

VOCAL QUALITY IN THEATRE ACTORS AND THE INFLUENCE OF A PERFORMANCE ON THE VOCAL QUALITY

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Abstract

Purpose. This study aimed to investigate whether one theatre performance impacts the objective and subjective vocal quality in professional theatre actors compared with non-professional theatre actors and professional dancers.

Methods. Voice recordings of 27 professional actors, 19 non-professional actors and 8 professional dancers were collected before and after a performance with a mean duration of 90 minutes. Speech samples included sustained phonation, continuous speech, aerodynamic measurements and voice range profile. Both Acoustic Voice Quality Index and Dysphonia Severity Index were computed. For auditory-perceptual evaluations the GRBASI scale was used. Several questionnaires were completed by the subjects before and after the performance to capture vocal abuse and risk factors.

Results. Almost no significant differences pre and post performance were found, except for the acoustic parameters F_0 , F_{low} and shimmer local, for aerodynamic measurements and for the slope of the LTAS. The general grade of perceptual evaluated dysphonia did not change significantly. Between the individual test groups, no differences in impact were detected. AVQI results show an overall pre and post mild grade of dysphonia. In contrast, DSI results did not indicate vocal problems. Questionnaires revealed poor vocal habits in professional actors.

Conclusion. The results of this study show an almost non-existing impact of one performance on the objective and subjective vocal quality in actors and dancers. However, a possible warm-up effect caused by acting could be observed.

Key Words:

Vocal quality – Acoustic analysis – Impact – Theatre actors – Dancers – Performance

Abstract (Dutch)

Doel. Deze studie beoogde te onderzoeken of een theatervoorstelling de objectieve en subjectieve stemkwaliteit van professionele acteurs in vergelijking met niet-professionele acteurs en professionele dansers beïnvloedt.

Methode. Stemopnames van 27 professionele acteurs, 19 niet-professionele acteurs en 8 professionele dansers werden verzameld voor en na een voorstelling van gemiddeld 90 minuten. Een aangehouden /a:/, doorlopende spraak, aerodynamische metingen en het stembereik werden opgenomen. De Acoustic Voice Quality Index (AVQI) en de Dysphonia Severity Index (DSI) werden berekend. Voor perceptuele evaluaties werd de GRBASI-schaal gebruikt. De deelnemers vulden zowel voor als na de voorstelling enkele vragenlijsten in om het stemmisbruik en risicofactoren in kaart te brengen.

Resultaten. Er werden quasi geen significante verschillen voor en na de voorstelling weerhouden. Enkel akoestische parameters als F_0 , F_{low} , shimmer local, aerodynamische metingen en de helling van de LTAS verschilden significant. Ook de algemene perceptuele analyses veranderden niet significant. Wanneer de testgroepen onderling werden vergeleken, werd er geen verschillende impact gevonden. AVQI resultaten tonen een algehele milde dysfonie, zowel pre als post, terwijl DSI scores geen stemproblemen aangeven. Bij professionele acteurs zijn slechte stemgewoonten prominent aanwezig.

Conclusie. De resultaten van deze studie tonen zo goed als geen impact van een voorstelling op de objectieve en subjectieve stemkwaliteit van acteurs en dansers. Er kan echter wel een mogelijk warm-up effect waargenomen worden dat veroorzaakt wordt door het acteren.

Trefwoorden:

Stemkwaliteit – Akoestische analyse – Impact – Theateracteurs – Dansers – Voorstelling

Introduction

Due to several factors, including environmental, psychological and social conditions, actors constitute a risk group to develop voice disorders. The actors' population is exposed to high professional demands. Theatre actors experience a lot of pressure and stress caused by job insecurity and an unstable lifestyle: they work late, have social duties and their work environment changes frequently (Ormezzano, Delale, & Lamy-Simonian, 2011; Timmermans et al., 2002; Wellens & Van Opstal, 2001).

During stage performances and rehearsals, it is hypothesized that actors may overload their vocal mechanism and are more likely candidates for vocal injury (Emerich, Titze, Svec, Popolo, & Logan, 2005), even though they have a more favourable glottal setting, providing a higher glottal closing speed while projecting their voices on stage compared to non-actors (Master, De Biase, Chiari, & Laukkanen, 2008). Vocal fatigue as a result of laryngeal overload is considered a frequent symptom in actors (Novak, Dlouha, Capkova, & Vohradnik, 1991). According to a study of Ferrone, Leung, and Ramig (2004), actors show symptoms of vocal abuse while performing their lines. To interpret the perfect character, they often need to imitate voices, to scream, to shout, to grunt, to groan or to cry, which can be presumed as vocally violent behaviour (Roy, Ryker, & Bless, 2000). They also need to show a various scale of emotions during performances (Raphael & Scherer, 1987). Guzman, Correa, Munoz, and Mayerhoff (2013) investigated the influence of emotional expression in spectral energy distribution in 37 professional theatre actors by doing acoustic analysis on recordings of a read-aloud task while performing six different emotions (happiness, sadness, fear, anger, tenderness, and eroticism) and while performing it without emotion (neutral). They observed the impact of the expression of emotions on the spectral energy and the influence that this had on the vocal quality. The work environment of actors can affect the quality of the voice in a negative way as well. Goulart and Vilanova (2011) found that a significant portion of the professional actors in their study have complaints related to professional voice use, especially associated to workplace conditions, such as type of stage. Theatres are often dusty areas. Sometimes actors wear heavy costumes or make-up which can hamper the vocal projection and the articulation. They need to posture in an unnatural way to portray their character and often the amplification is absent or badly placed (Hoffman-Ruddy, Lehman, Crandell, Ingram, & Sapienza, 2001).

Despite these multiple risk factors and the fact that they have a significantly higher knowledge about vocal hygiene than student actors (Zeine & Waltar, 2002), professionals show poor vocal hygiene habits. They smoke too much, drink a lot of alcohol and caffeinated drinks, eat later in the day which can cause gastroesophageal reflux disease (GERD) and don't do regular warm-up exercises (Timmermans et al., 2002; Varosanec-Skaric, 2008). 29% of a group of 48 Brazilian actors admitted using marijuana on a regular basis. In addition, 31% indicated taking some type of continuous medication (Goulart & Vilanova, 2011). Van Houtte, Van Lierde, D'haeseleer, and Claeys (2010) demonstrated that 16% of the patients who consulted the Ear, Nose and Throat department (ENT) for dysphonia were artists. According to Lerner, Paskhover, Acton, and Young (2013) 62% of first year drama students have an incomplete glottal closure, 59% have laryngeal hyperfunction and 55% have a decreased mucosal wave. In a study with 26 theatre actors 50% reported vocal complaints after a performance. They had a mean Acoustic Voice Quality Index (AVQI) of 3.48 which corresponds with mild dysphonia (D'haeseleer et al., 2016). Furthermore, little is known about the prevalence of voice disorders in professional theatre actors.

Few studies have investigated the impact of a performance. At this moment, only 3 studies described the influence on the objective and subjective vocal quality of actors. Novak et al. (1991) performed tape recordings a few minutes before and after a theatre performance in 45 actors. They analysed the fundamental frequency, the centre of gravity of the spectrum, the skewness of the slope through Long-Term Average Spectrum (LTAS) and did subjective evaluations on the actor's voices. Only the skewness of the slope, which was a little higher in males and lower in females, and the difference in shift of F_0 between males and females differed significantly. They evaluated the voices subjectively and didn't find subjective changes afterwards, except for 3 men whose voices seemed to sound higher. Ferrone et al. (2004) evaluated one actor before and after a series of eight performances. Despite the fact that the vocal technique of the actor was defined as vocally violent behaviour by eleven out of twelve professional listeners, it didn't result in symptoms of vocal abuse. The study did reveal a post-performance improvement in phonational range, maximum intensity levels, perturbation measures and s/z ratio. Eventually, D'haeseleer et al. (2016) didn't find a significant change in objective vocal quality, measured by the AVQI, but discovered a subtle amelioration of the overall grade of dysphonia, evaluated by the GRBASI scale.

The main goal of this study was to investigate whether one theatre performance affects the objective and subjective vocal quality in professional theatre actors compared with non-professional theatre actors and professional dancers. A possible influence on the vocal quality caused by factors such as stress, adrenaline or vocal load were examined as well. Therefore, dancers were included in order to eliminate the vocal load. Additionally, the authors wanted to map risk factors and vocal habits of professional theatre actors in comparison with other performers.

Methods

This research project was completed according to the Declaration of Helsinki and approved by the Ethics Committee of the Ghent University Hospital with the following registration number: B670201629828. A pre-test post-test design was managed.

Subjects

Participants were recruited in theatre companies, drama degree programs and by snowball sampling. Voice samples of 55 subjects were collected before and after a performance (mean duration 91 minutes, SD 30 minutes). For every speech sample the signal-to-noise ratio (SNR) was measured. Samples with an SNR below 20, were excluded ($n = 1$). Finally, voice samples of 54 participants were analysed. Professional actors (PA), who earn their living with acting, and non-professional actors (NPA) were included. Professional dancers (PD) were used as a control group. Although they are exposed to the same external factors, they don't experience vocal load. 27 professional actors (13 women, 14 men), 19 non-professional actors (12 women, 7 men) and 8 professional dancers (5 women, 3 men) were included in the study. Subjects were between 18 and 48 years old, with a mean age of 30.24 (SD 8.38). Professional actors were between 21 and 48 years old (mean 35.81, SD 6.42), non-professionals between 18 and 29 (mean 21.63, SD 2.41) and professional dancers between 26 and 42 (mean 31.88, SD 6.29). Non-professionals were significantly younger than the professionals (NPA – PA $p < 0.001$, NPA – PD $p < 0.001$) and the performances of the dancers were significantly shorter than actors (PD – PA $p = 0.006$, PD – NPA $p = 0.001$). They had to have a leading or a relevant supporting role in the play and could have any nationality. The characteristics per group are shown in table 1. A written informed consent was signed by each participant.

TABLE 1. Characteristics of the subjects						
		Mean	Median	Minimum	Maximum	SD
Performance (hours in a week)	Professional actor	8	8	1	20	3.99
	Non-professional actor	4	3.5	2	7	1.68
	Professional dancer	4.8	3.5	1	16	5.11
Rehearsals (hours in a week)	Professional actor	22.9	30	0	50	13.94
	Non-professional actor	6.3	6	2	20	4.00
	Professional dancer	15.3	10	3	37.5	12.31
Duration of the performance (minutes)	Professional actor	93	90	45	150	27.75
	Non-professional actor	101.8	90	75	150	27.65
	Professional dancer	56.9	60	45	80	11.93
Vocal load during the performance (minutes)	Professional actor	54.4	50	20	90	15.69
	Non-professional actor	43.7	30	20	90	24.71
	Professional dancer	3.8	5	0	5	2.32
Experience (years)	Professional actor	12.6	12	0	26	6.15
	Non-professional actor	8.5	8	3	16	4.45
	Professional dancer	11.9	8.5	5	30	8.87
		n/N (%)				
Character of the subjects						
- Leading role	Professional actor	22/26 (84.6)				
	Non-professional actor	10/19 (52.6)				
	Professional dancer	5/5 (100.0)				
- Supporting role	Professional actor	4/26 (15.4)				
	Non-professional actor	9/19 (47.4)				
	Professional dancer	/				
Education in arts	Professional actor	24/26 (92.3)				
	Non-professional actor	12/19 (63.2)				
	Professional dancer	5/6 (83.3)				
Musical instrument	Professional actor	17/27 (63)				
	Non-professional actor	5/19 (26.3)				
	Professional dancer	1/8 (12.5)				

Methods

Every participant went through the same voice assessment protocol before and after the performance. This protocol included objective and subjective voice assessments consisting of aerodynamic measurements, acoustic measurements, the voice range profile, the Dysphonia Severity Index (DSI; Wuyts et al. (2000)) and the Acoustic Voice Quality Index (AVQI; Maryn, De Bodt, and Roy (2010)), auditory-perceptual evaluation (GRBAS; Dejonckere et al. (1995); Hirano (1981), intensity and pitch) and self-evaluation questionnaires (patient history questionnaires, Dutch and English versions of the Voice Handicap Index (VHI; De Bodt et al. (2000); Jacobson et al. (1997)), the Vocal Tract Discomfort Scale (VTDS; Luyten et al. (2016); Mathieson et al. (2009)) and Corporal Pain Scale (CPS; Van Lierde et al. (2010)).

Voice recordings

The voice samples were recorded with a Samson C01U Pro USB Studio Condenser Microphone, digitalized at a sampling rate of 44.1 kHz. The mouth-to-microphone distance was between 20 and 30 cm. Afterwards these samples were analysed with the Praat software program for acoustic analysis (Institute of Phonetic Sciences, University of Amsterdam, The Netherlands (Boersma, 2002)). The testing was performed in the most suitable and available room, for example the changing rooms or the artists foyer. The same room was used for post-testing. The recording of background noise was eliminated as much as possible and the laptop was placed on a different position to avoid interference. The subjects were instructed to produce a sustained vowel /a:/ at a habitual pitch and loudness, which was subsequently analysed as a midvowel segment of at least 3 seconds. Continuous speech during the reading of a phonetically balanced text “Papa en Marloes” (Van de Weijer & Slis, 1991) was recorded at habitual pitch and loudness. For non-Dutch speaking participants ($n = 2$), the phonetically balanced text “The Northwind and The Sun” was used. The first two sentences were acoustically analysed and the remaining sentences were recorded for the perceptual voice evaluations. Furthermore the subjects were instructed to produce the vowel /a:/ as a glissando from the habitual pitch or intensity to the lowest frequency (F_{low}), the highest frequency (F_{high}), the highest intensity (I_{high}) and the lowest intensity (I_{low}).

Objective voice assessment

Aerodynamic measurements

The maximum phonation time (MPT; in seconds) for the sustained vowel /a:/ was measured at habitual pitch and loudness after a maximal inspiration. The best result of three trials was included in this study. The experimenters visually encouraged and motivated the subjects to obtain the maximum result.

Acoustic measurements

The sustained vowel /a:/ and continuous speech samples (first two sentences of “Papa en Marloes” (Van de Weijer & Slis, 1991) or “The Northwind and the Sun”) were acoustically analysed in the Praat software program (Boersma, 2002) by the same experimenters (CL and JD). The fundamental frequency (F_0 , in Hz), jitter ppq5 (%), shimmer local (%) and noise-to-harmonic ratio (NHR) were calculated. The speaking fundamental frequency (SFF, in Hz) of the continuous speech sample was calculated as well.

Voice range profile

The experimenters measured the frequency and intensity range of each participant. They were instructed to produce the vowel /a:/ as a glissando, implied by gliding from the habitual pitch or intensity to the patient’s lowest frequency (F_{low}), highest frequency (F_{high}), highest intensity (I_{high}) and lowest intensity (I_{low}). The subjects were informed that they should not use vocally violent behaviour such as screaming and shouting when producing the highest intensity. The investigators demonstrated each instruction and stimulated the subject’s productions with visual encouragements.

Dysphonia Severity Index (DSI)

The objective vocal quality of a participant is constructed by means of the DSI, which was invented to establish an objective and quantitative correlate of the perceived vocal quality (Wuyts et al., 2000). It is based on the weighted combination of four different voice dimensions: maximum phonation time (MPT, in seconds), the highest frequency (F_{high} , in Hz), lowest intensity (I_{low} , in dB), and the jitter (%). The formula of the DSI is: $DSI = 0.13 * MPT + 0.0053 * F_{high} - 0.26 * I_{low} - 1.8 * Jitter (\%) + 12.4$. DSI results normally vary between -5 and +5, with -5 being the severely dysphonic vocal quality and +5 reflecting good vocal quality. There is a cutting point between normal and

dysphonic voices, being 1.6 (Raes, Wuyts, de Bodt, & Clement, 2005). For each participant, the DSI was measured.

Acoustic Voice Quality Index (AVQI)

The AVQI (Maryn et al., 2010) was determined for each subject. This objective method to quantify the severity of dysphonia uses a multiparameter concept based on the sustained vocal /a:/ and continuous speech recordings. Maryn and Weenink (2015) has shown that the AVQI is a powerful and valid method to calculate overall dysphonia in speech. The AVQI consists of six different parameters: smoothed cepstral peak prominence (CPPS), harmonics-to-noise ratio (HNR), shimmer local (SL), shimmer local dB (SLdB), general slope of the spectrum (slope) and tilt of the regression line through the spectrum (tilt). The algorithm of Maryn et al. (2010) for detection, segmentation and concatenation of the voiced samples was adopted in Praat, as some of the above mentioned acoustic measurements are only valid for voiced segments of the continuous speech sample. To determine the AVQI, the following formula is needed: $AVQI = 9.072 - 0.245 * CPPS - 0.161 * HNR - 0.470 * SL + 6.158 * SLdB - 0.071 * Slope - 0.170 * Tilt$ and varies from 0 to 10. A higher AVQI score correlates with an overall bad vocal quality. The cutting point between normal and dysphonic voices is 2.70.

