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SINGING VOICE HANDICAP IN THE CROATIAN AMATEUR AND PROFESSIONAL CLASSICAL SINGERS

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SUMMARY: The aim of the study was to describe singing voice handicap in the Croatian professional and amateur classical singers. This cross-sectional study included 69 professionals (median age 47.5 interquartile range 42.0-55.8 years) and 41 amateurs (median age 30.0, interquartile range 25.0-41.0 years). Participants completed the Croatian version of the Singing Voice Handicap Index (SVHI-36), self-rated the severity of singing voice problem on another scale and answered questions about their age, gender, voice type and self-perceived average number of singing hours per week in the past three months. Cronbach's alpha of the Croatian version of the SVHI was 0.97 in amateurs, and 0.98 in professionals. SVHI scores significantly differed across the categories of self-perceived singing voice problem in amateurs (P=0.001) and professionals (P<0.001). Median SVHI score was 16.7 (interquartile range 7.6-29.2) in amateurs and 13.8 (interquartile range 5.9-30.2) in professionals. Higher SVHI score was associated with more severe self-perceived singing voice problem in amateurs (ρ=0.63, P<0.001) and professionals (ρ=0.68, P<0.001). Amateurs and professionals did not significantly differ in the self-perceived singing voice problem (P=0.698), nor the SVHI score (P=0.538). Compared to the professionals, amateurs more often reported voice breaks (P=0.009) and the trouble with loud singing (P=0.020), and were less concerned about losing money because of their singing problems (P=0.022). Croatian classical singers mostly had mild singing voice problems. Voice difficulties in amateurs indicate the importance of learning vocal technique. It is necessary to balance work commitments with vocal rest to preserve workability in professional classical singers.

Key words: *questionnaire, score, self-assessment, voice disorders, workability*

INTRODUCTION

Singing is a risk factor for voice disorders, particularly when it is excessive *(Prebil et al., 2020)*. Too long rehearsals and performances affect the vocal cords and cause vocal fatigue. Singers who are more sensitive to vocal fatigue become frustrated with their singing voice *(Arunachalam, 2014, Carroll et al., 2006, Onofre et al., 2021)*. Professional classical singers are usually educated to use specific vocal technique *(Mitchell et al., 2004)* that reduces vocal fatigue during singing and delays the onset of voice complaints (*Broaddus-Lawrence et al., 2000)*. Classical singing requires high vocal control in order to be able to sing long phrases, produce specific voice timbre and change dynamics or laryngeal registers. Inadequate training, poor vocal hygiene, smaller size of the classical ensemble, solo vocal performances and complex singing program increase their vo-

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cal demands and a risk of voice handicap *(Rubin & Codino, 2019)*. Amateur classical singers usually have limited knowledge of voice ergonomics *(Ravall & Simberg, 2020)* and vocal tract anatomy and physiology *(Sielska-Badurek, Osuch-Wojcikiewicz et al., 2017)*. In that case, prolonged vocal misuse causes vocal hyperfunction. It refers to the vocal cord dysfunction and the compensating laryngeal muscle activation causing vocal fold nodules, oedema and muscle tension dysphonia *(Galindo et al., 2017)*. Such problems significantly impact singers' quality of life *(Andrea et al., 2018)* and work ability *(Phyland & Miles, 2019)*.

The Singing Voice Handicap Index (SVHI) is a widely accepted self-administered questionnaire for measuring the social, emotional, physical and economic impact of singing voice problems *(Baracca et al., 2014, Denizoglu et al., 2016., Garcia-Lopez et al., 2010, Ghaemi et al., 2020., Gunjawate et al., 2017, Sielska Badurek, Sobol et al., 2017)*. It was originally created in 2007 by Cohen et al., and validated among professional and amateur singers with various singing styles (classical, country, choral, pop, rock, gospel). The severity of singers' voice handicap is quantified by the SVHI score. This score positively correlates with a severity of voice problems, and could be calculated regardless of the clinical examination. Linguistic validation of non-English versions could improve further evaluation of the singing voice handicap, and provide an objective measure of the self-assessed effects of voice therapy in clinical practice *(Cohen et al., 2008)*.

The aim of the study was to describe the singing voice handicap in the Croatian professional and amateur classical singers by using the Croatian translation of the SVHI.

