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REVIEW PAPER

CONSIDERATIONS AND DEMANDS IN THE VOICE CARE OF CONTEMPORARY COMMERCIAL SINGERS IN OCCUPATIONAL HEALTH AND SAFETY ASPECTS

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Abstract

Singers, classified as "vocal performers" are at an increased risk of developing voice disorders. The area of contemporary commercial singing has not been studied as extensively as classical singing. Non-classical singing is generally considered detrimental to vocal health and thus the information on challenges contemporary commercial singers (CCS) pose to otolaryngologists and other healthcare professionals is scarce. The authors present an overview of contemporary commercial singing styles in comparison to classical singing, discuss the notion of non-classical style being harmful to vocal health, present major risk factors associated with developing voice disorders in contemporary commercial singers, and outline the diagnostic process of vocal health assessment in this group of occupational voice users. Given that contemporary commercial singers constitute a unique and vast group of elite vocal performers, the authors stress the importance of raising awareness among healthcare professionals of the fact that these patients require special considerations for voice evaluation and treatment in the occupational health and safety framework. Med Pr. 2022;73(1):33–41

Key words: occupational voice, occupational risk factors, voice disorders, vocal health, diagnosis of voice disorders, contemporary commercial singers

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INTRODUCTION

Occupational voice health is becoming an important occupational health and safety issue as the number of people who depend on their voices for work is increasing. A number of studies have pinpointed certain occupational groups at elevated risk of developing voice disorders as a consequence of their inherent work conditions [1–3]. According to the classification proposed by Titze et al. [4], there are 4 groups of jobs classified regarding vocal load required for performing them. Singers fall into Group 1 called "Vocal performers," which means they rely on a consistent, refined, and appealing voice character as a fundamental tool of trade. Singers, regarded as "elite vocal performers" amid all the professional voice users, are also considered to be more vulnerable to voice disorders than other groups [5]. They have reported a greater incidence of phonotraumatic behaviors, vocal problems, and disorders in comparison to non-singers [6–8].

Singing requires precise and controlled voice use for prolonged periods of time with well-established breath support, high-quality articulation, and pitch alterations [9] and the demands that singers impose on their voice organ in singing vary measurably from those required for speech [10]. Therefore, singers are referred to as the most demanding vocal group [5,11] and require special considerations for voice evaluation and treatment [12]. Understanding the principles of the singing voice technique is crucial to all healthcare professionals treating singers because it is always present to a certain degree in any vocal issue that affects a singer [13].

The classical tradition of singing has been developing for many centuries and the vocal health of classical singers has been researched extensively [14]. By comparison, the field of contemporary commercial music (CCM) is still in its initial stage, both in terms of its history and the attention it has received in the medical arena. Contemporary commercial music encompasses all genres that are non-classical in nature, for example,

musical theater, jazz, pop, country, folk, rock, and gospel, to name but a few [14].

The invention of both recorded and amplified sound brought about new styles of singing, enabling singers to be heard without the need to project over large orchestras in huge spaces. In modern Western culture, people are in contact with music on a regular basis, either deliberately or by chance. For instance, it is common nowadays for singers to be almost always leading any musical ensemble in which they participate [15] and contemporary commercial music is performed in many different types of public and private contexts.

Moreover, with the growing popularity of televised reality shows and talent contests such as American Idol, X-Factor, The Voice (and their country-specific counterparts) around the world, the popularity of contemporary commercial singing surpasses classical or traditional music. It is observed in the music recording market, for instance in 1997 >90% of global sales of music recordings consisted of popular music, including traditional forms such as folk and blues, with classical music constituting only 3–4% [16].

With regard to employment, as stated in data from the US Bureau of Labor Statistics (1994–1995) for the population of 23 000 professional singers in America, only 3000 were classical and the remaining 20 000 were listed as "other" [17]. As a result, career opportunities for classical singers are decreasing and music theater has been more and more often added to the performance schedules by opera companies [18]. Even though contemporary commercial singers constitute in fact a majority of the singing professionals reflected in their statistical predominance, they do not seem to attract sufficient consideration in the medical field [17].