Subjective voice assessment

Auditory-perceptual evaluation

The participants were assigned to read a Dutch (n = 52) ("Papa en Marloes" Van de Weijer and Slis (1991)) or English text (n = 2) ("The Northwind and the Sun") out loud, depending on the subject's nationality or mother tongue. Both texts are phonetically balanced and had to be read at a habitual pitch and loudness. In order to acquire the auditory-perceptual evaluation, the GRBAS scale of Hirano (1981) was used. This scale has five different determined parameters: G (grade, degree of hoarseness of the voice), R (roughness, impression of irregularity of the vibration of the vocal folds), B (breathiness, degree to which air escaping between the vocal folds can be heard by the experimenter), A (asthenicity, degree of weakness heard in the voice) and S (strain, extent to which strain or hyperfunctional use of phonation is heard) (Couch, Zieba, Van der Linde, & Van der Merwe, 2015). Due to the need for an additional instability factor, a sixth parameter for fluctuation of voice quality over time was included (Dejonckere et

al., 1995). A four-point rating scale (0 = normal, 1 = slight, 2 = moderate, 3 = severe) was used for each parameter. The voice samples were evaluated at random and blinded by both investigators. The inter-investigator reliability was calculated (%) as well.

Self-evaluation questionnaires

In order to obtain the patient's history, participants had to fill in a questionnaire prior to the performance (Dutch n = 52, English n = 2). This investigation included voice influencing factors and was based on the questionnaire of the European Laryngological Society (ELS) protocol. The psychosocial impact of vocal difficulties was measured using the Dutch (De Bodt et al., 2000) (n = 52) or English (n = 2) (Jacobson et al., 1997) version of the Voice Handicap Index (VHI). This index is a self-perception questionnaire with 30 different statements, divided into three categories – functional, emotional and physical disabilities – consisting of 10 statements each. Each statement had to be answered on a four-point rating scale according to suitability (0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, 4 = always). The total score varies between 0 and 120. The more self-perceived disability caused by voice difficulties, the higher the score. In the interest of examining the vocal tract discomfort, the subjects had to fill in the Dutch (n = 52) (Luyten et al., 2016) or English (n = 2) (Mathieson et al., 2009) version of the Vocal Tract Discomfort Scale (VTDS). The VTDS is expressed by eight different symptoms or sensations that the subject can experience in the throat: burning, tight, dry, aching, tickling, sore, irritable, and lump in the throat. The subject has to point out the frequency (0 = never, 1 = seldom, 2 = sometimes, 3 = more than sometimes, 4 = often, 5 = very often, 6 = always) and severity for each sensation or symptom (0 = none, 1 = almost none, 2 = mild, 3 = more than mild, 4 = moderate, 5 = more than moderate, 6 = extreme) on a 7-point Likert scale. Likewise, the subjects were asked to fill in the Dutch (n = 52) or English (n = 2) version of the Corporal Pain Scale (CPS; Van Lierde et al. (2010)). This scale obtains results about the possible presence of self-perceived corporal pain sensations. It consists of 12 corporal pain symptoms of two different categories: firstly the proximal corporal pain located next to the larynx, neck, and shoulder girdle. These symptoms contain mandible pain, tongue pain, sore throat, neck pain, shoulder pain and diffuse pain. The second category consists of distal corporal pain located in other regions of the body, being headache, earache, back pain, chest pain, arm pain and hand pain. Participants had to indicate

the frequency (never, sometimes, often, almost always, always) and intensity (10-point scale with 0 meaning no pain and 10 meaning extreme pain) for each corporal pain symptom. The VHI, VTDS and CPS were completed before and after the performance to see whether there was an influence of external factors such as stress on the participant. Finally, a questionnaire estimating the vocal load during the performance was filled in by both the participant (Dutch $n = 52$, English $n = 2$) and the investigator after the performance. All of the above questionnaires can be found in the appendices.

Statistical analysis

SPSS 23.0 (SPSS Corporation, Chicago, IL) was used for the statistical analysis of the data. A significance level of $\alpha = 0.05$ was managed for every statistical test. Most variables for acoustic analysis were not normally distributed which was evaluated with the Shapiro-Wilk Test. Due to the different group sizes, paired nonparametric Wilcoxon matched-pairs signed-ranks tests were implemented for the comparison between pre and post measurements for every group. To assess the impact of a performance between the three groups, one-way ANOVAs were used. In case of significant differences, a post hoc Scheffe test was applied. To measure the inter-investigator reliability for the auditory-perceptual evaluation, Cohen's Kappa was used.

Results

Objective measurements

Results of the objective measurements are shown in table 2. P-values for pre-post comparison are presented as well. Significant differences are found for F_0 in male professional actors ($p = 0.041$), female non-professional actors ($p = 0.028$), F_{low} in female professional dancers ($p = 0.043$), shimmer local while producing /a:/ in professional dancers ($p = 0.036$), MPT in non-professional actors ($p = 0.027$) and the slope of LTAS in professional actors ($p = 0.023$). Every parameter increases except for the shimmer local (%). A significant higher impact was observed for F_{low} (female) and shimmer local while producing /a:/ in professional dancers compared to professional actors (resp. $p = 0.034$ and $p = 0.001$) and in professional dancers compared to non-professional actors (resp. $p = 0.002$ and $p = 0.004$). No other significant differences were measured.

TABLE 2. Objective measurements

		Professional actors				Non-professional actors				Professional dancers			
		<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>
<i>Acoustic parameters</i>													
F₀ men	<i>Pre</i>	14	97.84 (14.130)	92.79 (82.13 – 123.48)	0.041	7	113.98 (20.069)	108.35 (89.28 – 149.59)	0.499	3	89.13 (4.995)	88.61 (84.41 – 94.36)	0.285
	<i>Post</i>	14	105.72 (20.504)	103.18 (76.16 – 143.24)		7	119.19 (23.188)	120.35 (90.40 – 156.71)		3	90.48 (2.159)	90.71 (88.21 – 92.51)	
F₀ women	<i>Pre</i>	13	177.31 (28.265)	168.33 (142.00 – 231.70)	0.133	12	200.69 (27.688)	196.52 (169.07 – 265.15)	0.028	5	187.11 (17.279)	184.16 (172.04 – 216.69)	0.893
	<i>Post</i>	13	186.33 (36.812)	174.34 (147.47 – 294.83)		12	212.66 (33.960)	208.88 (155.10 – 269.79)		5	201.66 (22.210)	191.80 (151.59 – 236.36)	
Shimmer local (%)	<i>Pre</i>	27	3.87 (1.324)	3.85 (1.24 – 6.60)	0.239	19	2.88 (0.932)	2.88 (1.61 – 5.08)	0.314	8	7.81 (5.502)	6.71 (2.20 – 18.85)	0.036
	<i>Post</i>	27	4.42 (2.141)	3.92 (1.29 – 11.35)		19	3.24 (1.183)	3.02 (1.34 – 6.81)		8	5.33 (3.495)	4.76 (2.61 – 13.43)	
NHR	<i>Pre</i>	27	0.04 (0.031)	0.03 (0.005 – 0.12)	0.502	19	0.03 (0.027)	0.02 (0.004 – 0.11)	0.573	8	0.05 (0.051)	0.04 (0.008 – 0.16)	0.327
	<i>Post</i>	27	0.04 (0.032)	0.03 (0.003 – 0.14)		19	0.02 (0.016)	0.02 (0.005 – 0.07)		8	0.05 (0.083)	0.02 (0.01 – 0.26)	
SNR	<i>Pre</i>	27	32.01 (7.608)	30.78 (21.13 – 51.84)	0.486	19	32.20 (6.962)	30.26 (21.42 – 49.00)	0.033	8	29.58 (6.016)	28.64 (23.11 – 41.12)	0.484
	<i>Post</i>	27	30.33 (6.926)	29.60 (20.33 – 42.96)		19	28.13 (6.242)	27.27 (21.52 – 42.50)		8	28.09 (3.018)	27.25 (24.90 – 33.61)	
SFF men	<i>Pre</i>	14	113.22 (12.056)	112.96 (92.92 – 129.56)	0.600	7	125.81 (24.944)	122.04 (99.74 – 169.28)	0.735	3	95.85 (2.421)	95.25 (93.78 – 98.51)	1.000
	<i>Post</i>	13	113.94 (15.328)	108.73 (89.97 – 148.48)		7	126.44 (30.440)	119.62 (90.29 – 181.14)		3	98.29 (10.508)	94.92 (89.88 – 110.07)	
SFF women	<i>Pre</i>	13	191.15 (21.155)	190.58 (166.57 – 235.19)	0.116	12	207.70 (15.569)	210.99 (181.76 – 234.09)	0.182	5	185.54 (11.784)	182.55 (173.24 – 204.69)	0.080
	<i>Post</i>	13	197.75 (17.906)	202.75 (159.40 – 218.21)		12	210.71 (19.703)	207.80 (175.38 – 237.41)		5	207.64 (19.421)	201.23 (185.53 – 235.43)	

<i>DSI</i>													
DSI	<i>Pre</i>	26	6.06 (2.026)	5.73 (3.09 – 10.85)	0.381	19	5.58 (1.523)	5.62 (2.32 – 7.89)	0.455	8	5.09 (2.397)	5.55 (0.54 – 8.27)	0.484
	<i>Post</i>	27	5.83 (1.906)	5.87 (2.78 – 9.65)		19	5.79 (1.918)	6.18 (2.23 – 8.52)		8	5.33 (1.722)	5.72 (1.66 – 6.92)	
MPT (sec)	<i>Pre</i>	27	22.45 (7.339)	22.42 (11.24 – 48.65)	0.866	19	18.03 (4.303)	19.34 (9.81 – 28.02)	0.027	8	17.86 (3.89)	18.11 (11.27 – 22.65)	0.263
	<i>Post</i>	27	22.19 (6.618)	22.63 (8.86 – 41.26)		19	20.26 (6.673)	18.96 (7.90 – 31.47)		8	19.70 (5.830)	20.73 (11.25 – 29.79)	
Jitter ppq5 (%)	<i>Pre</i>	27	0.23 (0.094)	0.20 (0.11 – 0.49)	0.876	19	0.21 (0.079)	0.20 (0.10 – 0.41)	0.614	8	0.24 (0.141)	0.18 (0.12 – 0.48)	0.865
	<i>Post</i>	27	0.26 (0.143)	0.22 (0.10 – 0.74)		19	0.22 (0.097)	0.19 (0.09 – 0.43)		8	0.25 (0.134)	0.21 (0.10 – 0.48)	
I_{low} (dB)	<i>Pre</i>	26	52.18 (6.867)	53.33 (40.54 – 70.54)	0.713	19	57.18 (6.383)	58.52 (44.77 – 67.29)	0.872	8	55.18 (6.775)	56.89 (44.99 – 64.88)	1.000
	<i>Post</i>	27	52.51 (6.524)	55.04 (39.77 – 62.00)		19	56.52 (8.194)	56.32 (44.06 – 71.50)		8	55.17 (7.679)	53.30 (45.89 – 67.44)	
I_{high} (dB)	<i>Pre</i>	26	100.66 (5.457)	102.19 (88.56 – 106.12)	0.125	19	99.49 (5.506)	101.26 (87.60 – 105.62)	0.091	8	99.04 (10.813)	103.24 (73.73 – 106.30)	0.484
	<i>Post</i>	27	99.48 (6.651)	102.52 (85.50 – 106.22)		19	95.14 (9.437)	94.63 (70.67 – 106.15)		8	100.20 (10.196)	103.69 (75.36 – 106.17)	
F_{low} (Hz) men	<i>Pre</i>	14	68.00 (18.760)	64.59 (36.17 – 112.08)	0.826	7	78.22 (20.820)	87.91 (41.48 – 97.83)	0.499	3	82.02 (5.352)	84.87 (75.85 – 85.35)	0.593
	<i>Post</i>	14	66.97 (11.814)	67.02 (43.42 – 87.45)		7	84.84 (18.745)	91.45 (47.71 – 104.65)		3	79.22 (20.794)	74.90 (60.92 – 101.83)	
F_{low} (Hz) women	<i>Pre</i>	13	117.01 (16.329)	113.86 (90.27 – 146.24)	0.753	12	157.06 (16.154)	157.02 (126.36 – 186.13)	0.084	5	136.72 (14.088)	139.05 (118.34 – 155.88)	0.043
	<i>Post</i>	13	118.24 (16.638)	121.33 (87.44 – 141.87)		12	150.16 (19.345)	152.15 (115.15 – 175.30)		5	155.96 (13.039)	157.06 (142.39 – 174.17)	
F_{high} (Hz) men	<i>Pre</i>	14	686.23 (141.854)	652.03 (511.10 – 1006.78)	0.826	7	783.68 (121.971)	765.51 (614.07 – 938.64)	0.612	3	725.10 (136.031)	798.15 (568.15 – 809.00)	0.109
	<i>Post</i>	14	682.57 (141.006)	662.65 (465.34 – 981.27)		7	816.54 (137.404)	813.38 (615.61 – 1006.38)		3	686.51 (168.02)	775.46 (492.71 – 791.35)	
F_{high} (Hz) women	<i>Pre</i>	13	1021.51 (208.372)	1002.37 (746.72 – 1299.62)		12	990.78 (229.139)	1016.56 (477.40 – 1288.23)		5	927.18 (358.813)	948.65 (358.95 – 1298.52)	
	<i>Post</i>	13	1023.25	974.68		12	929.31	942.99		5	924.07	1011.72	

			(223.165)	(712.83 – 1299.54)	0.552		(261.813)	(474.28 – 1299.41)	0.530		(271.505)	(500.79 – 1230.56)	0.686
AVQI													
AVQI	<i>Pre</i>	26	3.18 (0.948)	3.31 (1.41 – 4.64)	0.292	19	2.89 (0.915)	2.79 (1.23 – 4.70)	0.856	8	4.43 (1.747)	4.50 (1.29 – 6.54)	0.093
	<i>Post</i>	27	3.13 (1.294)	3.43 (0.41 – 5.65)		19	2.94 (0.922)	2.85 (1.05 – 5.04)		8	3.92 (1.403)	3.79 (2.39 – 6.38)	
<i>CPPS</i>	<i>Pre</i>	26	13.66 (2.173)	13.21 (10.18 – 18.52)	0.454	19	13.30 (1.922)	13.11 (10.27 – 16.11)	0.277	8	11.13 (2.969)	10.90 (6.84 – 16.29)	0.327
	<i>Post</i>	27	13.56 (2.520)	13.51 (9.37 – 20.10)		19	13.58 (1.797)	13.44 (11.08 – 18.09)		8	11.54 (2.295)	12.39 (7.81 – 14.62)	
<i>HNR</i>	<i>Pre</i>	26	16.20 (2.704)	15.65 (11.91 – 22.90)	0.209	19	17.75 (2.398)	17.94 (12.77 – 21.89)	0.687	8	14.17 (3.531)	14.13 (9.34 – 19.86)	0.161
	<i>Post</i>	27	16.04 (3.339)	15.38 (9.50 – 23.46)		19	17.68 (2.422)	17.22 (13.59 – 24.05)		8	15.01 (3.761)	16.23 (7.76 – 19.20)	
<i>Shimmer local (%)</i>	<i>Pre</i>	26	5.88 (1.848)	6.15 (2.08 – 9.09)	0.594	19	5.38 (2.033)	4.49 (3.45 – 9.95)	0.968	8	8.51 (2.674)	8.48 (4.90 – 11.72)	0.263
	<i>Post</i>	27	6.27 (2.277)	6.54 (2.19 – 10.46)		19	5.78 (3.218)	5.45 (2.24 – 15.19)		8	7.39 (3.410)	6.84 (4.08 – 14.55)	
<i>Shimmer local dB</i>	<i>Pre</i>	26	0.54 (0.125)	0.55 (0.34 – 0.77)	0.367	19	0.48 (0.104)	0.45 (0.37 – 0.75)	0.968	8	0.78 (0.233)	0.80 (0.41 – 1.04)	0.123
	<i>Post</i>	27	0.57 (0.158)	0.56 (0.28 – 0.93)		19	0.48 (0.172)	0.46 (0.27 – 1.08)		8	0.67 (0.269)	0.61 (0.43 – 1.28)	
<i>Slope of the LTAS</i>	<i>Pre</i>	26	-17.32 (3.830)	-17.96 (-25.06 - -10.40)	0.023	19	-18.04 (6.174)	-14.52 (-27.98 - -7.75)	0.809	8	-18.66 (5.967)	-17.62 (-29.48 - -11.76)	0.484
	<i>Post</i>	27	-16.21 (3.687)	-15.84 (-24.38 - -9.46)		19	-18.23 (5.167)	-18.17 (-25.77 - -8.77)		8	-18.32 (6.175)	-17.50 (-27.77 - -9.60)	
<i>Tilt of trendline through LTAS</i>	<i>Pre</i>	26	-10.17 (0.931)	-10.27 (-11.59 - -7.65)	0.115	19	-10.31 (1.419)	-10.14 (-13.04 - -8.43)	0.469	8	-10.24 (1.260)	-10.06 (-12.24 - -7.99)	0.208
	<i>Post</i>	27	-10.35 (0.865)	-10.40 (-12.20 - -8.23)		19	-10.14 (1.354)	-10.49 (-12.30 - -7.86)		8	-10.71 (0.903)	-11.02 (-11.98 - -9.21)	

Subjective measurements

Auditory-perceptual evaluation

Table 3 displays the results of the auditory-perceptual evaluation using the GRBASI scale. The roughness (R) in non-professional actors deteriorates significantly pre and post performance ($p = 0.046$). There were no statistically significant differences comparing the influence of a performance between groups. Cohen's Kappa was implemented to measure the inter-investigator reliability, which can be found in table 3 as well (mean agreement 75.9%, range 48.6% - 100%).