PARTICIPANTS AND METHODS

This cross-sectional validation study included two groups of classical choir singers who were at high risk of voice handicap. There were 41 (15 males, 26 females) singers from two amateur choirs (Chamber choir Ivan Filipović, Zagreb and Oratory choir of St. Mark's Church, Zagreb) in one group, and 69 professional (35 males, 34 females) singers from two professional choirs (Opera choirs of the Croatian National Theatre Opera in Zagreb and the Croatian National Theatre Ivan pl. Zajc in Rijeka) in the other. Amateurs' median age was 30.0 (interquartile range 25.0-41.0) years, and professionals' was 47.5 (interquartile range 42.0-55.8) years. Research leader visited each of the four choirs, and informed available participants about the study. Participants gave their consent by completing the SVHI. As in the original, the Croatian translation (Supplement 1) consisted of 36 items scored on a 5-point Likert type scale (0=never, 1=almost never, 2=sometimes, 3=almost always, 4=always). The raw scores were scaled from 0 to 144. The final SVHI score had a range from 0 to 100 which was obtained by dividing each raw score by 144 and then multiplying it by 100. The highest score represented more self-perceived handicap in singers *(Cohen et al., 2007)*. All participants additionally answered questions about their age, sex, and self-perceived average number of singing hours per week in the past three months. They also self-rated the severity of their singing voice problem on a 4-point Likert type scale (0=no problem, 1=mild problem, 2=moderate problem, 3=severe problem).

The study was approved by the Ethical Committee of the School of Medicine University of Zagreb.

Validity

The questionnaire linguistic validation from English to Croatian language was performed by a professional translator, who was a native Croatian speaker. The Croatian translation was discussed by two occupational medicine specialists, two professional and two amateur classical singers. At that time, they were not familiar with the original versions of SVHI. Suggestions were implemented and back translated in English by another professional translator, who compared it with the original. Third translator translated the English version into Croatian, which was used as a final version for this research. Translators were not aware of the aim of the study.

All participants (N=110) completed the questionnaire in 5-10 minutes without any assistance or questions regarding the translated statements. During filling out the SVHI, participants were encouraged to claim the ambiguities related to the content of translated questionnaire.

Reliability

The internal consistency of the Croatian version of the SVHI was determined by Cronbach's alpha in each group of participants. The Cronbach's alpha of the questionnaire was 0.97 in the group of amateur singers and 0.98 in the group of professional singers.

Statistical analysis

Continuous data (age, SVHI score, self-perceived severity of singing voice problems, and self-perceived average number of singing hours) distribution was assessed by Kolmogorov-Smirnov test. According to the test results, continuous data were represented as medians with corresponding interquartile ranges (IQRs). Mann-Whitney *U* test was used to assess differences in continuous variables (age, SVHI score, self-perceived severity of singing voice problems, and self-perceived average number of singing hours) between groups. Categorical data (sex) were represented as absolute frequencies. Strength and direction of the association between variables was assessed by Spearman's correlation. All P values below 0.05 were considered significant. IBM SPSS Statistics version 25.0 was used in all statistical procedures.

RESULTS

Kruskal-Wallis *H* test was used to examine a difference of the SVHI scores between self-perceived severity categories (0=no problem, 1=mild problem, 2=moderate problem, 3=severe problem) in each group of participants. SVHI scores significantly differed across the categories of self-perceived singing voice problem in amateurs (P=0.001) and professionals (P<0.001). The criterion validity was determined by assessing Spearman's correlation between final SVHI scores and self-perceived severity of the singing voice problem. Higher SVHI score was associated with more severe self-perceived singing voice problem among amateurs (ρ=0.63, P<0.001) and professionals (ρ=0.68, P<0.001).

Final median SVHI score was 16.7 (IQR 7.6-29.2) among amateurs and 13.8 (IQR 5.9-30.2) among professionals. Amateurs and professionals did not significantly differ in the self-perceived singing voice problem (P=0.698) nor the SVHI score (P=0.538). More detailed information on the self-rated severity of the singing voice problem and SVHI scores is shown in Table 1.

