

Vocal Effects in Military Students Submitted to an Intense Recruit Training: A Pilot Study

*Camila Lima Nascimento, †Ana Carolina Constantini, and †Lúcia Figueiredo Mourão, *†Campinas, São Paulo, Brazil

Summary: Objectives. This study aims at evaluating the vocal parameters of military officers before and after an Intense Recruit Training (IRT), consisting of a 48-hour exercise protocol involving high vocal demand combined with physical effort, lower body hydration levels, and fewer hours of sleep.

Study Design. Eighty-three young male military officers (aged between 18 and 22 years) were recorded on three occasions: before, immediately after, and 2 weeks after the IRT.

Methods. Maximum phonation times (MPTs) using vocalization of the vowel /a/, the fricative consonants /s/ and /z/, and connected speech samples were collected. A number of acoustic parameters were analyzed: mean fundamental frequency, mean intensity, jitter, shimmer, harmonics-to-noise ratio, spectral emphasis (acoustic correlate of vocal effort), H1–H2 (difference between the amplitude of the first and the second harmonic), and the frequency and intensity ranges. For the immediate effects, statistical analyses were conducted using a paired sample *t* test ($P = 0.05$) to compare two moments: before and after the IRT. For the long-lasting effect, statistical analyses were conducted using a one-way analysis of variance (ANOVA) test ($P = 0.05$) to compare between all three moments (before, immediately after, and 2 weeks after the IRT).

Results. The MPTs of /a/, /s/, and /z/, the acoustic parameters as spectral emphasis, and the mean of intensity showed statistically significant changes between the data from before and immediately after training took place. The MPT of /a/ and the intensity range showed statistically significant changes between the measurements taken immediately after training and the ones taken 2 weeks after training; there were significant differences in the comparisons between the three groups of data acquired.

Conclusions. Some of the acoustic parameters were able to identify changes in the vocal conditions of the military students as consequence of high intensity voice and physical military training. The changes in the vocal intensity and MPT parameters seem to be related to general fatigue and lower hydration. The absence of impact in some parameters, specially 2 weeks after the IRT, may reveal that the students' voice is getting used to the military activities.

Key Words: Acoustic analysis–Military–Occupational health–Voice disorders.

INTRODUCTION

The Brazilian Army Preparatory School (BAPS) is responsible for selecting and preparing young men, aged between 17 and 22 years, to initiate an official military career in the Brazilian Army.¹ The BAPS is quite similar to the United States Military Academy Preparatory School. During the preparatory school, the students go through a severe and ruled routine, as a preparation for a military career, with activities that aim at developing the academic, military, and physical aspects of the future officers.²

Communication is an essential part of the military career because it has an important role during military missions and job performance. For these reasons, communication has been included as a selection criterion for joining the military preparatory schools, such as BAPS.² The military formation process requires a well-established activity program. There is a daily schedule for all students that must be followed strictly, for meals, classes, military training, athletic practice, rest time, and other activities.

During specific military activities, such as athletic practice and ceremonies, students are encouraged to use battle cries, songs, and hymns that need to be performed in a loud voice. The command voice must be clear, strong, and of high intensity, which are characteristics needed to control groups during activities that occur mainly in a noisy environment and with a large group of officers.

Research has shown that US army soldiers are more likely to be diagnosed with dysphonia when they are deployed,³ and also, a specific voice disorder, the paradoxical movements of vocal folds, has been observed as recurrent in the military population, and has been associated with high levels of physical activity and physical stress.⁴ In the study by Uvena et al,⁴ paradoxical movement of vocal folds was, in most cases, associated with some comorbid medical conditions such as gastroesophageal reflux disease, allergies, and asthma.

Some military activities occur under adverse conditions and require a high vocal demand, with elevated levels of vocal intensity during long periods of time, combined with intense physical training, controlled hydration, and sleep deprivation. One example is the “Intense Recruit Training” (IRT) which is a practical exercise to develop military knowledge. All the adverse conditions that the students are exposed to during the IRT can damage the process of voice production, especially if these conditions are found repeatedly.

The present pilot study raises some hypothesis. Does the exposure to adverse vocal factors such as reduced hydration,

Accepted for publication March 16, 2015.

From the *Master in Health, Interdisciplinary, and Rehabilitation, State University of Campinas–UNICAMP, Campinas, São Paulo, Brazil; and the †Department of Human Development and Rehabilitation, State University of Campinas–UNICAMP, Campinas, São Paulo, Brazil.

Address correspondence and reprint requests to Camila Lima Nascimento, Master in Health, Interdisciplinary, and Rehabilitation, State University of Campinas–UNICAMP, Rua Herculano Couto, 378, 13070123 Campinas, São Paulo, Brazil. E-mail: nascimento.camilalima@gmail.com

Journal of Voice, Vol. 30, No. 1, pp. 61–69

0892-1997/\$36.00

© 2016 The Voice Foundation

<http://dx.doi.org/10.1016/j.jvoice.2015.03.005>

sleep restriction, intense physical activity, and high vocal demand adversely interfere with the voice of the participants? Are 2 weeks of absence of this exposure sufficient to recover the voice of the participants? Are some of the acoustic parameters more sensitive in detecting the effect on the voice?