For this reason, the authors of this paper have chosen to focus specifically on contemporary commercial singers rather than the more commonly examined classical/opera singers. The aim of the present paper is to familiarize all voice care professionals, that is ENT (ear, nose and throat) doctors, phoniatricians, singing teachers, vocal coaches, speech-language pathologists, and occupational medicine specialists with this particular group of professional voice users – contemporary commercial singers (CCS) and to present some major challenges and demands that are placed upon them by the competitive entertainment industry within which they work. It stresses the importance of looking at CCS as a growing group of occupational voice users exposed to elevated occupational risk factors with a view to assisting this patient group best by means of prophylaxis, tailor-made management, and consideration in the occupational health and safety framework.

METHODS

The authors carried out a review of scientific literature related to contemporary commercial singing. Key articles were retrieved mainly from PubMed, Google Scholar, MEDLINE, Embase, and Web of Science. In all electronic databases, the following keywords were used: "contemporary commercial singers," "contemporary singing," "singing voice," "voice disorders," "occupational voice disorders," "dysphonia," "voice assessment."

The authors scanned the reference lists of the included studies and relevant reviews identified through the search. They analyzed all full-text reports and decided whether they met the inclusion criteria. Publications focusing on contemporary commercial music features, occupational hazards for singers, voice disorders in singers, and methods of voice assessment were included. The majority of the included scientific publications were published in 2000–2020. A few earlier publications were also used because of their impact on the understanding of the nature of the occupational group of contemporary commercial singers.

RESULTS

Contemporary commercial singing vs. classical singing – overview

Classical and non-classical styles of singing differ in a number of aspects. The classical singing style is associated with the opera and requires sophisticated vocal quality with harmonic richness, proper articulatory control, and vocal projection. In this way, the voice can be heard over the loud orchestra even without electronic amplification [19]. This technique referred to as *bel canto* – "beautiful voice" describes a clear, dense, sonorous vocal sound, rich in color and dynamics which is produced without compromising the vocal function [20,21]. Key characteristics of classical singing style include a well-balanced amount of subglottic pressure, active control of the abdomen, stable and relatively low positioning of the larynx, a raised soft palate, an appropriate resonance strategy, a consistent vibrato, tall and rounded vowels, and a balanced tone quality [20,22].

Contemporary commercial music, in turn, is a term coined by Jeanette LoVetri [23], who called it "music of the people" and describes its origins as follows: "this

music came from simple people who sang for personal reasons and created their own music, often without any kind of formal training." However, CCM is an umbrella term that encompasses many different genres and styles of music [17]. These are for instance rock, pop, jazz, rock, blues, music theatre, hip-hop, metal, country and western, soul, rhythm and blues, country and western. With regard to the singing voice, style is a method of vocal production that has defining acoustic, physiological, and perceptual features [24]. Bartlett [25] proposes 6 major style groups, as representative of CCS genres. Each of these groups includes a wide range of constantly developing sub-styles or fusion styles (Figure 1).

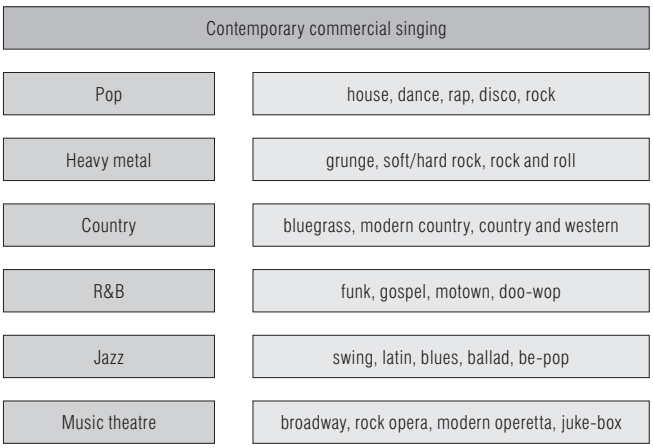

Figure 1. Classification of contemporary commercial singing genres and sub-styles as proposed by Bartlett [25]

The physiology of singing has not changed over the last centuries, however, musical styles have changed and developed considerably. Taking this into account it is understandable that there is a considerable need to understand the underlying mechanisms of voice production that enable performing them. Additionally, the advances in voice science have changed the attitudes of laryngologists, phoniatricians, speech-language pathologists (SLPs), and voice coaches toward CCM. For example, although rock singing used to be regarded as a vulgar use of the human voice and was as a rule scorned by the academic community, voice teachers and singers around the world have recently expressed a professional interest in studying particular techniques for singing rock'n'roll [26].