Table 1. Self-rated severity of the singing voice problem and SVHI scores

Tablica 1. Samoprocjena težine problema s pjevačkim glasom i SVHI rezultata

	AMATEURS N=41		PROFESSIONALS N=69	
	N	**SVHI score (IQR)**	**N**	**SVHI score (IQR)**
No problem	19	8.3 (4.9-16.7)	33	7.6 (3.1-13.9)
Mild problem	18	26.4 (13.0-34.7)	23	16.7 (10.4-27.1)
Moderate problem	3	27.8 (18.1-53.5)	6	45.5 (33.3-53.8)
Severe problem	1	65.3	7	66.0 (48.6-79.2)

IQR – interquartile range

The amateurs reported 6 singing hours (IQR 5.0-8.0) per week and the professionals 24 (IQR 18.0-30.0). Compared to professionals, amateurs were significantly younger (P<0.001) and reported fewer singing hours per week in the past three months (P<0.001). Among professional singers, the age was negatively associated with singing hours indicating that with increasing age professional singers spend less hours per week singing (ρ=-0.30, P=0.013). In amateurs, the age was positively associated with reporting more severe singing voice problem (ρ=0.34, P=0.028), while such association was not found in professionals.

Compared to the professionals, amateur singers reported voice breaks more often (P=0.009), had more frequent trouble with loud singing (P=0.020), and were less concerned about losing money because of their vocal issues (P=0.022). Amateurs reported voice breaks regardless of the age, gender, voice type and the number of singing hours. Those amateurs who reported less singing hours had more trouble with loud singing (ρ=-0.39, P=0.013), while professionals who reported less singing hours had more trouble with controlling the raspiness in the voice (ρ=-0.27, P=0.026). More detailed information on the frequency of experiencing singing voice problems is shown in Table 2.

Table 2. Frequency* of experiencing singing voice problems

Tablica 2. Učestalost* problema s pjevačkim glasom

SVHI statements	AMATEURS N=41	PROFESSIONALS N=69	P**
	Median (IQR)		
1) It takes a lot of effort to sing.	2.0 (1.0-3.0)	2.0 (1.0-2.0)	0.147
2) My voice cracks and breaks	**1.0 (1.0-2.0)**	**1.0 (0.0-1.0)**	**0.009**
3) I am frustrated by my singing.	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.494
4) People ask "What is wrong with your voice?" when I sing.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.906
5) My ability to sing varies day to day.	1.0 (0.5-2.0)	1.0 (1.0-2.0)	0.945
6) My voice "gives out" on me while I am singing.	1.0 (0.5-1.5)	1.0 (0.0-1.0)	0.180
7) My singing voice upsets me.	1.0 (0.0-2.0)	0.0 (0.0-2.0)	0.894
8) My singing problems make me not want to sing/perform.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.094
9) I am embarrassed by my singing.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.874
10) I am unable to use my "high voice."	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.717
11) I get nervous before I sing because of my singing problems.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.381
12) My speaking voice is not normal.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.191
13) My throat is dry when I sing.	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.731
14) I've had to eliminate certain songs from my singing/performances.	0.0 (0.0-1.0)	1.0 (0.0-1.0)	0.227
15) I have no confidence in my singing voice.	1.0 (0.0-1.0)	0.0 (0.0-1.0)	0.747
16) My singing voice is never normal.	1.0 (0.0-1.0)	1.0 (0.0-1.0)	0.750
17) I have trouble making my voice do what I want it to.	1.0 (0.0-1.0)	1.0 (0.0-2.0)	0.497
18) I have to "push it" to produce my voice when singing.	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.441
19) I have trouble controlling the breathiness in my voice.	1.0 (0.0-2.0)	0.0 (0.0-1.0)	0.117
20) I have trouble controlling the raspiness in my voice.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.919
21) I have trouble singing loudly.	**1.0 (0.0-2.0)**	**0.0 (0.0-1.0)**	**0.020**
22) I have difficulty staying on pitch when I sing.	1.0 (0.0-2.0)	1.0 (0.0-1.0)	0.895
23) I feel anxious about my singing.	1.0 (0.0-2.0)	0.0 (0.0-2.0)	0.529
24) My singing sounds forced.	1.0 (0.0-1.0)	0.0 (0.0-1.0)	0.065
25) My speaking voice is hoarse after I sing.	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.761
26) My voice quality is inconsistent.	1.0 (0.5-2.0)	1.0 (0.0-1.0)	0.169
27) My singing voice makes it difficult for the audience to hear me.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.848
28) My singing makes me feel handicapped.	1.0 (0.0-1.0)	0.0 (0.0-1.5)	0.415
29) My singing voice tires easily.	1.0 (0.0-2.0)	1.0 (0.0-2.0)	0.670
30) I feel pain, tickling, or choking when I sing.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.994
31) I am unsure of what will come out when I sing.	1.0 (0.0-2.0)	0.0 (0.0-1.0)	0.162
32) I feel something is missing in my life because of my inability to sing.	0.0 (0.0-1.0)	0.0 (0.0-1.0)	0.274
33) I am worried my singing problems will cause me to lose money.	**0.0 (0.0-0.0)**	**0.0 (0.0-1.0)**	**0.022**
34) I feel left out of the music scene because of my voice.	0.0 (0.0-0.0)	0.0 (0.0-1.0)	0.070
35) My singing makes me feel incompetent.	0.0 (0.0-0.5)	0.0 (0.0-1.0)	0.451
36) I have to cancel performances, singing engagements, rehearsals, or practices because of my singing.	0.0 (0.0-0.0)	0.0 (0.0-0.5)	0.347