Self-evaluation questionnaires

Table 4 presents the results of the patient's history and voice influencing factors. This table contains an overview of the subject's general health and vocal use. In comparison with non-professional actors and professional dancers, professional actors are more deprived of sleep (resp. 26.3%, 12.5% and 37.0%), smoke more (resp. 10.5%, 12.5% and 33.3%) and drink more alcohol (resp. 47.4%, 0% and 63%) in general. Non-professional and professional actors indicate having more stress than dancers (resp. 36.8 and 37% towards 0%). Results show more vocal abuse in actors, including talking a lot, shouting, throat clearing, forced voice use and imitations. The majority of actors do vocal warm-up exercises sometimes before a performance (NPA 57.9%'s and PA 55.6%). However, nearly nobody performs vocal cool-down exercises (NPA 5.3% and PA 7.4%).

The results of the VHI for every group are presented in table 5. The majority of the subjects perceive no problems before and after the performance, which results in a VHI total score below 20. A significant improvement was observed between pre and post evaluation in professional actors for the total score ($p = 0.019$), functional score ($p = 0.010$) and the emotional score ($p = 0.029$). No significant differences can be found when comparing the groups. The VTDS and CPS results are shown in tables 6-11 (appendix). Table 12 presents the vocal load during the performance, which was completed by both the subject and the examiner (appendix).

TABLE 3. Perceptual evaluations using the GRBASI scale

			Professional actors				Non-professional actors				Professional dancers			
		<i>Kappa</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>
Grade (G)	<i>Pre</i>	0.879	27	0.04 (0.192)	0 (0 – 1)	0.317	19	0.16 (0.375)	0 (0 – 1)	0.157	8	0.13 (0.354)	0 (0 – 1)	0.317
	<i>Post</i>	0.486	27	0.04 (0.192)	0 (0 – 1)		19	0.00 (0.000)	0 (0 – 0)		8	0.13 (0.354)	0 (0 – 1)	
Roughness (R)	<i>Pre</i>	0.699	27	0.26 (0.526)	0 (0 – 2)	0.317	19	0.05 (0.229)	0 (0 – 1)	0.046	8	0.38 (0.518)	0 (0 – 1)	0.564
	<i>Post</i>	0.852	27	0.30 (0.465)	0 (0 – 1)		19	0.11 (0.315)	0 (0 – 1)		8	0.13 (0.354)	0 (0 – 1)	
Breathiness (B)	<i>Pre</i>	0.730	27	0.26 (0.447)	0 (0 – 1)	1.000	19	0.21 (0.535)	0 (0 – 2)	0.564	8	0.38 (0.744)	0 (0 – 2)	0.317
	<i>Post</i>	0.712	27	0.33 (0.480)	0 (0 – 1)		19	0.37 (0.597)	0 (0 – 2)		8	0.50 (0.535)	0.50 (0 – 1)	
Asthenicity (A)	<i>Pre</i>	0.649	27	0.04 (0.192)	0 (0 – 1)	0.317	19	0.11 (0.315)	0 (0 – 1)	0.317	8	0.00 (0.000)	0 (0 – 0)	1.000
	<i>Post</i>	0.791	27	0.00 (0.000)	0 (0 – 0)		19	0.11 (0.315)	0 (0 – 1)		8	0.00 (0.000)	0 (0 – 0)	
Strain (S)	<i>Pre</i>	0.649	27	0.00 (0.000)	0 (0 – 0)	1.000	19	0.05 (0.229)	0 (0 – 1)	0.317	8	0.25 (0.463)	0 (0 – 1)	0.317
	<i>Post</i>	1.000	27	0.00 (0.000)	0 (0 – 0)		19	0.00 (0.000)	0 (0 – 0)		8	0.13 (0.354)	0 (0 – 1)	
Instability (I)	<i>Pre</i>	0.658	27	0.00 (0.000)	0 (0 – 0)	1.000	19	0.00 (0.000)	0 (0 – 0)	1.000	8	0.00 (0.000)	0 (0 – 0)	1.000
	<i>Post</i>	1.000	27	0.00 (0.000)	0 (0 – 0)		19	0.00 (0.000)	0 (0 – 0)		8	0.00 (0.000)	0 (0 – 0)	

TABLE 4. Voice influencing factors

		Professional actors		Non-professional actors		Professional dancers	
		n/N	%	n/N	%	n/N	%
<i>General health</i>							
Fatigue/sleep deprivation	<i>hardly</i>	3/27	11.1	1/19	5.3	4/8	50.0
	<i>sometimes</i>	14/27	51.9	13/19	68.4	3/8	37.5
	<i>frequently</i>	10/27	37.0	5/19	26.3	1/8	12.5
Smoking in general	<i>no</i>	12/27	44.4	15/19	78.9	6/8	75.0
	<i>passive</i>	0/27	0.0	1/19	5.3	1/8	12.5
	<i>previously</i>	6/27	22.2	1/19	5.3	0/8	0.0
	<i>yes</i>	9/27	33.3	2/19	10.5	1/8	12.5
Alcohol in general	<i>hardly</i>	1/27	3.7	3/19	15.8	1/7	14.3
	<i>sometimes</i>	9/27	33.3	7/19	36.8	6/7	85.7
	<i>frequently</i>	17/27	63.0	9/19	47.4	0/7	0.0
Colds	<i>hardly</i>	9/27	33.3	9/19	47.4	3/8	37.5
	<i>sometimes</i>	15/27	55.6	8/19	42.1	5/8	62.5
	<i>frequently</i>	3/27	11.1	2/19	10.5	0/8	0.0
Upper respiratory tract infections/asthma	<i>hardly</i>	20/27	74.1	12/19	63.2	5/8	62.5
	<i>sometimes</i>	4/27	14.8	3/19	15.8	3/8	37.5
	<i>frequently</i>	3/27	11.1	4/19	21.1	0/8	0.0
Lung problems	<i>hardly</i>	26/27	96.3	16/19	84.2	6/8	75.0
	<i>sometimes</i>	1/27	3.7	3/19	15.8	2/8	25.0
	<i>frequently</i>	0/27	0.0	0/19	0.0	0/8	0.0
Gastro-oesophageal reflux	<i>hardly</i>	24/27	88.9	17/19	89.5	6/8	75.0
	<i>sometimes</i>	2/27	7.4	2/19	10.5	2/8	25.0
	<i>frequently</i>	1/27	3.7	0/19	0.0	0/8	0.0
Drinking water in general (min. 1,5l/day)	<i>no</i>	0/27	0.0	2/19	10.5	0/8	0.0
	<i>sometimes</i>	10/27	37.0	2/19	10.5	1/8	12.5
	<i>frequently</i>	17/27	63.0	15/19	78.9	7/8	87.5
Allergy	<i>no</i>	18/27	66.7	14/19	73.7	5/8	62.5
	<i>sometimes</i>	7/27	25.9	2/19	10.5	1/8	12.5
	<i>frequently</i>	2/27	7.4	3/19	15.8	2/8	25.0
Stress	<i>hardly</i>	1/27	3.7	1/19	5.3	1/8	12.5
	<i>sometimes</i>	16/27	59.3	11/19	57.9	7/8	87.5
	<i>frequently</i>	10/27	37.0	7/19	36.8	0/8	0.0
Hearing problems	<i>no</i>	25/27	92.6	17/19	89.5	8/8	100.0
	<i>yes</i>	2/27	7.4	2/19	10.5	0/8	0.0
Menopause (women)	<i>no</i>	13/13	100.0	12/12	100.0	5/5	100.0
	<i>yes</i>	0/13	0.0	0/12	0.0	0/5	0.0
<i>Voice evaluation</i>							
<i>Vocal complaints in general</i>							
Feeling of irritation/pain in the throat	<i>hardly</i>	13/27	48.1	8/19	42.1	4/8	50.0
	<i>sometimes</i>	14/27	51.9	9/19	47.4	4/8	50.0
	<i>frequently</i>	0/27	0.0	2/19	10.5	0/8	0.0
Vocal fatigue	<i>hardly</i>	14/27	51.9	15/19	78.9	3/8	37.5
	<i>sometimes</i>	12/27	44.4	3/19	15.8	5/8	62.5
	<i>frequently</i>	1/27	3.7	1/19	5.3	0/8	0.0
Hoarseness	<i>hardly</i>	13/27	48.1	11/19	57.9	5/7	71.4
	<i>sometimes</i>	10/27	37.0	6/19	31.6	2/7	27.6
	<i>frequently</i>	4/27	14.8	2/19	10.5	0/7	0.0
Breathlessness during speaking	<i>hardly</i>	20/26	76.9	13/19	68.4	4/8	50.0
	<i>sometimes</i>	6/26	23.1	5/19	26.3	4/8	50.0
	<i>frequently</i>	0/26	0.0	1/19	5.3	0/8	0.0

<i>Vocal abuse in general</i>							
Talking a lot and for a long time	<i>hardly</i>	0/27	0.0	2/19	10.5	1/8	12.5
	<i>sometimes</i>	4/27	14.8	5/19	26.3	5/8	62.5
	<i>frequently</i>	23/27	85.2	12/19	63.2	2/8	25.0
Shouting	<i>hardly</i>	2/26	7.7	2/19	10.5	6/8	75.0
	<i>sometimes</i>	16/26	61.5	12/19	63.2	1/8	12.5
	<i>frequently</i>	8/26	30.8	5/19	26.3	1/8	12.5
Throat clearing	<i>hardly</i>	9/27	33.3	9/19	47.4	7/8	87.5
	<i>sometimes</i>	14/27	51.9	5/19	26.3	0/8	0.0
	<i>frequently</i>	4/27	14.8	5/19	26.3	1/8	12.5
Imitations	<i>hardly</i>	2/26	7.7	10/19	52.6	5/8	62.5
	<i>sometimes</i>	12/26	46.2	7/19	36.8	3/8	37.5
	<i>frequently</i>	12/26	46.2	2/19	10.5	0/8	0.0
Forced/inadequate use of the voice	<i>hardly</i>	8/27	29.6	8/19	42.1	6/8	75.0
	<i>sometimes</i>	17/27	63.0	9/19	47.4	2/8	25.0
	<i>frequently</i>	2/27	7.4	2/19	10.5	0/8	0.0
<i>Vocal use during performances in general</i>							
Vocal warm-up before a performance	<i>no</i>	6/27	22.2	6/19	31.6	4/8	50.0
	<i>sometimes</i>	15/27	55.6	11/19	57.9	2/8	25.0
	<i>frequently</i>	6/27	22.2	2/19	10.52	2/8	25.0
Vocal cool-down after a performance	<i>no</i>	25/27	92.6	18/19	94.7	7/8	87.5
	<i>sometimes</i>	2/27	7.4	1/19	5.3	0/8	0.0
	<i>frequently</i>	0/27	0.0	0/19	0.0	1/8	12.5
Vocal complaints after a performance	<i>hardly</i>	15/27	55.6	15/19	78.9	7/8	87.5
	<i>sometimes</i>	11/27	40.7	3/19	15.8	1/8	12.5
	<i>frequently</i>	1/27	3.7	1/19	5.3	0/8	0.0

TABLE 5. Results of the VHI scale

		Professional actors				Non-professional actors				Professional dancers			
		<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>p-value</i>
Voice handicap Index – Total	<i>Pre</i>	26	12.9 (7.93)	10.5 (2-32)	0.019	19	14.2 (8.92)	12 (0-29)	0.795	8	13.6 (10.66)	10 (1-31)	0.141
	<i>Post</i>	19	11.9 (8.56)	12 (0-32)		17	16.1 (11.59)	15 (0-39)		6	7.5 (7.92)	5.5 (0-17)	
Functional score	<i>Pre</i>	26	3 (2.84)	2 (0-9)	0.010	19	2.6 (2.65)	2 (0-9)	0.304	8	3.8 (2.92)	3 (0-8)	0.068
	<i>Post</i>	19	2.4 (2.48)	2 (0-8)		17	2.2 (2.35)	1 (0-7)		6	1.8 (2.40)	1 (0-6)	
Physical score	<i>Pre</i>	26	7.8 (4.19)	8 (0-17)	0.113	19	8.2 (6.3)	7 (0-24)	0.455	8	6.5 (5.07)	6.5 (1-15)	0.167
	<i>Post</i>	19	7.7 (4.84)	8 (0-17)		17	9.6 (7.41)	9 (0-27)		6	4.7 (5.24)	3 (0-11)	
Emotional score	<i>Pre</i>	26	2.1 (2.07)	1.5 (0-7)	0.029	19	3.5 (3.36)	2 (0-11)	0.208	8	3.4 (3.25)	3 (0-8)	0.285
	<i>Post</i>	19	1.8 (2.12)	1 (0-7)		17	4.4 (5.34)	2 (0-15)		6	1 (1.27)	0.5 (0-3)	
Current vocal state experienced by the subject													
		<i>N</i>	<i>n(%)</i>			<i>N</i>	<i>n(%)</i>			<i>N</i>	<i>n(%)</i>		
<i>Normal</i>	<i>Pre</i>	22	9 (40.9)			15	6 (40.0)			6	1 (16.7)		
	<i>Post</i>	15	6 (40.0)			11	3 (27.3)			4	1 (25.0)		
<i>Mild</i>	<i>Pre</i>	22	12 (54.5)			15	5 (33.3)			6	1 (16.7)		
	<i>Post</i>	15	7 (46.7)			11	6 (54.5)			4	2 (50.0)		
<i>Moderate</i>	<i>Pre</i>	22	1 (4.5)			15	3 (20.0)			6	4 (66.7)		
	<i>Post</i>	15	2 (13.3)			11	2 (18.2)			4	1 (25.0)		
<i>Severe</i>	<i>Pre</i>	22	0 (0.0)			15	1 (6.7)			6	0 (0.0)		
	<i>Post</i>	15	0 (0.0)			11	0 (0.0)			4	0 (0.0)		

Discussion

The goal of this study was to examine the vocal quality in theatre actors and the influence of a performance on the vocal quality. Objective measurements show that the objective vocal quality is not significantly different before and after the performance. This is in accordance with the findings of D'haeseleer et al. (2016), Ferrone et al. (2004) and Novak et al. (1991). However, some individual vocal parameters differ when comparing pre and post. Results show that the mean fundamental frequency (F_0) increases after a performance in professional and non-professional actors. This difference is significant in male professional and female non-professional actors. The phenomenon is not prominent in dancers. D'haeseleer et al. (2016) discovered the same trend in 26 professional theatre actors, although this difference was not significant. An amelioration is found in the MPT in non-professional actors as well. Additionally the study revealed an increase of the slope of the LTAS in professional actors, which correlates with a less tilting slope, meaning an increased glottal closing speed (Gauffin & Sundberg, 1980). Since the increase of the fundamental frequency, MPT and slope of the LTAS can be seen as a consequence of vocal warm-up exercises (Van Lierde et al., 2011), it is worth considering that a performance can have a similar effect on the voice as vocal warm-up. There is a decrease in shimmer local (%) while producing /a:/ in professional dancers, which corresponds to an improvement in vocal quality. Professional actors show a minimal amelioration in AVQI scores whereas non-professionals show a small decline, compared to a considerable improvement in professional dancers. Pre and post DSI results don't differ significantly. Auditory-perceptual evaluation (GRBAS scale) indicates no significant differences in professional actors before and after the performance. This contradicts the findings of D'haeseleer et al. (2016), who proved a subtle amelioration in overall grade (G) after the performance. Professional dancers do not show any significant differences as well, unlike non-professional actors, who have deteriorated roughness (R) after the performance. This can be attributed to a possible incorrect vocal use during the performance which is captured in the vocal load questionnaire, although this is not yet evidence-based. Generally speaking, it is worth considering that even though the actors were exposed to vocal abuse, there is little direct impact on the objective and subjective vocal quality.