To exert specific effects on the listener, rock, pop, and musical theater singers produce a number of characteristic non-classical vocal effects to emphasize the lyrics, situation, or emotional aspects. Others try to create specific, individual sounds and invent new styles [20]. In some cases, the singers' performances will be limited to one particular style, and in other cases, they will incorporate a number of them into their performance. For instance, professional musical theater singers will typically work in a number of vocal styles on a daily basis [17] and they are expected to deliver the best vocal quality along with a simultaneously performed choreographed routine. Lead singers of cover bands are also likely to make use of the majority of the styles listed above during every single performance to effectively imitate a variety of famous artists [17].

Unlike the classical style, CCM styles of music clearly demonstrate that the voice is not restricted to particular physical coordination [27]. The predominant features observed in a variety of non-classical singing styles are chest voice dominance, little or no use of vibrato, vocal registers that are clearly separated rather than unified, deliberate use of noise, irregular vibrations, breathiness, and nasality in the vocal tone [28,29]. Each of the CCM kinds of singing requires a different configuration of the vocal tract, different activities in the articulators, and the use of breath [27].

Is non-classical style of singing detrimental to vocal health?

Apart from aesthetical bias initially presented in literature [25], the question of vocal health in relation to non-classical singing styles has been raised in numerous studies [20,30]. Voice usage differs considerably among various styles of singing. It is commonplace to regard some styles, especially those that use strong glottal adduction and high subglottal pressures, as potentially harmful to the phonatory mechanism [31] and consider them detrimental to vocal health [32,33]. Different styles of singing employ a broad range of special vocal effects labeled as Distortion, Rattle, Growl, Grunt, Creaking, Air added to the voice, Screams, Vocal Breaks, and Ornamentation technique [32]. Although largely perceived as unhealthy, more and more frequently it is argued in literature that these effects can be achieved in a healthy manner [34].

In the last 30 years, advances in voice science have introduced the teaching of contemporary commercial music into the mainstream [18]. Voice pedagogues around the world successfully train singers in such styles, thus advocating that they can be achieved in non-harmful manners [31]. One such example is Complete Vocal Technique (CVT) – a method of singing teaching introduced in 1991 by Cathrine Sadolin [35]. It is mainly focused on presenting, characterizing, and teaching vocal effects and has since its publication achieved

Table 1. Major publications discussing application of particular vocal effects in contemporary commercial singing without straining the voice organ

Authors	Publication	Results
Saldias et al., 2019 [39]	"A Computerized Tomography Study of Vocal Tract Setting in Hyperfunctional Dysphonia and in Belting"	Belting, often described as sounding "pressed" or "tense" and considered strenuous to the vocal fold takes advantage of the "megaphone shape" of the vocal tract.
Bestebreurtje et al., 2000 [40]	"Resonance strategies for the belting style: Results of a single female subject study"	The loud and bright sound of the belting style is achieved by the implementation of resonance strategies that enhance higher harmonics of the voice source.
Guzman et al., 2014 [34]	"Laryngoscopic, acoustic, perceptual, and functional assessment of voice in rock singers"	Growl voice and reinforced falsetto do not seem to contribute to laryngeal disorders in the assessed group of rock singers.
Guzman et al., 2015 [41]	"Laryngoscopic and spectral analysis of laryngeal and pharyngeal configuration in non-classical singing styles"	Supraglottic activity during singing may be not necessarily a hyperfunctional behavior, but a strategy to avoid vocal fold damage while producing the desired voice quality.
Caffier et al., 2018 [20]	"Common Vocal Effects and Partial Glottal Vibration in Professional Nonclassical Singers"	The long-lasting use of the investigated nonclassical vocal effects had no negative impact on trained singers.
Guzman et al., 2019 [38]	"Aerodynamic Characteristics of Growl Voice and Reinforced Falsetto in Metal Singing"	A proper resonance strategy in reinforced falsetto and a decreased glottal adduction in growl voice could be the factors contributing to the avoidance of voice problems in singers who use these vocal resources.
Aaen et al., 2020 [32]	"Laryngostroboscopic Exploration of Rough Vocal Effects in Singing and their Statistical Recognizability: An Anatomical and Physiological Description and Visual Recognizability Study of Distortion, Growl, Rattle, and Grunt using laryngostroboscopic Imaging"	Vocal effects can be performed, identified, and recognized as particular vibratory patterns of supraglottic structures with no visible pathology in subjects performing the effects.

international widespread recognition [32]. Another example is Estil Voice Training (EVT) – a widely known educational system for singing and speaking voice established in 1988 by the American singing voice pedagogue Jo Estill following her extensive research in the area of voice physiology [36].

