

Voice Changes in Real Speaking Situations During a Day, With and Without Vocal Loading: Assessing Call Center Operators

*,[†],[‡]Boaz M. Ben-David and §Michal Icht, *Herzliya and §Ariel, Israel, ^{††}Toronto, Ontario, Canada

Summary: Objectives. Occupational-related vocal load is an increasing global problem with adverse personal and economic implications. We examined voice changes in real speaking situations during a single day, with and without vocal loading, aiming to identify an objective acoustic index for vocal load over a day.

Methods. Call center operators (CCOs, $n = 27$) and age- and gender-matched students ($n = 25$) were recorded at the beginning and at the end of a day, with (CCOs) and without (students) vocal load. Speaking and reading voice samples were analyzed for fundamental frequency (F_0), sound pressure level (SPL), and their variance (F_0 coefficient of variation [F_0 CV], SPL CV). The impact of lifestyle habits on voice changes was also estimated.

Results and conclusions. The main findings revealed an interaction, with F_0 rise at the end of the day for the students but not for the CCOs. We suggest that F_0 rise is a typical phenomenon of a day of normal vocal use, whereas vocal loading interferes with this mechanism. In addition, different lifestyle profiles of CCOs and controls were observed, as the CCOs reported higher incidence of dehydrating behaviors (eg, smoking, caffeine). Yet, this profile was not linked with voice changes. In sum, we suggest that F_0 rise over a day can potentially serve as an index for typical voice use. Its lack thereof can hint on consequent voice symptoms and complaints.

Key Words: Occupational voice–Voice loading–Call center operators–Hebrew.

INTRODUCTION

Employment in the modern world is characterized by an increasing number of employees working in professions that require continuous vocal usage.¹ The loss of vocal abilities has a major impact on the livelihood of many vocally demanding professions (in which voice is a main professional tool),² such as teachers, receptionists, sales personnel, physicians, clergy, singers, and actors. Not surprisingly, professional voice users are at risk of occupational voice disorders and represent a major portion of patients in voice clinics.^{3,4} The risks associated with voice professions are mainly related to vocal loading defined as prolonged and intense use of voice.^{5,6} The longer and louder a person uses his or her voice (talks, sings), the greater the strain on the voice mechanism,⁷ and the greater the risk for vocal symptoms (and pathologies).

Occupational demands have a clear impact on vocal loading, as certain jobs require long duration of connected speech with relatively high intensity.⁸ Long hours of work, irregular sleep, and fatigue are also related to voice changes, mainly with regard to voice roughness and brilliance.⁹ Stress was found to have an impact on voice as well, as stress-related increase in the heart rate¹⁰ increased the F_0 of the speaking voice.^{11,12} Likewise, environmental factors can affect voice. For example, the presence of loud background noise, insufficient acoustic conditions, and large speaking distances^{13,14} force

the speaker to produce louder voice. Other environmental factors, such as poor air quality (dryness, dust), may have a detrimental impact on the vocal mechanism as well.¹⁵

The lifestyle and habits of speakers (vocal hygiene) is the focus of many voice-related clinical interventions.¹⁶ Standard recommendations to patients with voice problems include sufficient hydration of the vocal folds (by increased environmental humidity, steam inhalation, and increased water intake) and avoiding dehydrating conditions and agents (smoke, alcohol, diuretics, antihistamines, and caffeine).^{17–20} However, evidence in the literature on the direct impact of such habits on voice and its quality is not clear.²¹ (For an example related to caffeine intake, refer the study by Akhtar et al.¹⁷)

The present study directly tests the possible link between vocal load and lifestyle on voice parameters over a day. We focused on a specific high-risk profession, call center operators (CCOs), and evaluated the impact of a single day of work (voice loading) on voice characteristics, compared with matched controls.

Call center operators voice load and related problems

CCOs provide customer teleservice over shifts, usually from a workstation, located in a large-shared open workspace. To date, the global call center industry is growing at an annual rate of over 20% per year, and the number of CCOs is continually increasing.²² CCOs are a unique subgroup of employees because their ability to work depends solely on their voice, in the absence of body- (gestures or facial expressions) or written-language.¹³

CCOs are a high-risk population for vocal disorders, because of occupational vocal load, as they continuously attend to calls with few breaks, coupled with excessive work-related stress.^{1,23} CCOs were found to be at risk for developing health-related problems, including musculoskeletal disorders and

Accepted for publication April 2, 2015.

From the *Communication, Aging, and Neuropsychology Lab (CANlab), Baruch Ivcher School of Psychology, Interdisciplinary Center (IDC), Herzliya, Israel; †Department of Speech-Language Pathology, and the Rehabilitation Sciences Institute, University of Toronto, Toronto, Ontario, Canada; ††Toronto Rehabilitation Institute, Toronto, Ontario, Canada; and the §Department of Communication Disorders, Ariel University, Ariel, Israel.