To measure the psychosocial impact on the vocal quality, several standardized scales were completed by the subjects before and after the performance. Professional actors and dancers acquire an improved score post performance on the VHI which stands for a better perception of the functional, physical and emotional aspects of the voice. However, only the amelioration in professional actors is considered significant. Non-professionals' scores worsened compared to the pre evaluations. The current perceived state of the voice shows the same trend, except for the professional actors who judged their voices the same pre and post performance. In general, professional actors are more critical about their voices. The question arises whether this scale is relevant for actors and dancers as all mean scores were below 20, which corresponds with no voice handicap. It is possible that this scale is not sensitive enough for this specific group of elite vocal performers (D'haeseleer et al., 2016). VTDS data showed subtle differences between the pre and post evaluations in professional actors. There is a deterioration in frequency and intensity of some vocal tract discomfort symptoms. In contrast, professional dancers show an overall amelioration. Non-professional actors however present lower frequency scores, but higher intensity scores. These results can be due to a certain subtle self-perceived impact of the vocal load during the performance, which explains the difference between actors and dancers. Results of the CPS show that professional actors score their pains nearly the same pre and post performance. This could illustrate the role of experience in performing. Non-professionals indicate having a decrease in both frequency and intensity. These data accentuate the fact that non-professional actors do not have as many performances as professionals, and thus might experience more stress before and relief after the performance. As a consequence, they have the impression of having less pain symptoms. Finally, professional dancers state having more and heavier pains after the performance. Dancers are undoubtedly exposed to a lot more physical effort during a performance, explaining these observations. Marchant-Haycox and Wilson (1992) detected more shoulder ache in this specific group compared to other performing artists as well.

When comparing the impact of a performance between the individual test groups, a significant p-value was observed for F_{low} (female) and shimmer local while producing /a:/ among professional dancers and professional actors and professional dancers and non-professional actors. Therefore, shimmer values improve only in dancers, whereas

shimmer deteriorates in actors. In female professional dancers, the vocal range diminishes while the range of actors approximately stays the same. As these were the only significant differences between groups and the group of female dancers was statistically too small, these observations cannot be interpreted. Furthermore, the tests on the GRBASI and VHI results reveal no significant differences. Taking these observations into account, there is probably no influence of vocal load, physical effort or external factors such as stress or adrenaline on the vocal quality after one performance. However, good coping behavior of the subjects can be an underlying cause of the non-observed impact of stress (Wellens & Van Opstal, 2001).

Remarkably, overall mean pre and post AVQI results show a score above the cutting point of 2.70, correlating with mild dysphonia. This is also found in previous research (D'haeseleer et al., 2016). Overall mean pre and post DSI results do not show any dysphonia. On the contrary, these values are all above 5. The results are in line with the purpose of both indexes: DSI evaluates the maximum vocal capacities, whereas AVQI purely measures the vocal quality. It is known that elite vocal performers have better control over their voices (Master, Guzman, Azocar, Munoz, & Bortnem, 2015). Self-evaluation questionnaires about the patient's history show that professional actors have an overall extrovert lifestyle which is reflected in their poor vocal habits and general health compared to the other groups. These results confirm the studies of D'haeseleer et al. (2016) and Timmermans et al. (2002) as well. Professional actors drink more alcohol, smoke more and are more deprived of sleep than non-professional actors and professional dancers. The difference between professional and non-professional actors could be linked to the significant age gap. In the literature a decline in smoking prevalence between 1980-2012 has been reported (Ng, Freeman, Fleming, & et al., 2014). Therefore, it can be assumed that the smoking habit of professional actors can be associated with a generational trend of smoking more. Additionally, smoking cigarettes can be presumed as stress relieving behaviour and can be a part of the artistic image. Likewise, drinking more alcohol confirms the previous assumptions of this extrovert way of living. An extroverted, sociable, more risk-taking and sensation-seeking lifestyle was described in the study of Marchant-Haycox and Wilson (1992). The questionnaires reveal more vocal abuse such as shouting, talking a lot, throat clearing, forced voice use and imitations. Working late, social duties after performances and an overall artistic environment encourages these

statements (Timmermans et al., 2002). Hypothetically, dancers are more disciplined, achievement-oriented and conscious about their body and general health (Marchant-Haycox & Wilson, 1992), which declares the obtained results. However, the test group of included professional dancers is too small to acknowledge or prove this explanation. One out of five professional actors and one out of three non-professional actors never do vocal warm-up exercises before a performance in general. Only one out of five professional actors and one out of ten non-professional actors reports to do it frequently. These findings are not reflected in the study of D'haeseleer et al. (2016). It is stated by several authors that vocal warm-up exercises prevent vocal injury and prepare the actor for the vocal activity (Elliot, Sundberg, & Gramming, 1995; McHenry, Johnson, & Foshea, 2009; Ragan, 2016; Van Lierde et al., 2011). In this study, nearly nobody performs vocal cool-down exercises, but this is less common (D'haeseleer et al., 2016; Ragan, 2016).

Moreover, it is important to recognise the limitations and weaknesses of this investigation. Firstly, the small number of professional dancers as participants made it difficult to act as a control to interpret the findings of this study. Aside from the limited number of dancers, the homogeneous group of modern dancers might have biased the results. A possible suggestion for future research could involve a wider spectrum of dance styles and a larger test group. For example, it would be interesting to investigate whether a ballet dancer is more disciplined than a break-dancer. The small number of dancers limited this research in matching the actors with the dancers as well, to eliminate factors such as gender and age. Besides, the significant age gap between professionals and non-professionals could be avoided during the search of participants. Time pressure and an extensive voice assessment protocol before and after the performance caused a lot of missing data in the questionnaires. The examiners noticed that completing every questionnaire and finishing the voice recordings was too much effort in terms of motivation and time limitations. As a consequence of these missing values it is likely to get a wrong image of the results. Another limitation of field research is the diverse test environment. Presence of noise and a test setting with poor acoustics could have impacted the objective measurements. Rothman, Brown, and LaFond (2002) concluded that the environment in which the experimental samples are recorded can affect the results. To avoid this methodological issue, we suggest recordings should be performed in the most

acoustically favourable room of the same theatre with as little as possible background noise. In a future study design the long-term impact of a series of performances could be investigated. Ferrone et al. (2004) partly captured this research question, but studied only one subject.

Further research should attempt to measure the effect of vocal training in actors, being vocal warm-up and cool-down. Services provided by speech language pathologists could improve the insufficient vocal knowledge of actors (Zeine & Waltar, 2002). As mentioned before, Elliot et al. (1995), McHenry et al. (2009) and Van Lierde et al. (2011) affirmed the importance of vocal warm-up in terms of prevention and preparation. Roy et al. (2000) also emphasizes the benefits of vocal training (hygienic laryngeal release techniques) such as defending the laryngeal system against vocal abuse. To maximize vocal capacities in future musical actors, manual circumlaryngeal therapy has proved to be an adequate training (D'haeseleer, Claeys, & Lierde, 2013). Furthermore, Ragan (2016) indicates a perceived sense of vocal well-being after performing the vocal cool-down protocol in singers.

Conclusion

The impact of a performance on the objective vocal quality in professional actors, non-professional actors and professional dancers is almost non-existing. However, a theatre performance induced a subtle increase in fundamental frequency (F_0), which indicates a possible warm-up effect caused by acting. Almost no significant differences of impact between the test groups were observed. Hence, neither vocal load, stress, adrenaline or physical effort change the vocal quality after one performance. Whether these factors have a long-term influence is subject for further research. Finally, the results showed poor vocal habits in professional theatre actors, which emphasizes the importance of vocal education.

References

- Boersma, P. P. G. (2002). Praat, a system for doing phonetics by computer. *Glott international*, 5.
- Couch, S., Zieba, D., Van der Linde, J., & Van der Merwe, A. (2015). Vocal effectiveness of speech-language pathology students: Before and after voice use during service delivery. *S Afr J Commun Disord*, 62(1), E1-7. doi: 10.4102/sajcd.v62i1.95
- D'haeseleer, E., Claeys, S., & Lierde, K. (2013). The effectiveness of manual circumlaryngeal therapy in future elite vocal performers. *The Laryngoscope*, 123(8), 1937-1941.
- D'haeseleer, E., Meerschman, I., Claeys, S., Leyns, C., Daelman, J., & Van Lierde, K. (2016). Vocal Quality in Theater Actors. *J Voice*. doi: 10.1016/j.jvoice.2016.11.008
- De Bodt, M., Jacobson, B., Musschoot, S., Zaman, S., Heylen, L., Mertens, F., . . . Wuyts, F. (2000). De voice handicap index. *Een instrument voor het kwantificeren van de psychosociale consequenties van stemstoornissen. Logopedie*, 13, 29-33.
- Dejonckere, P. H., Remacle, M., Fresnel-Elbaz, E., Woisard, V., Crevier-Buchman, L., & Millet, B. (1995). Differentiated perceptual evaluation of pathological voice quality: reliability and correlations with acoustic measurements. *Revue de laryngologie-otologie-rhinologie*, 117(3), 219-224.
- Elliot, N., Sundberg, J., & Gramming, P. (1995). What happens during vocal warm-up? *Journal of Voice*, 9(1), 37-44.
- Emerich, K. A., Titze, I. R., Svec, J. G., Popolo, P. S., & Logan, G. (2005). Vocal range and intensity in actors: a studio versus stage comparison. *J Voice*, 19(1), 78-83. doi: 10.1016/j.jvoice.2004.08.006
- Ferrone, C., Leung, G., & Ramig, L. O. (2004). Fragments of a Greek Trilogy: impact on phonation. *J Voice*, 18(4), 488-499. doi: 10.1016/j.jvoice.2004.01.001
- Gauffin, J., & Sundberg, J. (1980). *Data on the glottal voice source behavior in vowel production*: na.
- Goulart, B. N., & Vilanova, J. R. (2011). Professional theatre actors: environmental and socio-occupational use of voice. *J Soc Bras Fonoaudiol*, 23(3), 271-276.

- Guzman, M., Correa, S., Munoz, D., & Mayerhoff, R. (2013). Influence on spectral energy distribution of emotional expression. *J Voice*, 27(1), 129.e121-129.e110. doi: 10.1016/j.jvoice.2012.08.008
- Hirano, M. (1981). *Clinical examination of voice* (Vol. 5): Springer.
- Hoffman-Ruddy, B., Lehman, J., Crandell, C., Ingram, D., & Sapienza, C. (2001). Laryngostroboscopic, acoustic, and environmental characteristics of high-risk vocal performers. *J Voice*, 15(4), 543-552. doi: 10.1016/s0892-1997(01)00054-6
- Jacobson, B. H., Johnson, A., Grywalski, C., Silbergleit, A., Jacobson, G., Benninger, M. S., & Newman, C. W. (1997). The voice handicap index (VHI) development and validation. *American Journal of Speech-Language Pathology*, 6(3), 66-70.
- Lerner, M. Z., Paskhover, B., Acton, L., & Young, N. (2013). Voice disorders in actors. *J Voice*, 27(6), 705-708. doi: 10.1016/j.jvoice.2013.05.006
- Luyten, A., Bruneel, L., Meerschman, I., D'haeseleer, E., Behlau, M., Coffe, C., & Van Lierde, K. (2016). Prevalence of Vocal Tract Discomfort in the Flemish Population Without Self-Perceived Voice Disorders. *J Voice*, 30(3), 308-314. doi: 10.1016/j.jvoice.2015.04.017
- Marchant-Haycox, S. E., & Wilson, G. D. (1992). Personality and stress in performing artists. *Personality and individual differences*, 13(10), 1061-1068.
- Maryn, Y., De Bodt, M., & Roy, N. (2010). The Acoustic Voice Quality Index: toward improved treatment outcomes assessment in voice disorders. *Journal of communication disorders*, 43(3), 161-174.
- Maryn, Y., & Weenink, D. (2015). Objective dysphonia measures in the program Praat: smoothed cepstral peak prominence and acoustic voice quality index. *J Voice*, 29(1), 35-43. doi: 10.1016/j.jvoice.2014.06.015
- Master, S., De Biase, N., Chiari, B. M., & Laukkanen, A. M. (2008). Acoustic and perceptual analyses of Brazilian male actors' and nonactors' voices: long-term average spectrum and the "actor's formant". *J Voice*, 22(2), 146-154. doi: 10.1016/j.jvoice.2006.09.006
- Master, S., Guzman, M., Azocar, M. J., Munoz, D., & Bortnem, C. (2015). How do laryngeal and respiratory functions contribute to differentiate actors/actresses and untrained voices? *J Voice*, 29(3), 333-345. doi: 10.1016/j.jvoice.2014.09.003

- Mathieson, L., Hirani, S., Epstein, R., Baken, R., Wood, G., & Rubin, J. (2009). Laryngeal manual therapy: a preliminary study to examine its treatment effects in the management of muscle tension dysphonia. *Journal of Voice*, 23(3), 353-366.
- McHenry, M., Johnson, J., & Foshea, B. (2009). The effect of specific versus combined warm-up strategies on the voice. *J Voice*, 23(5), 572-576. doi: 10.1016/j.jvoice.2008.01.003
- Ng, M., Freeman, M. K., Fleming, T. D., & et al. (2014). Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA*, 311(2), 183-192. doi: 10.1001/jama.2013.284692
- Novak, A., Dlouha, O., Capkova, B., & Vohradnik, M. (1991). Voice fatigue after theater performance in actors. *Folia Phoniatr (Basel)*, 43(2), 74-78.
- Ormezzano, Y., Delale, A., & Lamy-Simonian, A. (2011). [The prevention of voice disorders in the actor: protocol and follow-up nine months of professional theater]. *Rev Laryngol Otol Rhinol (Bord)*, 132(1), 41-44.
- Raes, J., Wuyts, F. L., de Bodt, M., & Clement, P. (2005). The Dysphonia Severity Index used with a percentage scale. *Stem-, spraak-en taalpathologie*, 11(1).
- Ragan, K. (2016). The Impact of Vocal Cool-down Exercises: A Subjective Study of Singers' and Listeners' Perceptions. *Journal of Voice*, 30(6), 764. e761-764. e769.
- Raphael, B. N., & Scherer, R. C. (1987). Voice modifications of stage actors: acoustic analyses. *Journal of Voice*, 1(1), 83-87.
- Rothman, H. B., Brown, W. S., Jr., & LaFond, J. R. (2002). Spectral changes due to performance environment in singers, nonsingers, and actors. *J Voice*, 16(3), 323-332.
- Roy, N., Ryker, K. S., & Bless, D. M. (2000). Vocal violence in actors: an investigation into its acoustic consequences and the effects of hygienic laryngeal release training. *J Voice*, 14(2), 215-230.
- Timmermans, B., De Bodt, M. S., Wuyts, F. L., Boudewijns, A., Clement, G., Peeters, A., & Van de Heyning, P. H. (2002). Poor voice quality in future elite vocal performers and professional voice users. *J Voice*, 16(3), 372-382.
- Van de Weijer, J., & Slis, I. (1991). Nasaliteitsmeting met de nasometer. *Logopedie en Foniatrie*, 63, 97-101.

- Van Houtte, E., Van Lierde, K., D'haeseleer, E., & Claeys, S. (2010). The prevalence of laryngeal pathology in a treatment-seeking population with dysphonia. *Laryngoscope*, 120(2), 306-312. doi: 10.1002/lary.20696
- Van Lierde, K. M., D'haeseleer, E., Baudonck, N., Claeys, S., De Bodt, M., & Behlau, M. (2011). The impact of vocal warm-up exercises on the objective vocal quality in female students training to be speech language pathologists. *Journal of Voice*, 25(3), e115-e121.
- Van Lierde, K. M., D'haeseleer, E., Wuyts, F. L., De Ley, S., Geldof, R., De Vuyst, J., & Sofie, C. (2010). The objective vocal quality, vocal risk factors, vocal complaints, and corporal pain in Dutch female students training to be speech-language pathologists during the 4 years of study. *Journal of Voice*, 24(5), 592-598.
- Varosanec-Skaric, G. (2008). Acoustics characteristics of voice and vocal care in acting and other students. *Clin Linguist Phon*, 22(10-11), 881-889. doi: 10.1080/02699200802173151
- Wellens, W. A., & Van Opstal, M. (2001). Performance stress in professional voice users. *Occupational Voice: Care and Cure. The Hague, Kugler*, 81-100.
- Wuyts, F. L., De Bodt, M. S., Molenberghs, G., Remacle, M., Heylen, L., Millet, B., . . . Van de Heyning, P. H. (2000). The dysphonia severity index an objective measure of vocal quality based on a multiparameter approach. *Journal of Speech, Language, and Hearing Research*, 43(3), 796-809.
- Zeine, L., & Waltar, K. L. (2002). The voice and its care: survey findings from actors' perspectives. *J Voice*, 16(2), 229-243.