Nowadays breathy, distorted, and affected voices are common in contemporary non-classical singing and it has been reported that there are ways to teach them in a healthy way. For instance, the level of glottal closure is crucial for a good and safe way to use a breathy voice, and a distorted sound has to be produced with free and pressureless use of the ventricular folds [37]. Similarly, the techniques commonly applied in heavy metal style of singing: growl voice and reinforced falsetto seem to perceptually be a pressed and laryngeal hyperfunctional voice, classically labeled as vocal abuse. It is understandable to assume that continual use of such voices may predispose the singers to develop a voice disorder. However, some metal singers and singing teachers hold the opinion that if produced in a healthy manner, long-term use of these techniques will not cause harm to the voice [38].

The findings from literature conclude that although various vocal effects may indeed give the impression of "roughness and hoarseness," if produced properly, used only briefly, in a controlled manner, and used as unique means of expression they do not lead to direct impairment of the singer's voice [20,32,34]. Table 1 presents major publications discussing the application of particular vocal effects in contemporary commercial singing without overloading the voice organ and thus eliminating the risk of injuries. The findings described in the studies were confirmed by means of instrumental and objective methods of voice assessment.

Occupational risk factors for developing voice disorders in professional CCM singers

Singers, being a large group of professional voice users expose their voices to elevated risk factors [42]. Singing is among the functions that most critically depend on the voice. Continuous vocal production is an activity entailing a synchronized interaction of multiple physical processes such as respiration, phonation, and resonance [15,42]. For this reason, the vocal health of singers may be affected by a range of ergonomic (environmental) and extra-occupational (individual) factors, some of which concern all singers, and others are observed in contemporary commercial singers in particular (Figure 2).