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

**Mann-Whitney U test: significant difference at $P<0.05$

DISCUSSION

Linguistic validation of the Croatian version of the SVHI

All participants easily completed the SVHI regardless of their vocation, and did not report any ambiguities related to the statements. Except the aforementioned, stronger evidence of validity is the observed size of correlation between severity categories and the SVHI score (0.63 and 0.68), which is consistent with Cohen's finding of the correlation coefficient 0.63 *(Cohen et al., 2007)*. In addition, we found that SVHI scores significantly differ across severity categories according to Kruskal-Wallis *H* test results (P=0.001 and P<0.001), which is consistent with Cohen's finding of the significant difference of SVHI scores between the same categories (P<0.001) *(Cohen et al., 2007)*. In both groups of participants, Cronbach's alpha coefficient showed excellent internal consistency (0.97 and 0.98) of the Croatian version of the SVHI, which indicates high reliability of a measure. These findings correspond the Cronbach's alpha coefficient of the original questionnaire (0.97) *(Cohen et al., 2007)* and the Italian version of the SVHI (0.97) *(Baracca et al., 2014)*. However, since our participants have completed the SVHI only once, we were not able to determine test-retest reliability. The Croatian version of the SVHI was not able to discriminate between amateur (16.7, IQR 7.6-29.2) and professional (13.8, IQR 5.9-30.2) classical singers' voice handicap. Both groups' median SVHI scores fell within the normative SVHI score range, which is 20.65 with a 95% confidential interval of 10.6-30.1 for healthy professional users *(Sobol et al., 2020)*.

Singing voice handicap

Slightly less than a half of professional and amateur singers reported no singing voice problem. No significant emotional and social impact of voice handicap was observed. This is in line with previous findings that choral singing is associated with strong immediate well-being effects *(Cohen et al., 2007)*. Although some previous studies indicated that well-being effects and emotional and social responses associated with singing differ in professional and amateur singers *(Cohen et al., 2008, Sobol et al., 2020)*, in our study differences in emotional and social impact of voice problems between professional and amateur singers were not observed. However, a difference was observed for the economic impact since professionals reported more worries about the economic impact of voice problems than amateurs.

Professionals also reported more trouble with controlling the raspiness in their voice than amateurs, and for professionals age was associated with less singing hours. However, no differences were found between professionals and amateurs in reported singing voice problem nor SVHI scores. If the voice handicap was not underreported, this finding may indicate more ambitious younger singers who sang more and wanted to stand out. Professional singers reported 24 (IQR 18.0-30.0) singing hours per week. According to work regulations of the Croatian National Theatres in Zagreb and Rijeka, professional choristers have an obligation to prepare themselves individually at least 2 hours a day or 17 hours a week, attend rehearsals and perform music on a stage. Choir rehearsals should last about 4 hours. Professional choristers are allowed to take a break every 60 to 80 minutes of singing for 15 to 25 minutes, depending on the theatre, the number of breaks and the type of rehearsal. In one working day, it is allowed to hold two music rehearsals with a total duration of 5 (3+2 or 2+3) to 7 (4+3 or 3+4) hours. It is prescribed that at least 4 hours must elapse before the start of the second rehearsal on the same day. Performances are mostly held in the evening, could last more than 4 hours and consequentially cause vocal fatigue. In such cases, there is no prescribed adjustment of the start time, duration or intensity of the choir rehearsal on the next working day.