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VTDS

Frequency

0 = never, 1 = seldom, 2 = sometimes, 3 = more than sometimes, 4 = often, 5 = very often, 6 = always

Intensity

0 = none, 1 = almost none, 2 = mild, 3 = more than mild, 4 = moderate, 5 = more than moderate, 6 = extreme

CPS

Frequency

0 = never, 1 = sometimes, 2 = often, 3 = almost always, 4 = always

TABLE 6. Results of the VTDS in professional actors

		Frequency								Intensity							
		N	0	1	2	3	4	5	6	N	0	1	2	3	4	5	6
Burning	Pre, n (%)	25	10 (40.0)	14 (56.0)	0 (0.0)	1 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)	25	10 (40.0)	4 (16.0)	6 (24.0)	3 (12.0)	1 (4.0)	1 (4.0)	0 (0.0)
	Post, n (%)	18	5 (27.8)	8 (44.4)	4 (22.2)	1 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	18	4 (22.2)	4 (22.2)	7 (38.9)	2 (11.1)	0 (0.0)	1 (5.6)	0 (0.0)
Tight	Pre, n (%)	25	5 (20.0)	8 (32.0)	9 (36.0)	1 (4.0)	1 (4.0)	1 (4.0)	0 (0.0)	25	3 (12.0)	3 (12.0)	9 (36.0)	6 (24.0)	2 (8.0)	2 (8.0)	0 (0.0)
	Post, n (%)	18	1 (5.6)	3 (16.7)	11 (61.1)	2 (11.1)	1 (5.6)	0 (0.0)	0 (0.0)	18	2 (11.1)	2 (11.1)	10 (55.6)	3 (16.7)	1 (5.6)	0 (0.0)	0 (0.0)
Dry	Pre, n (%)	25	2 (8.0)	5 (20.0)	14 (56.0)	3 (12.0)	1 (4.0)	0 (0.0)	0 (0.0)	25	2 (8.0)	2 (8.0)	16 (64.0)	2 (8.0)	3 (12.0)	0 (0.0)	0 (0.0)
	Post, n (%)	18	0 (0.0)	4 (22.2)	10 (55.6)	4 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	18	0 (0.0)	5 (27.8)	7 (38.9)	6 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)
Aching	Pre, n (%)	25	14 (56.0)	8 (32.0)	3 (12.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	25	12 (48.0)	4 (16.0)	6 (24.0)	1 (4.0)	1 (4.0)	1 (4.0)	0 (0.0)
	Post, n (%)	18	12 (66.7)	5 (27.8)	1 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17	10 (58.8)	1 (5.9)	3 (17.6)	1 (5.9)	1 (5.9)	1 (5.9)	0 (0.0)
Tickling	Pre, n (%)	25	4 (16.0)	10 (40.0)	5 (20.0)	4 (16.0)	2 (8.0)	0 (0.0)	0 (0.0)	25	4 (16.0)	5 (20.0)	7 (28.0)	5 (20.0)	3 (12.0)	1 (4.0)	0 (0.0)
	Post, n (%)	18	3 (16.7)	6 (33.3)	8 (44.4)	0 (0.0)	1 (5.6)	0 (0.0)	0 (0.0)	18	3 (16.7)	3 (16.7)	9 (50.0)	2 (11.1)	0 (0.0)	1 (5.6)	0 (0.0)
Sore	Pre, n (%)	25	14 (56.0)	8 (32.0)	3 (12.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	25	13 (52.0)	6 (24.0)	2 (8.0)	4 (16.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Post, n (%)	18	12 (66.7)	2 (11.1)	3 (16.7)	1 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	18	11 (61.1)	1 (5.6)	2 (11.1)	4 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)
Irritable	Pre, n (%)	25	6 (24.0)	12 (48.0)	5 (20.0)	2 (8.0)	0 (0.0)	0 (0.0)	0 (0.0)	24	5 (20.8)	6 (25.0)	10 (41.7)	2 (8.3)	0 (0.0)	1 (4.2)	0 (0.0)
	Post, n (%)	18	6 (33.3)	5 (27.8)	7 (38.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	18	5 (27.8)	2 (11.1)	7 (38.9)	1 (5.6)	2 (11.1)	1 (5.6)	0 (0.0)
Lump	Pre, n (%)	25	4 (16.0)	5 (20.0)	11 (44.0)	3 (12.0)	0 (0.0)	2 (8.0)	0 (0.0)	24	5 (20.8)	3 (12.5)	6 (25.0)	5 (20.8)	3 (12.5)	2 (8.3)	0 (0.0)
	Post, n (%)	18	5 (27.8)	1 (5.6)	9 (50.0)	1 (5.6)	2 (11.1)	0 (0.0)	0 (0.0)	18	5 (27.8)	0 (0.0)	7 (38.9)	4 (22.2)	1 (5.6)	1 (5.6)	0 (0.0)

TABLE 7. Results of the VTDS in non-professional actors

		Frequency								Intensity							
		N	0	1	2	3	4	5	6	N	0	1	2	3	4	5	6
Burning	Pre, n (%)	19	11 (57.9)	6 (31.6)	1 (5.3)	1 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)	19	11 (57.9)	2 (10.5)	4 (21.1)	2 (10.5)	0 (0.0)	0 (0.0)	0 (0.0)
	Post, n (%)	17	8 (47.1)	5 (29.4)	2 (11.8)	1 (5.9)	1 (5.9)	0 (0.0)	0 (0.0)	17	8 (47.1)	5 (29.4)	2 (11.8)	0 (0.0)	1 (5.9)	1 (5.9)	0 (0.0)
Tight	Pre, n (%)	19	11 (57.9)	1 (5.3)	5 (26.3)	0 (0.0)	1 (5.3)	1 (5.3)	0 (0.0)	19	11 (57.9)	3 (15.8)	1 (5.3)	2 (10.5)	0 (0.0)	2 (10.5)	0 (0.0)
	Post, n (%)	17	6 (35.3)	3 (17.6)	6 (35.3)	0 (0.0)	1 (5.9)	1 (5.9)	0 (0.0)	17	6 (35.3)	1 (5.9)	7 (41.2)	1 (5.9)	2 (11.8)	0 (0.0)	0 (0.0)
Dry	Pre, n (%)	19	3 (15.8)	4 (21.1)	6 (31.6)	2 (10.5)	1 (5.3)	3 (15.8)	0 (0.0)	19	3 (15.8)	3 (15.8)	7 (36.8)	1 (5.3)	1 (5.3)	3 (15.8)	1 (5.3)
	Post, n (%)	17	2 (11.8)	5 (29.4)	4 (23.5)	2 (11.8)	1 (5.9)	3 (17.6)	0 (0.0)	17	2 (11.8)	3 (17.6)	4 (23.5)	2 (11.8)	2 (11.8)	3 (17.6)	1 (5.9)
Aching	Pre, n (%)	19	13 (68.4)	3 (15.8)	3 (15.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	19	13 (68.4)	0 (0.0)	3 (15.8)	3 (15.8)	0 (0.0)	0 (0.0)	0 (0.0)
	Post, n (%)	17	8 (47.1)	6 (35.3)	3 (17.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17	8 (47.1)	4 (23.5)	5 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Tickling	Pre, n (%)	19	5 (26.3)	1 (5.3)	5 (26.3)	7 (36.8)	1 (5.3)	0 (0.0)	0 (0.0)	19	5 (26.3)	0 (0.0)	9 (47.4)	1 (5.3)	3 (15.8)	0 (0.0)	1 (5.3)
	Post, n (%)	17	1 (5.9)	4 (23.5)	8 (47.1)	3 (17.6)	1 (5.9)	0 (0.0)	0 (0.0)	17	1 (5.9)	4 (23.5)	5 (29.4)	5 (29.4)	1 (5.9)	1 (5.9)	0 (0.0)
Sore	Pre, n (%)	19	16 (84.2)	2 (10.5)	1 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	19	16 (84.2)	0 (0.0)	2 (10.5)	0 (0.0)	1 (5.3)	0 (0.0)	0 (0.0)
	Post, n (%)	17	14 (82.4)	3 (17.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17	14 (82.4)	3 (17.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Irritable	Pre, n (%)	19	5 (26.3)	4 (21.1)	5 (26.3)	4 (21.1)	0 (0.0)	1 (5.3)	0 (0.0)	19	5 (26.3)	2 (10.5)	4 (21.1)	4 (21.1)	1 (5.3)	3 (15.8)	0 (0.0)
	Post, n (%)	17	5 (29.4)	5 (29.4)	2 (11.8)	3 (17.6)	2 (11.8)	0 (0.0)	0 (0.0)	17	5 (29.4)	3 (17.6)	2 (11.8)	5 (29.4)	2 (11.8)	0 (0.0)	0 (0.0)
Lump	Pre, n (%)	19	8 (42.1)	4 (21.1)	2 (10.5)	1 (5.3)	2 (10.5)	1 (5.3)	1 (5.3)	19	8 (42.1)	2 (10.5)	3 (15.8)	1 (5.3)	1 (5.3)	2 (10.5)	2 (10.5)
	Post, n (%)	17	7 (41.2)	2 (11.8)	3 (17.6)	1 (5.9)	2 (11.8)	2 (11.8)	0 (0.0)	17	7 (41.2)	1 (5.9)	3 (17.6)	1 (5.9)	1 (5.9)	3 (17.6)	1 (5.9)

TABLE 8. Results of the VTDS in professional dancers

		Frequency								Intensity							
		N	0	1	2	3	4	5	6	N	0	1	2	3	4	5	6
Burning	Pre, n (%)	8	2 (25.0)	4 (50.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8	2 (25.0)	0 (0.0)	5 (62.5)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)
	Post, n (%)	6	1 (16.7)	4 (66.7)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	1 (16.7)	2 (33.3)	1 (16.7)	1 (16.7)	1 (16.7)	0 (0.0)	0 (0.0)
Tight	Pre, n (%)	8	1 (12.5)	2 (25.0)	5 (62.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	1 (14.3)	1 (14.3)	3 (42.9)	1 (14.3)	1 (14.3)	0 (0.0)	0 (0.0)
	Post, n (%)	6	2 (33.3)	3 (50.0)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	2 (33.3)	1 (16.7)	1 (16.7)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)
Dry	Pre, n (%)	8	1 (12.5)	2 (25.0)	4 (50.0)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	7	1 (14.3)	0 (0.0)	2 (28.6)	2 (28.6)	2 (28.6)	0 (0.0)	0 (0.0)
	Post, n (%)	6	1 (16.7)	2 (33.3)	2 (33.3)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	1 (16.7)	1 (16.7)	2 (33.3)	0 (0.0)	1 (16.7)	1 (16.7)	0 (0.0)
Aching	Pre, n (%)	8	3 (37.5)	2 (25.0)	1 (12.5)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	8	3 (37.5)	1 (12.5)	1 (12.5)	1 (12.5)	2 (25.0)	0 (0.0)	0 (0.0)
	Post, n (%)	6	2 (33.3)	3 (50.0)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5	2 (40.0)	0 (0.0)	1 (20.0)	0 (0.0)	2 (40.0)	0 (0.0)	0 (0.0)
Tickling	Pre, n (%)	8	2 (25.0)	2 (25.0)	4 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8	2 (25.0)	0 (0.0)	4 (50.0)	1 (12.5)	1 (12.5)	0 (0.0)	0 (0.0)
	Post, n (%)	6	1 (16.7)	3 (50.0)	1 (16.7)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	1 (16.7)	2 (33.3)	1 (16.7)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)
Sore	Pre, n (%)	7	3 (42.9)	2 (28.6)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	3 (42.9)	0 (0.0)	3 (42.9)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)
	Post, n (%)	6	3 (50.0)	2 (33.3)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	3 (50.0)	0 (0.0)	2 (33.3)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)
Irritable	Pre, n (%)	8	2 (25.0)	2 (25.0)	2 (25.0)	2 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	8	2 (25.0)	0 (0.0)	3 (37.5)	1 (12.5)	2 (25.0)	0 (0.0)	0 (0.0)
	Post, n (%)	6	2 (33.3)	2 (33.3)	2 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6	2 (33.3)	1 (16.7)	1 (16.7)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)
Lump	Pre, n (%)	8	2 (25.0)	2 (25.0)	3 (37.5)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	8	2 (25.0)	0 (0.0)	3 (37.5)	2 (25.0)	1 (12.5)	0 (0.0)	0 (0.0)
	Post, n (%)	6	2 (33.3)	2 (33.3)	1 (16.7)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	6	2 (33.3)	0 (0.0)	3 (50.0)	0 (0.0)	1 (16.7)	0 (0.0)	0 (0.0)

TABLE 9. Results of the CPS in professional actors

		Frequency						Intensity		
		N	0	1	2	3	4	N	Mean (SD)	Median (Range)
Headache	Pre n(%)	24	0 (0.0)	22 (91.7)	2 (8.3)	0 (0.0)	0 (0.0)	18	3.9 (1.75)	3.0 (2.0 – 8.0)
	Post n(%)	17	0 (0.0)	15 (88.2)	2 (11.8)	0 (0.0)	0 (0.0)	12	2.8 (1.90)	3.0 (2.0 – 8.0)
Earache	Pre n(%)	23	15 (65.2)	8 (34.8)	0 (0.0)	0 (0.0)	0 (0.0)	18	1.2 (2.04)	0.0 (0.0 – 7.0)
	Post n(%)	17	11 (64.7)	6 (35.3)	0 (0.0)	0 (0.0)	0 (0.0)	12	0.8 (1.42)	0.0 (0.0 – 4.0)
Mandible pain	Pre n(%)	24	21 (87.5)	2 (8.3)	1 (4.2)	0 (0.0)	0 (0.0)	18	0.6 (1.72)	0.0 (0.0 – 7.0)
	Post n(%)	17	12 (70.6)	5 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	12	0.9 (1.44)	0.0 (0.0 – 4.0)
Tongue pain	Pre n(%)	24	23 (95.8)	1 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)	18	0.2 (0.71)	0.0 (0.0 – 3.0)
	Post n(%)	17	17 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	12	0.0 (0.00)	0.0 (0.0 – 0.0)
Sore throat	Pre n(%)	24	0 (0.0)	21 (87.5)	3 (12.5)	0 (0.0)	0 (0.0)	17	3.2 (1.35)	3.0 (1.0 – 6.0)
	Post n(%)	17	1 (5.9)	13 (76.5)	3 (17.6)	0 (0.0)	0 (0.0)	12	3.3 (1.44)	3.0 (2.0 – 6.0)
Neck pain	Pre n(%)	24	4 (16.7)	13 (54.2)	4 (16.7)	3 (12.5)	0 (0.0)	18	2.9 (2.41)	2.5 (0.0 – 8.0)
	Post n(%)	17	2 (11.8)	9 (52.9)	5 (29.4)	1 (5.9)	0 (0.0)	12	3.2 (1.75)	3.0 (0.0 – 6.0)
Shoulder pain	Pre n(%)	24	6 (25.0)	11 (45.8)	4 (16.7)	3 (12.5)	0 (0.0)	18	2.7 (2.61)	2.5 (0.0 – 8.0)
	Post n(%)	17	3 (17.6)	8 (47.1)	5 (29.4)	1 (5.9)	0 (0.0)	12	2.3 (1.83)	2.0 (0.0 – 5.0)
Back pain	Pre n(%)	24	1 (4.2)	15 (62.5)	7 (29.2)	1 (4.2)	0 (0.0)	18	3.8 (1.62)	4.0 (1.0 – 7.0)
	Post n(%)	17	1 (5.9)	8 (47.1)	7 (41.2)	1 (5.9)	0 (0.0)	12	3.5 (1.24)	3.5 (2.0 – 6.0)
Chest pain	Pre n(%)	24	17 (70.8)	5 (20.8)	2 (8.3)	0 (0.0)	0 (0.0)	18	1.0 (1.85)	0.0 (0.0 – 6.0)
	Post n(%)	17	12 (70.6)	3 (17.6)	2 (11.8)	0 (0.0)	0 (0.0)	12	0.7 (1.50)	0.0 (0.0 – 5.0)
Arm pain	Pre n(%)	24	12 (50.0)	9 (37.5)	3 (12.5)	0 (0.0)	0 (0.0)	18	1.8 (2.50)	0.5 (0.0 – 8.0)
	Post n(%)	17	10 (58.8)	5 (29.4)	2 (11.8)	0 (0.0)	0 (0.0)	12	1.3 (1.71)	0.0 (0.0 – 4.0)
Hand pain	Pre n(%)	24	18 (75.0)	5 (20.8)	1 (4.2)	0 (0.0)	0 (0.0)	18	0.6 (1.46)	0.0 (0.0 – 5.0)
	Post n(%)	17	12 (70.6)	4 (23.5)	1 (5.9)	0 (0.0)	0 (0.0)	12	1.0 (1.65)	0.0 (0.0 – 4.0)
Diffuse pain	Pre n(%)	24	18 (75.0)	5 (20.8)	1 (4.2)	0 (0.0)	0 (0.0)	18	0.6 (1.46)	0.0 (0.0 – 6.0)
	Post n(%)	17	14 (82.4)	3 (17.6)	0 (0.0)	0 (0.0)	0 (0.0)	12	0.6 (1.73)	0.0 (0.0 – 6.0)