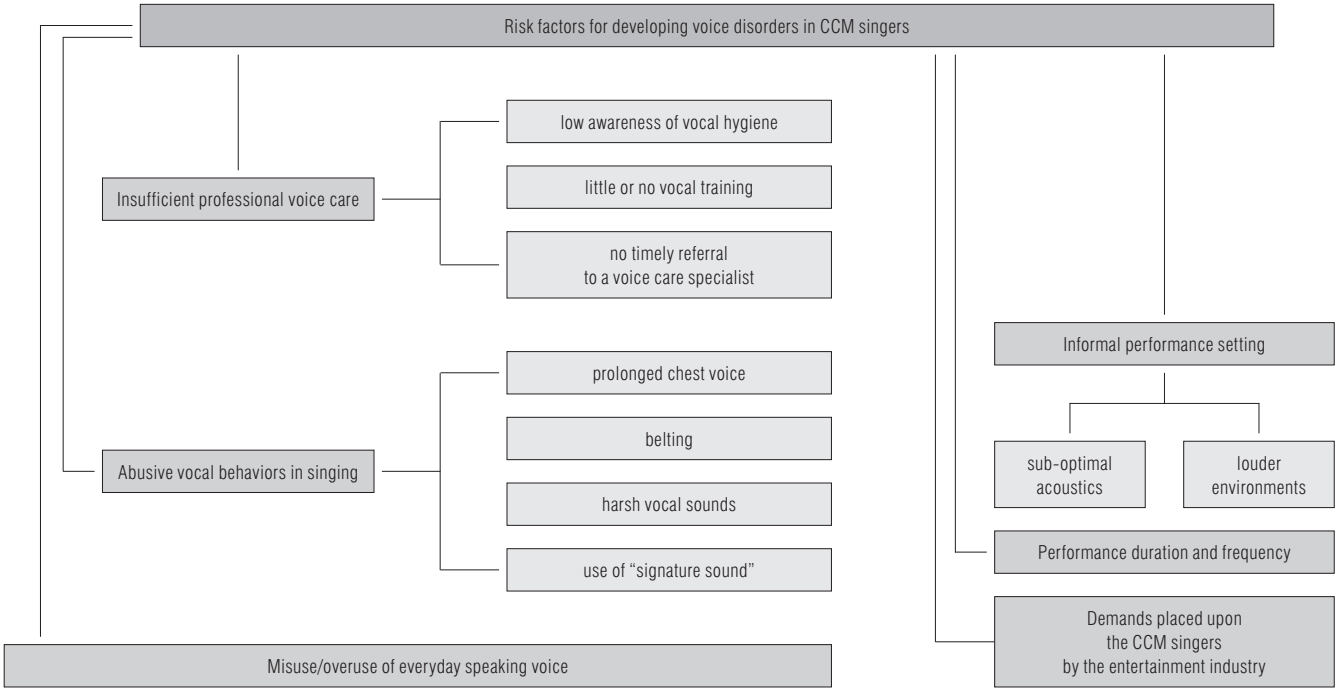

Figure 2. Main risk factors associated with voice disorders in contemporary commercial music (CCM) singers

One of the frequent risk factors for developing a voice disorder is the lack of sufficient knowledge about the principles of voice production and vocal hygiene. It has been reported in literature that CCM singers have low awareness of vocal hygiene, frequently experience voice difficulty, and thus face a higher risk of vocal problems [43]. Oftentimes contemporary commercial singers have little or no vocal training, unlike classical singers who require years, or sometimes decades of training and guidance before a singer is equipped with the knowledge how to use sensorimotor experience in order to produce sound in a healthy way and to be prepared to perform on an operatic stage [19,44]. Throughout the course of education, classical singing students are under the supervision of pedagogues, speech-language pathologists, and laryngologists hoping that preventative lifestyle modification will help them avoid vocal problems [45]. However, CCM singers are less likely to seek professional training because the majority of voice teachers mainly offer a classical vocal technique and are not familiar with contemporary style characteristics [43].

In some cases, voice disorders are caused by certain behaviors or types of voice use that are dependent on the genre of the music sung [46]. For instance, singers who utilize a heavier mechanism, such as prolonged chest voice, belting, and harsh vocal sounds, have greater vocal fold adduction and higher subglottic pressures. It results in an increased risk of vocal injury compared to singers who utilize a lighter mechanism [47]. Certain CCM singing styles commonly include vocal sounds that are considered harmful for voice. Some of these vocal sounds, like growl, are produced by narrowing of epilaryngeal and/or other vocal tract structures, causing a distorted and auditorily perceptual pressed sound [34]. Such vocal behaviors, if produced without caution or for extended periods of time may negatively affect the voice organ.

Another interesting notion in the case of CCM singers is the phenomenon of the so-called "signature sound." Some CCM singers intentionally use a raspy voice or feel that intermittent voice breaks are stylistically appropriate. However, these vocal behaviors are commonly regarded as vocal abuse/misuse and in the long run may result in phonotrauma, affecting their vocal quality and stamina. This implies that singers performing in contemporary genres may be at greater risk for developing vocal pathologies regardless of whether that benefits the signature sound or not [47].

Moreover, a CCM singer's performance duration typically surpasses those of a classical singer, and commonly takes place in a more informal setting, which can include louder environments and sub-optimal acoustics [47]. For instance, musical theatre singers are required to sing 7–8 performances/week, whereas opera singers rarely give more than 2 or 3 performances/week [48].

As a consequence, CCM singers may be prone to developing vocal cumulative effects symptoms associated with vocal fatigue, a condition associated with excessive voice demands placed on speakers, in which loss of phonatory abilities develops as phonatory effort increases [42].

Another factor that contributes to a higher risk of developing voice disorder in CCM singers is extra-occupational vocal activity. It is not uncommon for this group of voice professionals to engage in supplementary employment ("the day job") to achieve and maintain a safe and stable living salary. It is worth underlining that at least some causal factors of singers' reported voice problems may lie in the misuse or overuse of their everyday speaking voice rather than a misuse of their singing voice [49], or it could be both – vocally abusive speech habits and hours of exhausting singing combined [8].

It should also be taken into consideration that the demands placed upon the CCM singers by the entertainment industry can also contribute to the development of voice disorders. The commercial imperatives of managers, agents, producers, booking agents, recording executives urge them to demand more than the artists can healthily give [17].