On the basis of these hypotheses, the aim of this pilot study was to evaluate the vocal parameters of military officers before and after an IRT.

MATERIALS AND METHODS

This research was conducted after being accepted by the Ethics Committee of the State University of Campinas (request number 62 348 from 07/24/2012), and a written informed consent was obtained from the subjects. The study was approved by a committee of the military that allowed its completion.

Study design

This is a longitudinal pilot study that aims to compare different moments of acoustic voice parameters in young military officer students, before and after an IRT, to assess the immediate impact of IRT and to later impact after IRT.

Subjects

The corpus was composed of voice samples from 83 young male military officer students aged between 18 and 22 years (mean, 19.5 years and standard deviation, 1.2 years). The military officers were, at the time, students at the preparatory school of the Brazilian Army. They had to go through a severe selection process with health exams before entering the preparatory school. The health trial considers the presence of speech problems in the candidates and tries to avoid them.¹

The IRT happened on spring, after 8 months from the student's beginning in preparatory school of the Brazilian Army.

Procedures

The vocal samples were recorded on three occasions: before, immediately after (<1 hour before it ended), and 2 weeks after the IRT (Appendix) which consisted in a 2-day military exercise, lasting 37 consecutive hours, involving high vocal demands to produce military command shouts in combination with intense physical training of about 14 hours. During the training, the students were submitted to controlled hydration, with two water bottle replacements and sleep deprivation which consisted in six intermittent hours of sleep with a schedule for activities.

Data collection

The recordings were made in a quiet room, using an HP notebook (HP Mini 110) equipped with a sound card (Tascam US-100 USB audio interface) and a unidirectional microphone (Shure SV-100 multi-purpose microphone), positioned 10 cm from each of the subject's mouths. The recordings were stored in the notebook using the software *Audacity* (Audacity Team [2012]) (Version 2.0.2). To proceed with acoustic analyses and extract the measurements, we used the software *Praat* (Paul Boersma & David Weenink [2012]) (Version 5.3.16).

The vocal samples were collected during two specific tasks. The first task was a test of the following maximum phonation times (MPTs): the vocalization of the sustained vowel /a/ and the vocalization of the sustained fricative consonants /s/ and /z/, repeated once. The subjects were instructed to take a deep breath and vocalize the sounds as long as they could, although they had their voices recorded. The second task was the recording of a connected speech sample, which consisted of each participant's full name, age, place of birth, counting numbers from one to ten, and a common battle cry. The battle cry is "Brasil, acima de tudo" that is frequently used by Brazilian Army officers and has been repeated during military exercises for many years. During their formation, the students are instructed to execute the shout with a clear and strong voice. The subjects were instructed to execute the battle cry exactly like they do in their daily activities. The connected speech tasks were produced in the subjects' usual voices.

Measures

The acoustic analysis has been widely used as an important tool to analyze vocal quality and a way to make inferences about the laryngeal conditions.^{5,6} Furthermore, such analysis can be considered a noninvasive procedure, which facilitates the development of several studies in the field of voice science. It is important to highlight that the use of acoustic analysis must follow a high control of procedures so that the obtained measures become reliable.

Therefore, this study was based on data obtained by an acoustic analysis, which will be detailed as follows.

The total time of production of MPTs, for the sustained vowel /a/ and the fricatives /s/ and /z/, was measured from the beginning of the vocalization until its end, using acoustic signal representation.

For the acoustic measures, the first and the last second of vocalization were disregarded to avoid possible interferences in voice quality. Mean and range of fundamental frequency, mean and range of intensity, jitter (local), shimmer (local), harmonics-to-noise ratio, spectral emphasis, and H1–H2 (difference between the first two spectral harmonic magnitudes) were extracted automatically using the software *Praat*. The differences between the maximum and minimum of the fundamental frequency and intensities were calculated considering the entire utterances of connected speech tasks, and spectral emphasis was calculated considering the vowels in the connected speech tasks and the vocal task (sustained vowel /a/). All the other acoustic measures were analyzed using the sustained vowel, and the stable point of each vowel was used to extract the measurements.

When regarding the intensity mean, it is known that several conditions may affect the obtained values for this acoustic parameter such as the distance between the subject's mouth and the microphone during the recordings. In the present study, the researchers had controlled this distance during the whole data collection process in an attempt to minimize the possible external effects in the extracted values.

Spectral emphasis, which has been considered the acoustic correlate of vocal effort, was calculated as the difference (in

Download English Version:

<https://daneshyari.com/en/article/1101248>

Download Persian Version:

<https://daneshyari.com/article/1101248>

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