TABLE 10. Results of the CPS in non-professional actors

		Frequency						Intensity		
		N	0	1	2	3	4	N	Mean (SD)	Median (Range)
Headache	Pre n(%)	19	2 (10.5)	11 (57.9)	5 (26.3)	1 (5.3)	0 (0.0)	15	4.1 (2.34)	5.0 (0.0 – 7.0)
	Post n(%)	17	1 (5.9)	11 (64.7)	4 (23.5)	1 (5.9)	0 (0.0)	12	4.3 (1.78)	4.0 (0.0 – 7.0)
Earache	Pre n(%)	19	12 (63.2)	6 (31.6)	0 (0.0)	0 (0.0)	1 (5.3)	18	1.8 (2.26)	0.0 (0.0 – 6.0)
	Post n(%)	17	14 (82.4)	2 (11.8)	1 (5.9)	0 (0.0)	0 (0.0)	16	0.9 (1.89)	0.0 (0.0 – 5.0)
Mandible pain	Pre n(%)	19	15 (78.9)	2 (10.5)	2 (10.5)	0 (0.0)	0 (0.0)	18	1.2 (2.41)	0.0 (0.0 – 7.0)
	Post n(%)	17	13 (76.5)	3 (17.6)	1 (5.9)	0 (0.0)	0 (0.0)	16	1.3 (2.44)	0.0 (0.0 – 6.0)
Tongue pain	Pre n(%)	19	14 (73.7)	3 (15.8)	2 (10.5)	0 (0.0)	0 (0.0)	16	0.4 (1.09)	0.0 (0.0 – 4.0)
	Post n(%)	17	13 (76.5)	3 (17.6)	1 (5.9)	0 (0.0)	0 (0.0)	15	0.5 (1.13)	0.0 (0.0 – 3.0)
Sore throat	Pre n(%)	19	3 (15.8)	14 (73.7)	1 (5.3)	1 (5.3)	0 (0.0)	16	4.0 (2.13)	4.0 (0.0 – 8.0)
	Post n(%)	16	2 (12.5)	11 (68.8)	3 (18.8)	0 (0.0)	0 (0.0)	13	4.5 (2.30)	4.0 (0.0 – 8.0)
Neck pain	Pre n(%)	19	7 (36.8)	5 (26.3)	5 (26.3)	1 (5.3)	1 (5.3)	17	2.9 (2.46)	3.0 (0.0 – 6.0)
	Post n(%)	17	5 (29.4)	8 (47.1)	2 (11.8)	1 (5.9)	1 (5.9)	13	3.2 (2.82)	3.0 (0.0 – 9.0)
Shoulder pain	Pre n(%)	19	8 (42.1)	4 (21.1)	4 (21.1)	3 (15.8)	0 (0.0)	15	2.2 (2.73)	2.0 (0.0 – 8.0)
	Post n(%)	17	6 (35.3)	6 (35.3)	3 (17.6)	2 (11.8)	0 (0.0)	12	2.7 (2.87)	2.0 (0.0 – 8.0)
Back pain	Pre n(%)	19	4 (21.1)	5 (26.3)	7 (36.8)	2 (10.5)	1 (5.3)	15	4.1 (2.83)	4.0 (0.0 – 8.0)
	Post n(%)	17	4 (23.5)	6 (35.3)	6 (35.3)	1 (5.9)	0 (0.0)	12	3.4 (2.31)	4.0 (0.0 – 6.0)
Chest pain	Pre n(%)	18	7 (38.9)	9 (50.0)	2 (11.1)	0 (0.0)	0 (0.0)	14	1.9 (2.11)	1.5 (0.0 – 7.0)
	Post n(%)	17	8 (47.1)	6 (35.3)	3 (17.6)	0 (0.0)	0 (0.0)	13	1.9 (2.82)	0.0 (0.0 – 10.0)
Arm pain	Pre n(%)	18	14 (77.8)	4 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	15	0.4 (1.06)	0.0 (0.0 – 3.0)
	Post n(%)	17	12 (70.6)	5 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	14	0.8 (1.58)	0.0 (0.0 – 4.0)
Hand pain	Pre n(%)	18	16 (88.9)	0 (0.0)	2 (11.1)	0 (0.0)	0 (0.0)	17	0.2 (0.66)	0.0 (0.0 – 2.0)
	Post n(%)	17	15 (88.2)	0 (0.0)	2 (11.8)	0 (0.0)	0 (0.0)	16	0.3 (0.68)	0.0 (0.0 – 2.0)
Diffuse pain	Pre n(%)	18	13 (72.2)	3 (16.7)	2 (11.1)	0 (0.0)	0 (0.0)	17	1.2 (2.08)	0.0 (0.0 – 5.0)
	Post n(%)	17	15 (88.2)	1 (5.9)	1 (5.9)	0 (0.0)	0 (0.0)	16	0.4 (1.32)	0.0 (0.0 – 5.0)

TABLE 11. Results of the CPS in professional dancers

		Frequency						Intensity		
		N	0	1	2	3	4	N	Mean (SD)	Median (Range)
Headache	Pre n(%)	8	2 (25.0)	6 (75.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	2.3 (2.43)	2.0 (0.0 – 7.0)
	Post n(%)	6	1 (16.7)	5 (83.3)	0 (0.0)	0 (0.0)	0 (0.0)	4	1.5 (1.29)	1.5 (0.0 – 3.0)
Earache	Pre n(%)	7	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	6	0.3 (0.52)	0.0 (0.0 – 1.0)
	Post n(%)	6	5 (83.3)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	5	0.0 (0.00)	0.0 (0.0 – 0.0)
Mandible pain	Pre n(%)	8	5 (62.5)	3 (37.5)	0 (0.0)	0 (0.0)	0 (0.0)	6	0.8 (1.33)	0.0 (0.0 – 3.0)
	Post n(%)	6	5 (83.3)	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	5	0.6 (1.34)	0.0 (0.0 – 3.0)
Tongue pain	Pre n(%)	8	8 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	0.1 (0.38)	0.0 (0.0 – 1.0)
	Post n(%)	6	6 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5	0.0 (0.00)	0.0 (0.0 – 0.0)
Sore throat	Pre n(%)	8	2 (25.0)	4 (50.0)	2 (25.0)	0 (0.0)	0 (0.0)	7	2.0 (1.73)	2.0 (0.0 – 5.0)
	Post n(%)	6	1 (16.7)	5 (83.3)	0 (0.0)	0 (0.0)	0 (0.0)	4	2.3 (1.50)	3.0 (0.0 – 3.0)
Neck pain	Pre n(%)	8	1 (12.5)	5 (62.5)	2 (25.0)	0 (0.0)	0 (0.0)	6	3.2 (2.32)	3.0 (0.0 – 7.0)
	Post n(%)	6	1 (16.7)	3 (50.0)	2 (33.3)	0 (0.0)	0 (0.0)	4	3.5 (2.38)	4.5 (0.0 – 5.0)
Shoulder pain	Pre n(%)	8	2 (25.0)	3 (37.5)	2 (25.0)	1 (12.5)	0 (0.0)	6	3.2 (2.86)	3.5 (0.0 – 6.0)
	Post n(%)	6	1 (16.7)	2 (33.3)	2 (33.3)	1 (16.7)	0 (0.0)	4	3.8 (2.63)	4.5 (0.0 – 6.0)
Back pain	Pre n(%)	8	0 (0.0)	4 (50.0)	4 (50.0)	0 (0.0)	0 (0.0)	6	5.2 (1.72)	5.0 (3.0 – 8.0)
	Post n(%)	6	0 (0.0)	3 (50.0)	2 (33.3)	1 (16.7)	0 (0.0)	4	6.0 (1.41)	6.5 (4.0 – 7.0)
Chest pain	Pre n(%)	8	4 (50.0)	4 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	1.4 (1.99)	0.0 (0.0 – 5.0)
	Post n(%)	6	3 (50.0)	3 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	5	1.2 (1.64)	0.0 (0.0 – 3.0)
Arm pain	Pre n(%)	8	4 (50.0)	4 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	7	1.4 (1.99)	0.0 (0.0 – 5.0)
	Post n(%)	6	2 (33.3)	4 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	5	1.6 (1.67)	2.0 (0.0 – 4.0)
Hand pain	Pre n(%)	8	5 (62.5)	3 (37.5)	0 (0.0)	0 (0.0)	0 (0.0)	7	0.9 (1.86)	0.0 (0.0 – 5.0)
	Post n(%)	6	3 (50.0)	3 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	5	1.0 (1.41)	0.0 (0.0 – 3.0)
Diffuse pain	Pre n(%)	8	3 (37.5)	4 (50.0)	0 (0.0)	1 (12.5)	0 (0.0)	7	1.7 (2.14)	2.0 (0.0 – 6.0)
	Post n(%)	6	1 (16.7)	4 (66.7)	1 (16.7)	0 (0.0)	0 (0.0)	4	2.0 (2.16)	1.5 (0.0 – 5.0)

TABLE 12. Vocal load during the performance

		Professional actors			Non-professional actors			Professional dancers		
		<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>	<i>N</i>	<i>Mean (SD)</i>	<i>Median (Range)</i>
Vocal load – estimation subject		26	61.5 (24.97)	60.0 (20.0 – 120.0)	17	48.5 (29.83)	40.0 (15.0 – 120.0)	8	4.9 (7.12)	1.5 (0.0 – 20.0)
Vocal load – estimation examiner		23	54.4 (15.69)	54.4 (20.0 – 90.0)	19	43.7 (24.71)	30.0 (20.0 – 90.0)	8	3.8 (2.32)	5.0 (0.0 – 5.0)
		<i>n/N</i>	<i>%</i>	<i>% (by examiner) 23/27</i>	<i>n/N</i>	<i>%</i>	<i>% (by examiner) 19/19</i>	<i>n/N</i>	<i>%</i>	<i>% (by examiner) 8/8</i>
Shouting	<i>no</i>	5/26	19.2	8.7	2/17	11.8	5.3	8/8	100.0	75.0
	<i>yes</i>	21/26	80.8	91.3	15/17	88.2	94.7	0/8	0.0	25.0
Laughing	<i>no</i>	2/26	7.7	13.0	3/17	17.6	31.6	4/8	50.0	100.0
	<i>yes</i>	24/26	92.3	87.0	14/17	82.4	68.4	4/8	50.0	0.0
Crying	<i>no</i>	10/25	40.0	43.5	5/17	29.4	36.8	8/8	100.0	100.0
	<i>yes</i>	15/25	60.0	56.5	12/17	70.6	63.2	0/8	0.0	0.0
Coughing	<i>no</i>	20/26	76.9	87.0	9/17	52.9	57.9	8/8	100.0	100.0
	<i>yes</i>	6/26	23.1	13.0	8/17	47.1	42.1	0/8	0.0	0.0
Imitations	<i>no</i>	9/26	34.6	43.5	13/17	76.5	68.4	8/8	100.0	100.0
	<i>yes</i>	17/26	65.4	56.5	4/17	23.5	31.6	0/8	0.0	0.0
Whispering	<i>no</i>	16/26	61.5	60.9	13/17	76.5	73.7	5/8	62.5	50.0
	<i>yes</i>	10/26	38.5	39.1	4/17	23.5	26.3	3/8	37.5	50.0
Physical effort	<i>no</i>	5/26	19.2	39.1	5/17	29.4	52.6	1/8	12.5	0.0
	<i>yes</i>	21/26	80.8	60.9	12/17	70.6	47.4	7/8	87.5	100.0
Dust/smoke	<i>no</i>	11/26	42.3	73.9	14/17	82.4	89.5	8/8	100.0	87.5
	<i>yes</i>	15/26	57.7	26.1	3/17	17.6	10.5	0/8	0.0	12.5
Face paint/make-up	<i>no</i>	20/26	76.9	78.3	15/17	88.2	94.7	7/8	87.5	100.0
	<i>yes</i>	6/26	23.1	21.7	2/17	11.8	5.3	1/8	12.5	0.0
Heavy costumes	<i>no</i>	22/26	84.6	82.6	14/16	87.5	89.5	8/8	100.0	100.0
	<i>yes</i>	4/26	15.4	17.4	2/16	12.5	10.5	0/8	0.0	0.0
Suffering from heat	<i>no</i>	12/26	46.2	43.5	8/17	47.1	21.1	5/8	62.5	37.5
	<i>yes</i>	14/26	53.8	56.5	9/17	52.9	78.9	3/8	37.5	62.5
Smoking	<i>no</i>	23/25	92.0	95.7	15/16	93.8	94.7	8/8	100.0	100.0
	<i>yes</i>	2/25	8.0	4.3	1/16	6.3	5.3	0/8	0.0	0.0
Alcohol	<i>no</i>	24/25	96.0	100.0	15/17	88.2	84.2	8/8	100.0	100.0
	<i>yes</i>	1/25	4.0	0.0	2/17	11.8	15.8	0/8	0.0	0.0

Drinking water before	<i>no</i>	4/25	16.0	/	5/17	29.4	/	1/8	12.5	/
	<i>yes</i>	21/25	84.0	/	12/17	70.6	/	7/8	87.5	/
Drinking water during	<i>no</i>	8/25	32.0	58.3	5/17	29.4	76.9	6/8	75.0	62.5
	<i>yes</i>	17/25	68.0	41.7	12/17	70.6	23.1	2/8	25.0	37.5
Drinking water after	<i>no</i>	3/25	12.0	/	5/17	29.4	/	1/8	12.5	/
	<i>yes</i>	22/25	88.0	/	12/17	70.6	/	7/8	87.5	/
Vocal warm-up	<i>no</i>	11/25	44.0	/	3/17	17.6	/	5/8	62.5	/
	<i>yes</i>	14/25	56.0	/	14/17	82.4	/	3/8	37.5	/
Vocal cool-down	<i>no</i>	23/25	92.0	/	16/17	94.1	/	8/8	100.0	/
	<i>yes</i>	2/25	8.0	/	1/17	5.9	/	0/8	0.0	/



Universitair Ziekenhuis Gent

FORMULIER VAN TOESTEMMING

Ik, ondergetekende, heb de informatiebrief voor deelnemers gelezen en er een kopie van gekregen. Ik stem in met de inhoud van het document en stem ook in deel te nemen aan de studie: de stemkwaliteit van professionele acteurs en de impact van acteren op de stemkwaliteit.

Ik heb een kopie gekregen van dit ondertekende en gedateerde formulier voor toestemming. Ik heb uitleg gekregen over de aard, het doel, de duur, de eventuele voor- en nadelen van de studie en over wat men van mij verwacht.

Men heeft mij ingelicht over het bestaan van een verzekeringspolis in geval er letsel zou ontstaan dat aan de studieprocedures is toe te schrijven.

Ik ben me ervan bewust dat deze studie werd goedgekeurd door een onafhankelijke Commissie voor Medische Ethiek verbonden aan het UZ Gent en dat deze studie zal uitgevoerd worden volgens de richtlijnen voor de goede klinische praktijk (ICH/GCP) en de verklaring van Helsinki, opgesteld ter bescherming van mensen deelnemend aan experimenten. In geen geval was de goedkeuring de aanzet om deel te nemen aan de studie.

Ik mag me op elk ogenblik uit de studie terugtrekken zonder een reden voor deze beslissing op te geven en zonder dat dit een invloed zal hebben op mijn verdere relatie met de onderzoekers.