Amateur singers had more trouble with loud singing and voice cracking even though they were younger and sang less than professionals. From the aspect of this study, it was difficult to explain the observed differences because we were not aware of participants' job tenure. Also, we did not have information about additional vocal load among amateurs, who could possibly work as occupational voice users. Older amateurs reported more severe singing voice problem which could be potentially related to prolonged vocal misuse,

long smoking experience and high probability of gastroesophageal and laryngopharyngeal reflux. We recruited amateur classical singers from two internationally renowned Croatian choirs. They often perform in the concert halls or churches, travel and participate in the music festivals and competitions. Singers were required to attend 2 to 3 rehearsals a week regularly because of demanding music program. A few weeks before the performance, the number and duration of rehearsals would increase significantly. If necessary, conductors additionally organized individual rehearsals for singers who were using inadequate vocal technique or already had vocal complaints while singing. All these factors could have contributed to the observed pattern of results.

Limitations

Classical singers were randomly sampled in both groups of participants. The conclusions about the differences in voice handicap are quite limited by the significant difference in age between the two groups of participants. Croatian translation of the SVHI was used for the first time, and there were no previous findings about its validity nor reliability.

CONCLUSION

Professional and amateur Croatian classical singers mostly had mild singing voice problems. However, voice difficulties in amateurs were noticeable, and indicate the importance of learning vocal technique. When creating a work plan for professional classical singers, it is necessary to balance work commitments with vocal rest to preserve singing voice and workability.

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POTEŠKOĆE S PJEVAČKIM GLASOM U HRVATSKIH AMATERSKIH I PROFESIONALNIH KLASIČNIH PJEVAČA

SAŽETAK: Cilj istraživanja bio je opisati poteškoće pjevačkog glasa u hrvatskih profesionalnih i amaterskih klasičnih pjevača. U ovo presječno istraživanje uključeno je 69 profesionalnih pjevača (medijan dobi 47,5, interkvartilni raspon 42,0-55,8 godina) i 41 amaterski pjevač (medijan dobi 30,0, interkvartilni raspon 25,0-41,0 godina). Sudionici su ispunili hrvatsku verziju Indeksa vokalnih poteškoća pjevača (engl. Singing Voice Handicap Index, SVHI-36), samostalno su ocijenili ozbiljnost poteškoća s pjevačkim glasom na drugoj skali, odgovorili su na pitanja o svojoj dobi, spolu, vrsti glasa te procijenili prosječan tjedni broj sati pjevanja u prethodna tri mjeseca. Cronbachov koeficijent pouzdanosti hrvatskog verzije indeksa SVHI bio je 0,97 u amatera i 0,98 u profesionalaca. Rezultati indeksa značajno su se razlikovali među stupnjevima samoprocijenjenih poteškoća s pjevačkim glasom u amatera (P=0,001) i u profesionalaca (P<0,001). Medijan rezultata indeksa SVHI bio je 16,7 (interkvartilni raspon 7,6-29,2) u amatera i 13,8 (interkvartilni raspon 5,9-30,2) u profesionalaca. Veći rezultat indeksa SVHI bio je povezan s težim samoprocijenjenim poteškoćama s pjevačkim glasom u amatera (ρ=0,63, P<0,001) i profesionalaca (ρ=0,68, P<0,001). Amateri i profesionalci nisu se značajno razlikovali u samoprocijenjenim poteškoćama s pjevačkim glasom (P=0,698) niti u rezultatu indeksa SVHI (P=0,538). U odnosu na profesionalce, amateri su češće prijavili pucanje glasa (P=0,009) i poteškoće s glasnim pjevanjem (P=0,020) te su se manje brinuli za gubitak novca zbog poteškoća s pjevanjem (P=0,022). Hrvatski klasični pjevači većinom su imali blage poteškoće s pjevačkim glasom. Vokalne poteškoće u amatera ukazuju na važnost učenja vokalne tehnike. Potrebno je balansirati radne obveze i vokalni odmor radi očuvanja radne sposobnosti u profesionalnih klasičnih pjevača.

Ključne riječi: *upitnik, rezultat, samoprocjena, poremećaj glasa, radna sposobnost*

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