work and those who are retired manifest similar reactions and utilize a similar number of coping strategies during speaking situations. The study findings indicated no statistically significant differences on any BAB-Voice subtest scores between the two groups. While a weak-to-moderate relationship between age and BCL scores was present, the percentage of variance within the BCL scores explained by age was very small. The influence factors other than employment status and age on BAB-Voice scores should be a focus of future studies.

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