Men heeft mij ingelicht dat ik recht heb op het verkrijgen van mijn individuele resultaten van de stemtesten en logopedisch advies daaromtrent. Men heeft mij uitgelegd dat mijn resultaten anoniem zullen verwerkt worden voor wetenschappelijke doeleinden, maar aan niemand buiten mezelf zullen doorgegeven worden. Persoonlijke gegevens en gegevens over mijn gezondheid worden verwerkt en bewaard gedurende minstens 20 jaar. Ik stem hiermee in en ben op de hoogte dat ik recht heb op toegang en verbetering van deze gegevens.

Ik begrijp dat het Ethisch Comité of bevoegde overheden mijn gegevens mogelijk willen inspecteren om de verzamelde informatie te controleren. Door dit document te ondertekenen geef ik toestemming voor deze controle. Mijn gegevens zullen daarbij altijd anoniem doorgegeven worden, waarbij mijn naam en adres geheim blijven.

Ik ben bereid op vrijwillige basis deel te nemen aan deze studie.

Naam van de vrijwilliger: _____

Datum: _____

Handtekening:

Naam van de persoon
die voorafgaande uitleg
heeft gegeven: _____

Datum: _____

Handtekening:



Vakgroep Spraak-, Taal- en Gehoorwetenschappen

INFORMATIEBROCHURE



Onderzoek naar de acteursstem en de stemkwaliteit na acteren

1. Algemene informatie Stemkwaliteit bij acteurs

De stemmogelijkheden van acteurs zijn gemiddeld gezien groter dan deze van niet-professionele stemgebruikers. Toch behoren zij tot een risicogroep voor het ontwikkelen van stemproblemen gezien de hoge professionele stembelasting. Acteurs zijn elite vocal performers bij wie het geringste stemprobleem ernstige professionele gevolgen heeft.

Onderzoek naar het stemprofiel van de acteur en het effect van een voorstelling op de stemkwaliteit zal helpen om in de toekomst acteurs met stemproblemen beter te begeleiden.

Doel van het onderzoek

In deze studie wordt nagegaan wat het gemiddeld stemprofiel is van de professionele en niet-professionele acteur en wat de impact is van acteren (na één theatervoorstelling) op de stemkwaliteit. Daarnaast wordt nagegaan of de mogelijke impact enkel te wijten is aan de stembelasting of dat er externe factoren aanwezig zijn. Dit wordt onderzocht aan de hand van het afnemen van hetzelfde protocol bij professionele dansers.

2. Doelgroep

Professionele en niet-professionele acteurs
Professionele dansers

3. Onderzoek

Voor en na een theater- of dansvoorstelling wordt de stemkwaliteit gemeten a.d.h.v. het stemonderzoek volgens het Voice Assessment Protocol (European Study Group On Voice Disorders): geen invasieve onderzoeken, enkel stemopnames en vragenlijsten.

- Anamnese
- Perceptuele beoordeling van de stem
- Aërodynamische metingen
- Acoustic Vocal Quality Index
- Dysphonia Severity Index
- Vragenlijsten (VHI, pijnschaal, Vocal Tract Discomfort Scale en stembelasting tijdens de voorstelling)

4. Frequentie en duur

Frequentie

2: voor en na een voorstelling (van 1 à 2 uur)

Duur van het onderzoek

± half uur per meting

5. Deelname en beëindiging

De deelname aan deze studie vindt plaats op vrijwillige basis. U kan weigeren om deel te nemen aan de studie en u kan zich op elk ogenblik terugtrekken uit de studie zonder dat u hiervoor een reden moet opgeven en zonder dat dit op enigerlei wijze een invloed zal hebben op uw verdere relatie en/of behandeling met de onderzoeker. Als u deelneemt, wordt u gevraagd het toestemmingsformulier te tekenen.

6. Risico's en voordelen

Rekening houdend met de huidige gegevens van de wetenschap, verwachten wij geen enkel risico verbonden met dit onderzoek. U hebt het recht op elk ogenblik vragen te stellen over alle aspecten van het onderzoek. Deze studie werd goedgekeurd door een onafhankelijke Commissie voor Medische Ethiek verbonden aan dit ziekenhuis en wordt uitgevoerd volgens de richtlijnen voor de goede klinische praktijk (ICH/GCP) en de verklaring van Helsinki opgesteld ter bescherming van mensen deelnemend aan klinische studies. In geen geval dient u de goedkeuring door de Commissie voor Medische Ethiek te beschouwen als een aanzet tot deelname aan deze studie.

7. Kosten

Uw deelname aan deze studie brengt uiteraard geen kosten mee voor u. De onderzoeken worden kosteloos uitgevoerd.

8. Vertrouwelijkheid

In overeenstemming met het koninklijk besluit van 8 december 1992 en het koninklijk besluit van 22 augustus 2002, zal u persoonlijke levenssfeer gerespecteerd worden en zal u toegang krijgen tot de verzamelde gegevens. Elk onjuist gegeven kan op uw verzoek verbeterd worden. De resultaten van dit onderzoek zullen verwerkt en gebruikt worden in het kader van wetenschappelijk onderzoek. Hierbij garanderen wij de anonimiteit van elke deelnemer.

9. Verzekering

Conform de wet inzake experimenten op de menselijke persoon van 7 mei 2004 werd voor dit onderzoek een verzekering afgesloten met foutloze aansprakelijkheid.

10. Onderzoekers

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VOICE ASSESSMENT PROTOCOL

Naam: Geslacht: M V

Geboortedatum: Nationaliteit:

Categorie: professionele acteur niet-professionele acteur professionele danser

In te vullen door deelnemer VOOR de voorstelling:

ANAMNESE

Algemeen

Aantal uren voorstellingen per week (gemiddeld):

Aantal uren repetitie per week (gemiddeld):

Type voorstelling:

→ Indien acteur: komedie drama cabaret improvisatie bewegingstheater andere:

→ Indien danser: ballet jazz modern hiphop hedendaags andere:

Duur voorstelling:

Rol: hoofdrol bijrol

→ Indien hoofdrol:

→ Indien bijrol:

Opleiding: nee ja:

Aantal jaren ervaring in het vak:

Bespeelt u een muziekinstrument? nee ja:

Andere hobby's of professionele activiteiten:

Algemene gezondheid

Vermoeidheid/slaaptekort: bijna niet soms frequent

Roken algemeen: nee passief vroeger ja

→ Indien ja: Aantal sigaretten per dag:

Sinds:

Alcohol algemeen: bijna niet soms frequent

→ Gemiddeld aantal consumpties per week:

Verkoudheden: bijna niet soms frequent

Infecties bovenste luchtwegen/ astma: bijna niet soms frequent

Longproblemen: bijna niet soms frequent

Gastro-oesofagale reflux: bijna niet soms frequent

Water drinken (minimum 1,5l/dag) algemeen:	nee	soms	frequent
Allergie:	nee	soms	frequent
Stress:	bijna niet	soms	frequent
Gehoorproblemen:	nee	ja	
Menopauze (bij vrouwen):	nee	ja	

Evaluatie van de stem

Stemklachten algemeen:

Gevoel van irritatie/pijn in de keel:	bijna niet	soms	frequent
Vermoeiend om te spreken:	bijna niet	soms	frequent
Heesheid:	bijna niet	soms	frequent
Ademnood tijdens het spreken:	bijna niet	soms	frequent

Andere:

→ Indien u hierboven 1 of meermaals frequent heeft ingevuld:

Wanneer ontstaan?

Geleidelijk / plots ? wisselend / constant ?

Logopedie gevolgd: nee ja

→ Indien ja: Hoe lang?

Soort therapie:

Stemgebruik algemeen:

Veel en langdurig praten:	bijna niet	soms	frequent
Roepen:	bijna niet	soms	frequent
Keelschrapen:	bijna niet	soms	frequent
Andere stemmetjes:	bijna niet	soms	frequent
Geforceerd / onaangepast stemgebruik:	bijna niet	soms	frequent

Stem bij voorstellingen algemeen:

Stemopwarming voor een voorstelling: nee soms frequent

→ Indien frequent, welke stemoefeningen:

Cool-down oefeningen na een voorstelling: nee soms frequent

→ Indien frequent, welke stemoefeningen:

Stemklachten na een voorstelling: bijna niet soms frequent

→ Indien frequent, welke:

ANAMNESE

Beginuur – einduur van de voorstelling:

Duur stembelasting (schatting):

Veel en langdurig praten:

nee ja

[illegible]

Keelschrapen: nee ja

Geforceerd / onaangepast stemgebruik op de set: nee ja

Lachen: nee ja

Wenen: nee ja

Hoesten: nee ja

Imitations:

Fluisteren: nee ja

[illegible]

Stof/rookmachine: nee ja

Schmink: nee ja

Zware kostuums:

	nee	ja
--	-----	----

Last van warmte op de set: nee ja

→ Indien ja: hoe lang?

Roken tijdens de voorstelling:

	nee	passief	ja
--	-----	---------	----

→ Indien ja: aantal sigaretten?

Alcohol tijdens de voorstelling: nee ja

→ Indien ja: aantal consumpties?

Water drinken voor de voorstelling: nee ja

→ Indien ja: hoeveel liter?

Water drinken tijdens de voorstelling: nee ja

→ Indien ja: hoeveel liter?

Water drinken na de voorstelling: nee ja

→ Indien ja: hoeveel liter?

Stemopwarming voor de voorstelling: nee soms

→ Indien frequent, welke stemoefeningen:

Cool-down oefeningen na de voorstelling: nee ja

→ Indien frequent, welke stemoefeningen:

In te vullen door de onderzoeker VOOR de voorstelling:

SIGNAL-TO-NOISE RATIO:

PERCEPTUEEL

G R B A S I

Intensiteit:	te stil	normaal	te luid
Pitch:	te laag	normaal	te hoog

AERODYNAMISCH

MFT:	norm vrouw: 16.2 s	norm man: 21.8 s
------	--------------------	------------------

AKOESTISCH /A:/

F₀:

Jitter ppq5:

Shimmer local:

NHR:

SFF:

VOICE RANGE PROFILE

I-range:	norm vrouw: 51 – 96 dB	norm man: 50.7 – 97 dB
F-range:	norm vrouw: 142 – 867 Hz	norm man: 85 – 586 Hz

DYSPHONIA SEVERITY INDEX (DSI)

DSI-score:

ACOUSTIC VOICE QUALITY INDEX (AVQI)

Smoothed cepstral peak prominence (CPPS):

Harmonics-to-noise ratio:

Shimmer local:

Shimmer local dB:

Slope of LTAS:

Tilt of trendline through LTAS:

AVQI-score:

In te vullen door de onderzoeker NA de voorstelling:

SIGNAL-TO-NOISE RATIO:

PERCEPTUEEL

G R B A S I

Intensiteit:	te stil	normaal	te luid
Pitch:	te laag	normaal	te hoog

AERODYNAMISCH

MFT:	norm vrouw: 16.2 s	norm man: 21.8 s
------	--------------------	------------------

AKOESTISCH /A:/

F₀:
Jitter ppq5:
Shimmer local:
NHR:
SFF:

VOICE RANGE PROFILE

I-range:	norm vrouw: 51 – 96 dB	norm man: 50.7 – 97 dB
F-range:	norm vrouw: 142 – 867 Hz	norm man: 85 – 586 Hz

DYSPHONIA SEVERITY INDEX (DSI)

DSI-score:

ACOUSTIC VOICE QUALITY INDEX (AVQI)

Smoothed cepstral peak prominence (CPPS):
Harmonics-to-noise ratio:
Shimmer local:
Shimmer local dB:
Slope of LTAS:
Tilt of trendline through LTAS:
AVQI-score:

Papa en Marloes staan op het station.

Ze wachten op de trein.

Eerst hebben ze een kaartje gekocht.

Er stond een hele lange rij, dus dat duurde wel even.

Nu wachten ze tot de trein eraan komt.

Het is al vijf over drie, dus het duurt nog vier minuten.

Er staan nog veel meer mensen te wachten.

Marloes kijkt naar links, in de verte ziet ze de trein al aankomen.

From: van de Weijer and Slis (1991)

STEMBELASTING TIJDENS DE VOORSTELLING (IN TE VULLEN DOOR DE ONDERZOEKER)

Naam: **Geslacht:** **M** **V**

Geboortedatum: **Nationaliteit:**

Categorie: professionele acteur niet-professionele acteur professionele danser

Beginuur – einduur van de voorstelling:

Duur stembelasting (schatting):

Roepen: nee ja

→ Indien ja: hoe lang?

Lachen: nee ja

→ Indien ja: hoe lang?

Wenen: nee ja

→ Indien ja: hoe lang?

Hoesten: nee ja

→ Indien ja: hoe lang?

Imitaties: nee ja

→ Indien ja: hoe lang?

Fluisteren: nee ja

→ Indien ja: hoe lang?

Fysieke inspanning: nee ja

→ Indien ja: hoe lang?

Hydratatie: nee ja

→ Indien ja: hoeveel?

Alcohol : nee ja

→ Indien ja: hoeveel?

Roken: nee ja

→ Indien ja: hoe lang?

Stof/rookmachine: nee ja

→ Indien ja: hoe lang?

Schmink: nee ja

→ Indien ja: hoe lang?

Zware kostuums: nee ja

→ Indien ja: hoe lang?

Last van warmte op de set: nee ja

→ Indien ja: hoe lang?

NEDERLANDSE VERSIE VAN DE VOICE HANDICAP INDEX (DE BODT ET AL., 2000)

Dit zijn uitspraken die mensen gebruiken om hun stem en effecten van hun stem op hun leven te beschrijven. Geef voor elke uitspraak aan hoe vaak u dezelfde ervaring heeft, door het meest passende antwoord te omcirkelen.

0 - Nooit, 1 - Bijna nooit, 2 - Soms, 3 - Bijna altijd, 4 - Altijd

F1 - Mijn stem maakt het moeilijk voor mensen om me te kunnen horen.	0	1	2	3	4
P2 - Ik raak buiten adem bij het spreken.	0	1	2	3	4
F3 - Mensen verstaan me moeilijk in een lawaaierige omgeving.	0	1	2	3	4
P4 - Het geluid van mijn stem varieert gedurende de dag.	0	1	2	3	4
F5 - Mijn familieleden hebben problemen me te horen wanneer ik roep in huis.	0	1	2	3	4
F6 - Ik vermijd het gebruik van de telefoon.	0	1	2	3	4
E7 - Ik ben nerveus wanneer ik met anderen spreek, vanwege mijn stem.	0	1	2	3	4
F8 - Ik ben geneigd groepen mensen te vermijden vanwege mijn stem.	0	1	2	3	4
E9 - Mensen lijken geïrriteerd door mijn stem.	0	1	2	3	4
P10 - Mensen vragen "wat is er met je stem aan de hand?"	0	1	2	3	4
F11 - Ik vermijd een gesprek met vrienden, burens en kennissen vanwege mijn stem.	0	1	2	3	4
F12 - Wanneer ik alleen met iemand spreek, vragen ze het gezegde te herhalen.	0	1	2	3	4
P13 - Mijn stem klinkt krakerig en droog.	0	1	2	3	4
P14 - Het voelt alsof ik moeite moet doen voor mijn stemgeluid.	0	1	2	3	4
E15 - Ik heb het gevoel dat andere mensen mijn stemproblemen niet begrijpen.	0	1	2	3	4
F16 - Mijn stemproblemen beperken mijn persoonlijke en sociale leven.	0	1	2	3	4
P17 - De helderheid van mijn stem is onvoorspelbaar.	0	1	2	3	4
P18 - Ik probeer mijn stem te veranderen om anders te klinken.	0	1	2	3	4
F19 - Ik heb het gevoel dat ik buiten gesprekken word gelaten vanwege mijn stem.	0	1	2	3	4
P20 - Ik moet mij inspannen om te spreken.	0	1	2	3	4
P21 - Mijn stem is 's avonds slechter.	0	1	2	3	4
F22 - Door mijn stem verlies ik inkomen.	0	1	2	3	4
E23 - Mijn stemprobleem maakt me van streek.	0	1	2	3	4
E24 - Ik uit mij minder vanwege mijn stemprobleem.	0	1	2	3	4
E25 - Door mijn stem voel ik me gehandicapt.	0	1	2	3	4
P26 - Mijn stem verzwakt tijdens het spreken.	0	1	2	3	4
E27 - Het ergert me wanneer mensen me vragen iets te herhalen.	0	1	2	3	4
E28 - Ik voel me gegeneerd wanneer mensen me moeten vragen iets te herhalen.	0	1	2	3	4
E29 - Door mijn stem voel ik mij onbekwaam.	0	1	2	3	4
E30 - Ik schaam me vanwege mijn stemprobleem.	0	1	2	3	4

Kunt u tenslotte omcirkelen hoe uw stem vandaag is:

- ☐ Goed
- ☐ Redelijk
- ☐ Matig
- ☐ Slecht

Score F:	/40
Score E:	/40
Score P:	/40

NEDERLANDSE VERTALING VAN DE VOCAL TRACT DISCOMFORT SCALE (LUYTEN ET AL., 2015)

Gelieve bij elk van de onderstaande gewaarwordingen aan te geven hoe frequent deze ervaring voorkomt en in welke mate u deze ervaart. Hieronder vindt u enige uitleg over de door ons gebruikte begrippen.