Address correspondence and reprints requests to Communication, Aging, and Neuropsychology Lab (CANlab), Baruch Ivcher School of Psychology, Interdisciplinary Center, P.O. Box 167, Herzliya 4610101, Israel. E-mail: boaz.ben.david@idc.ac.il

Journal of Voice, Vol. ■, No. ■, pp. 1-11

0892-1997/\$36.00

© 2015 The Voice Foundation

<http://dx.doi.org/10.1016/j.jvoice.2015.04.002>

psychological distress.²⁴⁻²⁶ Organic voice problems are also frequent in this population,^{13,19} with symptoms of hoarseness, vocal fatigue (negative vocal adaptation that occurs as a consequence of prolonged voice use²⁷), odyngophonia, and generalized fullness in the neck.^{19,28-30} The aforementioned symptoms can be related to vocal attrition—disorders or changes in laryngeal tissues caused by excessive or inappropriate use of the vocal mechanism (overuse or misuse²⁹). Indeed, Jones et al¹⁹ found that CCOs (telemarketers) were twice as likely to report one or more symptoms of vocal attrition (68%) compared with controls (for comparable results, refer the study by Devadas and Rajashekhar²²; Liechavicius, 2000, in the study by Oliveira et al²³).

Employment-related voice symptoms impair the productivity and job performance, as well as the psychological well-being, of this growing cohort of CCOs.¹ Recently, Devadas and Rajashekhar²² found that around half of examined CCOs complained that vocal symptoms affected their job performance, 16% reported that the symptoms affected their social interactions, and 10% mentioned them as a major source of frustration. Voice problems among voice-demanding professions lead to large amount of lost time from work.³¹ For example, more than one-third of teachers (a noticeable group of professional voice users) are absent from work as a result of voice problems.³² A decade ago, related costs (lost workdays, use of sick benefits, replacement costs for substitute teachers, and treatment expenses) were estimated at \$2.5 billion annually in the United States alone.³³ Consequently, the identification of a specific acoustic measure that may serve as an early indicator for later voice disorder has both personal-clinical and general-economic importance. From the clinician perspective, it is important to identify an objective (acoustic) index that correlates with voice symptoms and complaints. From an economic perspective, early identification can lead to preventative steps that can reduce the high costs.

Vocal function changes during a working day

One possible marker for voice changes over a day of vocal load is F_0 . The evidence available in the present literature generally shows an increase in F_0 after a day's work for voice professionals, both in laboratory settings^{34,35} (but refer the study by De Bodt³⁶) and in field conditions.³⁷⁻³⁹ For example, the F_0 of school teachers was found to be higher in the afternoon lecture than in the morning lecture.⁴⁰ It is not clear whether this phenomenon is related to voice load, as some studies reported an increase in F_0 after a single day without vocal load,^{37,41} whereas others found it to be inconsistent (an effect only for men but not for women⁴²; a reversed pattern⁴³).

Another acoustic parameter that has been evaluated in vocal loading studies (but less commonly than F_0) is sound pressure level (SPL). Similarly to F_0 , the evidence for the impact of voice load on SPL is inconsistent, with some studies suggesting that loading raises SPL values,³⁵ whereas others report a decrease.³⁶ The evidence on F_0 and SPL calls for further investigation as performed in the present study.

The present study

We investigated occupational vocal loading in Hebrew speakers CCOs in the course of a single working day, comparing changes over a day in their voice samples to a control group (healthy student, age- and gender-matched), without any voice load. The Israeli market demonstrates well the vocal challenges facing CCOs, with a rising number of call centers. In 2008, there were about 120 call centers in Israel, with around 8500 CCOs. Over the span of 4 years, the number of call centers quadrupled reaching 500 in 2012 (with 200 large-scale centers⁴⁴) and is only expected to inflate, as a governmental plan supports the establishment of such centers.⁴⁵ The job strain on Israeli CCOs is intense, because of a recent update to the Consumer Protection Regulations limiting phone-service waiting-times to 3 minutes.⁴⁶

We were interested in the impact of vocal loading on specific features of voice, analyzing how such acoustic parameters reflect the possible changes in the vocal function during a working day. Following Rantala et al,³⁹ four parameters were chosen: F_0 , SPL, and their estimates of variance (F_0 coefficient of variation [F_0 CV] and SPL CV). We also tested the impact of voice load on a blind subjective measurement of voice quality (G factor of the GRBAS). Background information and behavioral factors (eg, lifestyle) were evaluated by questionnaires concerning occupational and living habits, general health, and vocal complaints.⁴⁷ We tested the link between these lifestyle factors and acoustic changes over a day.

METHODS

Participants

The CCO group was recruited during a 1-day visit at a call center of a large Israeli communication company located at the center of Israel. During recruitment, the experimenter presented the study and its goals to all CCOs present at the call center. The CCO group was made of 27 (20 women, 7 men) CCO employees who responded to the appeal and volunteered to participate, with a mean age of 27.2 years (range 18–36 years). Inclusion criteria were (1) A tenure of at least 6 months at the center; (2) A minimum average of six working hours per shift; and (3) Consecutive work at the center for the past month (ie, not returning from a vacation or a sick leave). The control group was made of 25 undergraduate students (19 women, six men), with a mean age of 22.2 years (range 20–29 years), who received course credit for their participation. None of the participants were involved in high voice-demand activities (eg, singing), and they reported no vocal disorders. At the time of the study, each participant's voice (in both groups) represented his or her typical voice, and all reported good functional health (generally and as related to voice). Only one of the participants (CCO group) received previous voice training, but this was not found to have a significant impact on the data. A similar percentage of participants in the control (5 of 25) and the CCO group (5 of 27) reported laryngeal signs and symptoms (ie, allergy, laryngeal irritation). We also note that a portion of three CCOs' afternoon recordings was corrupted, and only partial data were analyzed for these participants. The study

Download English Version:

<https://daneshyari.com/en/article/10519594>

Download Persian Version:

<https://daneshyari.com/article/10519594>

[Daneshyari.com](https://daneshyari.com)