However, as reported in literature, despite a great number of risk factors related to singing and CCM singers' tendency toward voice problems, they rarely seek professional help for a voice disorder until it develops into a severe pathology [50]. This problem is well presented in a study by Sielska-Badurek et al. [30], who assessed, by means of laryngovideostroboscopy, laryngeal function of students in the first 2 months of their 4-year singing training at the High School of Music and reported that 22% of the students were diagnosed with vocal nodules.

Diagnosis of voice disorders in contemporary commercial singers

Voice evaluation, in all cases, should reflect anatomical and physiological deviance associated with a particular voice disorder. The vocal dysfunction assessment involves tools that may be objective and subjective, as well as qualitative and quantitative measurements using invasive or non-invasive techniques [51]. Objective measurements do not evaluate the biopsychosocial impact of a voice disorder. Therefore, the use of a multiparameter voice-assessment protocol, that is the integrated use of subjective and objective assessments, can systematically evaluate the patient's voice. Such an approach also helps doctors design treatment targets that are in accord with the patients' beliefs, expectations, and needs [52,53]. In other words, the information about the patient's voice disorder is of greatest value when it is a full and accurate reflection of the voice problem [54].

In 2000 the Committee on Phoniatrics of the European Laryngological Society (ELS) put forward a set of guidelines for the assessment of voice pathology. The aim of the proposed protocol was to work towards better agreement and consistency regarding the basic methodology for evaluating voice disorders [55]. The structural assessment of pathological voices offered by ELS includes not only organic and functional aspects but also the individual perception of the disease. Therefore, a multidimensional set of minimal basic measurements suitable for all "common" dysphonias is proposed and it includes 5 different approaches: perception, laryngovideostroboscopy, acoustics, aerodynamics, and subjective rating by the patient.

In the case of singers, it is of great importance to incorporate, along with the above-mentioned generic tools, specific examinations tailored especially for this particular occupational group. For instance, standard acoustic measures of vocal quality including jitter, shimmer, and noise-to-harmonic ratio (NHR) may not adequately describe the desired richness of the singer's voice [56]. It is therefore of great benefit to the singer-patient to examine additional parameters differentiating sung and spoken voices, such as vocal range or Singing Power Ratio representing the acoustic characteristics of singing voice quality.

Similarly, in terms of subjective voice assessment, there are tools designed specifically for singers and more sensitive in detecting subtle pathological changes in this population. The most commonly used instrument that is fully dedicated to singing voice is *Singing Voice Handicap Index* (SVHI) developed by Cohen et al. [57] in 2007. It is used worldwide for assessment of physical, emotional, social, and economic impact of singing voice problems and it has also proved to be a practical and beneficial health status instrument for assessing treatment results in singers [30]. Armed with most detailed knowledge on all aspects of the singing voice the clinician will be able to better serve the patient, and the patient, in turn, will more likely benefit from the health care provided.

CONCLUSIONS

In the presented paper the authors compare CCM with classical singing, however, it should be underlined that both terms are not the opposite of each other nor are

at the same level. Contemporary commercial singers are regarded highly by their public and much is known about their lifestyles from media reports. However, the information about them as professional voice users is still insufficient [58]. Given that they constitute a large part of the occupational voice professional group, they should be given special consideration by ENTs, phoniatricians, SLPs as well as occupational medicine professionals.

The awareness of voice disorders as work-related diseases has increased over the last decades and some countries have recognized voice disorders as occupational disorders [59]. A number of experts in the field of voice studies strongly advocate for increased voice care education for singers with the intent of preventing vocal injury, as well as making singers aware of the role of the SLPs should injury occur [10,60]. This is particularly essential in the case of CCM singers, who in comparison to classical singers are in a disadvantaged position as they normally do not receive formal vocal training and education regarding voice physiology and vocal hygiene. However, similarly to classical singers, a voice impairment in their case may lead to income loss, a deterioration of the overall quality of life, and psychological and emotional problems. Therefore, efforts should be undertaken to raise awareness among healthcare professionals of special consideration and care contemporary commercial singers deserve.

Future research should be aimed at objective identification of risk factors in the population of CCM singers and at performing further studies on this subject in clinical studies.

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