Branderig: gloeiend en ontstoken

Geknepen: spanning ter hoogte van de keel

Droog: schurend

Zeurende pijn: continue, doffe, oppervlakkige pijn

Kriebelend: tintelend gevoel dat niet overgaat bij het stem geven of hoesten

Stekende pijn: plots opkomende pijn bij het stem geven of bij het aanraken van de keel

Geïrriteerd: prikkelend, warm

Globusgevoel: gevoel van een “brok in de keel” waardoor men de neiging heeft te hoesten, de keel te schrapen of te slikken

Frequentie van voorkomen waarbij:

0 = nooit

1 = zelden

2 = soms

3 = meer dan soms

4 = vaak

5 = heel vaak

6 = altijd

Hoe hoger het cijfer, hoe hoger de frequentie

Intensiteit van voorkomen waarbij:

0 = geen gewaarwording

1 = bijna geen gewaarwording

2 = geringe gewaarwording

3 = meer dan geringe gewaarwording

4 = matige gewaarwording

5 = meer dan matige gewaarwording

6 = ernstige gewaarwording

Hoe hoger het cijfer, hoe hoger de intensiteit

Branderig	0	1	2	3	4	5	6
Geknepen	0	1	2	3	4	5	6
Droog	0	1	2	3	4	5	6
Zeurende pijn	0	1	2	3	4	5	6
Kriebelend	0	1	2	3	4	5	6
Stekende pijn	0	1	2	3	4	5	6
Geïrriteerd	0	1	2	3	4	5	6
Globusgevoel	0	1	2	3	4	5	6

0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6
0	1	2	3	4	5	6

PIJNSCHAAL (VAN LIERDE ET AL., 2010)

Hieronder volgen 12 pijnsymptomen. Geef voor elk pijnsymptoom aan hoe vaak u deze ervaring heeft, door een kruisje te plaatsen in de kolom van het meest passende antwoord. Vervolgens geeft u in de laatste kolom de intensiteit waarmee u deze pijn ervaart aan met een cijfer van 0 tot en met 10 (0 = geen pijn, 10 = zeer hevige pijn).

	Nooit	Soms	Vaak	Bijna altijd	Altijd	Intensiteit
Hoofdpijn						
Oorpijn						
Pijn aan de kaak						
Pijn aan de tong						
Keelpijn						
Nekpijn						
Schouderpijn						
Rugpijn						
Pijn in de borststreek						
Armpijn						
Handpijn						
Diffuse pijn						



Universitair Ziekenhuis Gent

INFORMED CONSENT

I, the undersigned, have read the information letter for participants and got a copy of it. I agree with the content and I agree to participate in the study: the voice quality of professional actors and the influence of acting on the voice.

I've got a copy of this signed and dated permission of participation. The researchers informed me about the type, the purpose, the time span, the possible advantages and disadvantages and their expectations.

They reported that there exist an insurance policy in case of injuries due to the procedures of the study.

I am aware that this study was approved by an independent medical ethics committee related to the Ghent University Hospital and that this study will be accomplished according to good clinical practice guidelines (ICH/GCP) and the Declaration of Helsinki, which is drafted to protect participants of experiments. In any case, this approval urged me to take part in this study.

At any moment I can withdraw from the study without giving a reason for this decision. This won't have an influence on my further relationship with the researchers.

They informed me that I can obtain my individual results of the tests and therapeutic advice thereon. I know that my results will be processed anonymously for academic purposes, but won't be passed on to anyone but myself. Personal information and data about my health will be processed and kept during at least 20 years. I accept this and I am aware that I have access to the information and I may correct this.

I understand that the ethics committee or authoritative sources will possibly inspect my data to verify the collected information. By signing this document I give permission for this check. My data will always be passed on anonymously, where my name and my address will remain secret.

I am prepared to participate voluntarily in this study.

Name of the volunteer: _____ Date: _____

Signature:

Name of the investigator
who gave the preceding

explanation: _____ Date: _____

Signature:

Department Speech, Language and Hearing Sciences

INFORMATION LEAFLET



Research on the vocal quality in
theatre actors and the influence of a
performance on the voice

1. General information

Vocal quality in theatre actors

The voice possibilities of professional actors are averagely bigger than those of non-professional voice users. Nevertheless they are at risk of developing voice problems due to high professional voice load. Actors are elite vocal performers to whom the littlest vocal issue can have serious professional consequences. Research into the vocal profile of actors and the impact of a performance on the vocal quality will help to support actors with voice disorders in the future.

Purpose of the research

We aim to study the average vocal profile of professional and non-professional actors and the impact of acting (after one performance) on the vocal quality. We'd like to investigate if the possible impact is only due to the vocal load or maybe to external factors like stress. To observe this, we examine professional dancers using the same protocol.

2. Target group

Professional and non-professional theatre actors
Professional dancers

3. Examination

The vocal quality will be measured before and after a theatre or dance performance using the Voice Assessment Protocol (European Study Group On Voice Disorders). This doesn't include invasive examinations, only following voice recordings and questionnaires:

- Anamnesis
- Perceptual evaluation of the voice
- Aerodynamic measurements
- Acoustic Vocal Quality Index
- Dysphonia Severity Index
- Questionnaires: VHI, Pain Scale, Vocal Tract Discomfort Scale + Vocal Load during the Performance

4. Frequency and duration

Frequency

2: before and after a performance (60 minutes to 120 minutes)

Duration of the examination

± half an hour for one measurement

5. Participation and termination

The participation in this study is voluntarily. You can refuse to take part and you can withdraw from the study at any moment without giving a reason for this decision. This won't have an influence on the further relationship with the researcher. If you decide to participate, you will be asked to sign the informed consent.

6. Risks and advantages

When we consider the current scientific knowledge, we don't expect any risk associated with this research. At any moment, you can ask questions about all aspects of the research. This study was approved by an independent medical ethics committee related to the Ghent University Hospital and will be accomplished according to good clinical practice guidelines (ICH/GCP) and the Declaration of Helsinki, which is drafted to protect participants of experiments. In any case, this approval isn't an incentive to take part in this study.

7. Costs

Your participation obviously won't cost you anything. The examinations will be performed free of charge.

8. Confidence

In accordance with the Royal Decree of the 8th of December 1992 en the Royal Decree of the 22th August 2002, your privacy will be respected and you will have access to the collected data. Every incorrect information can be adjust on your request. The results of this research will be implemented and used as a part of scientific research. We guarantee the anonymity of each participant.

9. Insurance

According to the law on human experiments of the 7th of May 2004, there is taken out an insurance policy with errorless liability.

10. Researchers

Researchers:

Julie Daelman
jldaelma.daelman@ugent.be

Clara Leyns
clara.leyns@ugent.be

Contact:

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De Pintelaan 185
9000 Gent
E-mail: Evelien.Dhaeseleer@ugent.be
Tel: 09/332 24 67

VOICE ASSESSMENT PROTOCOL

Name:..... Gender: M F

Birth date:..... Nationality:.....

Category: professional actor non-professional actor professional dancer

To be filled in by the participant BEFORE the performance:

QUESTIONNAIRE

General information

Number of hours of performances per week (average):

Number of hours of rehearsals per week (average):

Type of performance:

→ If actor: comedy drama cabaret improvisation physical theatre other:.....

→ If dancer: ballet jazz modern hiphop other:.....

Duration of the performance:

Role: leading actor supporting actor

→ If leading role:

→ If supporting role:

Specific education: no yes:

Years of experience:

Do you play a music instrument? no yes:

Other hobbies or professional activities:

General health

Fatigue/sleep deprivation: hardly sometimes frequently

Smoking in general: no passive previously yes

→ If yes: Number of cigarettes per day:

Since:

Alcohol in general: hardly sometimes frequently

→ Average number of consumptions per week:

Colds: hardly sometimes frequently

Upper respiratory tract infections / asthma: hardly sometimes frequently

Lung problems: hardly sometimes frequently

Gastro-oesophageal reflux: hardly sometimes frequently

To be filled in by the participant AFTER the performance:

QUESTIONNAIRE

Vocal use during the performance:

Start time – end time of the performance:.....

Duration voice load (estimate):

Talking a lot and for a long time:

	no	yes
--	----	-----

Shouting: no yes

Throat clearing:	no	yes
------------------	----	-----

Forced / inadequate use of the voice on the set: no yes

Laughing: no yes

Crying: no yes

Coughing: no yes

Imitations: no yes

Whispering: no yes

Physical effort: no yes

Dust/smoke machine:	no	yes
---------------------	----	-----

Face paint/ Make-up: ☐ no ☐ yes

Heavy costumes:	no	yes
-----------------	----	-----

Suffering from heat on the set:

	no	yes
--	----	-----

→ If yes: how long?

Smoking during the performance:	no	passive	yes
no	1	0	0
passive	0	1	0
yes	0	0	1

→ If yes: number of cigarettes?

Alcohol during the performance: no yes

→ If yes: number of consumptions?

	no	yes
Drinking water before the performance:		

→ If yes: how many litres?

Drinking water during the performance:	no	yes
--	----	-----

→ If yes: how many litres?

Drinking water after the performance: no yes

→ If yes: how many litres?

Voice warm-up before the performance: no yes

→ If yes: which voice exercises:

Cool-down exercises after the performance: no yes

→ If yes, which voice exercises:

The North Wind and the Sun were disputing which was the stronger, when a traveller came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the traveller take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveller fold his cloak around him; and at last the North Wind gave up the attempt. Then the Sun shined out warmly, and immediately the traveller took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two.

VOICE HANDICAP INDEX (JACOBSON ET AL., 1997)

These are statements that many people have used to describe their voices and the effects of their voices on their lives. Check the response that indicates how frequently you have the same experience.

0 – Never, 1 – Almost never, 2 – Sometimes, 3 – Almost always, 4 – Always

F - My voice makes it difficult for people to hear me.	0	1	2	3	4
P - I run out of air when I talk.	0	1	2	3	4
F - People have difficulty understanding me in a noisy room.	0	1	2	3	4
P - The sound of my voice varies throughout the day.	0	1	2	3	4
F - My family has difficulty hearing me when I call them throughout the house.	0	1	2	3	4
F - I use the phone less often than I would like.	0	1	2	3	4
E - I'm tense when talking with others because of my voice.	0	1	2	3	4
F - I tend to avoid groups of people because of my voice.	0	1	2	3	4
E - People seem irritated with my voice.	0	1	2	3	4
P - People ask : "What is wrong with your voice?"	0	1	2	3	4
F - I speak with friends, neighbours, or relatives less often because of my voice.	0	1	2	3	4
F - People ask me to repeat myself when speaking face-to-face.	0	1	2	3	4
P - My voice sounds creaky and dry.	0	1	2	3	4
P - I feel as though I have to strain to produce voice.	0	1	2	3	4
E - I find other people don't understand my voice problem.	0	1	2	3	4
F - My voice difficulties restrict my personal and social life.	0	1	2	3	4
P - The clarity of my voice is unpredictable.	0	1	2	3	4
P - I try to change my voice to sound different.	0	1	2	3	4
F - I feel left out of conversations because of my voice.	0	1	2	3	4
P - I use a great deal of effort to speak.	0	1	2	3	4
P - My voice is worse in the evening.	0	1	2	3	4
F - My voice problem causes me to lose income.	0	1	2	3	4
E - My voice problem upsets me.	0	1	2	3	4
E - I am less out-going because of my voice problem.	0	1	2	3	4
E - My voice makes me feel handicapped.	0	1	2	3	4
P - My voice "gives out" on me in the middle of speaking.	0	1	2	3	4
E - I feel annoyed when people ask me to repeat.	0	1	2	3	4
E - I feel embarrassed when people ask me to repeat.	0	1	2	3	4
E - My voice makes me feel incompetent.	0	1	2	3	4
E - I'm ashamed of my voice problem.	0	1	2	3	4

Please circle the word that matches how you feel your voice is today:

- ☐ Normal
- ☐ Mild
- ☐ Moderate
- ☐ Severe

Score F:	/40
Score E:	/40
Score P:	/40

VOCAL TRACT DISCOMFORT SCALE (MATHIESON ET AL., 2009)

The following are symptoms or sensations that you may feel in your throat, which may occur as part of your voice problem. Please indicate the frequency with which they occur and the severity of the symptom/ sensation, by circling a number in the appropriate column.

Frequency of sensation / symptom

0 = never

1 = seldom

2 = sometimes

3 = more than sometimes

4 = often

5 = very often

6 = always

Severity of sensation / symptom

0 = none

1 = almost none

2 = mild

3 = more than mild

4 = moderate

5 = more than moderate

6 = extreme

Burning	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Tight	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Dry	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Aching	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Tickling	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Sore	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Irritable	0	1	2	3	4	5	6	0	1	2	3	4	5	6
Lump in the throat	0	1	2	3	4	5	6	0	1	2	3	4	5	6

CORPORAL PAIN SCALE (VAN LIERDE ET AL., 2010)

Here are 12 pain symptoms. Please indicate for each symptom how often you experience that sensation by checking off the column of the most proper answer. In the last column you can give the intensity of the pain with a number from zero to ten (0 = no pain, 10 = extreme pain).

	Never	Sometimes	Often	Almost always	Always	Intensity
Headache						
Earache						
Mandible pain						
Tongue pain						
Sore throat						
Neck pain						
Shoulder pain						
Back pain						
Chest pain						
Arm pain						
Hand pain						
Diffuse pain						

GEZOCHT

Professionele/niet-professionele acteurs
en professionele dansers

WANTED

Professional/non-professional actors
and professional dancers



WIE ZIJN WE

Wij zijn Julie en Clara, studentes master Logopedie aan universiteit Gent. Voor onze masterproef zijn wij op zoek naar personen die willen deelnemen aan ons onderzoek.



WHO ARE WE

We are Julie and Clara, students MSc Speech, Language and Hearing Sciences (Logopaedics) at the University of Ghent. In order to complete our masterthesis we are looking for some volunteers to participate in our study.

WAT DOEN WE

We onderzoeken de stemkwaliteit van acteurs en de impact van een voorstelling op de stem. Daarnaast gaan we na of dat enkel te wijten is aan de stembelasting of door invloed van externe factoren. Daarvoor vergelijken we de resultaten van de acteurs met die van professionele dansers.



WHAT ARE WE DOING

We examine the vocal quality of actors and the influence of performance on the vocal quality. In addition, we examine whether this is only caused by the voice load or by the influence of external factors. Therefore we compare the results of the actors with those of professional dancers.



WIE ZOEKEN WE

We zijn op zoek naar professionele acteurs (acteren is je job) en niet-professionele acteurs, die enthousiast zijn om deel te nemen aan onze masterproef. Ook rekruteren we professionele dansers, aangezien jullie onze controlegroep vormen.



WHO DO WE NEED

We are looking for professional actors (acting is your job) and non-professional actors, who are eager to participate in our study. Likewise, we recruit professional dancers, as you are our control group.



WAT MOET JE DOEN

We verwachten van jou dat je zowel voor als na de voorstelling een kwartiertje tijd vrijmaakt voor ons. Gedurende deze 15 minuten willen we meer te weten komen over je stemgebruik en nemen we een stemonderzoek af.



WHAT CAN YOU DO

We expect you to make time before and after the performance for about 15 minutes. During these 15 minutes we want to learn more about the use of your voice and we do a voice assessment.



Wil jij graag meewerken of ken je iemand?
Aarzel dan niet om ons te contacteren. Bedankt!

Do you want to participate or do you know someone who will? Please contact us. Thanks!

GEZOCHT

professionele dansers

WANTED

professional dancers



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We examine the vocal quality of actors and the influence of performance on the vocal quality. In addition, we examine whether this is only caused by the voice load or by the influence of external factors. Therefore we compare the results of the actors with those of professional dancers.



WIE ZOEKEN WE

We zijn op zoek naar professionele dansers (dansen is je job), die enthousiast zijn om deel te nemen aan onze masterproef.



WHO DO WE NEED

We are looking for professional dancers (dancing is your job) who are eager to participate in our study.

WAT MOET JE DOEN

We verwachten van jou dat je zowel voor als na de voorstelling een kwartiertje tijd vrijmaakt voor ons. Gedurende deze 15 minuten willen we meer te weten komen over je stemgebruik en nemen we een stemonderzoek af.



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