Música Hodie | ISSN: 2317-6776 DOI: 10.5216/mh.v22.69631

The impact of group singing on students' psycho-emotional state

O impacto do canto em grupo no estado psicoemocional dos alunos

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Abstract: The research aims to study the influence of group singing on students' general well-being, as well as their psychological and emotional state. The study involved 180 students between the ages of 18 and 20. Group 1 consisted of students, who have never practiced vocal. Group 2 consisted of students, who have been practicing group singing regularly. Group 2 had a more favourable psycho-emotional state with significantly lower levels of depression, anxiety, stress, neuroticism, emotional detachment. After three months of group vocal training, the 1st group students had a 1.45-fold decrease in depression ($p<0.05$) compared to the initial level, anxiety - 1.46 times ($p<0.05$), stress - 1.33 times ($p<0.05$), neuroticism - 1.42 times ($p<0.05$), emotional detachment - 1.50 times ($p<0.05$). Thus, group singing helps to improve the general and psycho-emotional state of students.

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Keywords: Group singing. Health effects of singing. Psycho-emotional state. General well-being. Depression level. Anxiety level.

Resumo: A pesquisa tem como objetivo estudar a influência do canto em grupo no bem-estar geral dos alunos, bem como no seu estado psicológico e emocional. O estudo envolveu 180 alunos com idades entre 18 e 20 anos. O Grupo 1 foi composto por alunos que nunca praticaram canto. O Grupo 2 foi composto por alunos que praticam canto coletivo regularmente. O grupo 2 apresentou um estado psicoemocional mais favorável, com níveis significativamente mais baixos de depressão, ansiedade, estresse, neuroticismo e distanciamento emocional. Após três meses de treinamento vocal em grupo, os alunos do 1º grupo tiveram redução de 1,45 vezes na depressão ($p < 0,05$) em relação ao nível inicial, ansiedade - 1,46 vezes ($p < 0,05$), estresse - 1,33 vezes ($p < 0,05$) , neuroticismo - 1,42 vezes ($p < 0,05$), distanciamento emocional - 1,50 vezes ($p < 0,05$). Assim, o canto em grupo ajuda a melhorar o estado geral e psicoemocional dos alunos.

Palavras-chave: Canto em grupo. Efeitos do canto na saúde. Estado psicoemocional. Bem-estar geral. Nível de depressão. Nível de ansiedade.

Submetido em: 12 de julho de 2021

Aceito em: 2 de agosto de 2022

Introduction

Music, without exaggeration, can be called one of the most diverse, inspired, and greatest forms of art, through which a person can convey and describe the most diverse range of emotions, feelings, and moods (MARW, 2017; NNANYELUGO and UKWUEZE, 2017). Music is an important factor in the formation of the human "self" and consciousness (MCCORMICK, 2015; WRIGHT and FINNEY, 2017). Thanks to singing, a person has the opportunity to express his/her state, relieve internal tension, develop confidence, become freer in his/her self-expression. No musical instrument in existence today can match the voice of a gifted singer in terms of the power of its emotional and artistic impact (LINNEMANN *et al*., 2017; PAVLICEVIC, 2019; PEARCE *et al*., 2015).

In recent years, singing has been referred to not only as an art form, a kind of music, or a hobby, but also as a rather powerful tool for psychological and physiological therapeutic effects on a human body (CLIFT *et al*., 2015; KYLE and KNIGHT, 2020). Singing can affect almost any human organ, because vocal is a so-called means of self-massage. Each organ of the human body has its own unique vibration frequency, which changes when a disease occurs, resulting in dysfunction not only in the work of a particular organ, but in the whole system of organs or even the body. Singing is a good way to restore the necessary frequency of organ vibration (HERBST, 2017; WADE *et al*., 2017). During singing, the main respiratory muscle - the diaphragm - massages the surface of the liver parenchyma, thereby increasing the flow of bile, preventing its stagnation and clogging, which are predictors of gallstones formation, human organs are activated and begin to function more intensively (NISTOR *et al*., 2015; PAVLICEVIC, 2019). Many researchers have noted the close connection between the practice of singing and choral performance to improve the mental and physiological health, improve morale and general well-being of the participants in these activities (DAYKIN *et al*., 2018; HURST, 2014).

The positive influence of singing on the human respiratory system has long been known (LEWIS *et al*., 2016; NISTOR *et al*., 2015; STEPHENS and WYON, 2020). Thanks to active movements of the diaphragm during singing, there is a training of diaphragmatic breathing, respiratory muscles, which replaces respiratory gymnastics, contributing to proper breathing, chest development, and improvement of lung drainage (GICK, 2011; NISTOR *et al*., 2015; SCHMIDT and GOLLER, 2016). Besides, constant regular singing promotes increase of lungs' vital capacity (GICK, 2011; SCHMIDT and GOLLER, 2016). Inhalation followed by slow exhalation during singing contributes to reduction of sleepiness, fatigue, improvement of concentration, as there is an activation of the sympathetic nervous system (LEWIS *et al*., 2016; MCNAMARA *et al*., 2017; SCHMIDT and GOLLER, 2016). A systematic review of the literature by GOLDENBERG (2018) focuses on the role of singing in the treatment of respiratory system disorders (in particular, bronchial asthma, chronic obstructive pulmonary disease, lung cancer, cystic fibrosis) (GOLDENBERG, 2018). The review also includes studies on changes in the manifestation of respiratory symptoms in disorders of other systems and organs (in particular, multiple sclerosis, quadriplegia) as a result of the practice of singing. GOLDENBERG points to the positive effects of a series of singing lessons on the quality of life and/or physical performance of the participants in these studies. The beneficial effect of singing in chronic obstructive pulmonary disease was also shown in a study by SKINGLEY *et al*. (2014), in which 97 people suffering from chronic obstructive pulmonary disease took part. After a 36-week course of singing lessons, the participants noted an improvement in their respiratory and psychological state, as well as general well-being. However, the results of this study are based on subjects' subjective perceptions (SKINGLEY *et al*., 2014).

While singing, a lot of oxygen enters the human body, blood circulation improves, heartbeat normalizes, and blood pressure decreases (STEPHENS and WYON, 2020). Besides, due to circulation intensification, the brain activates, which improves memory,

increases its volume, develops verbal memory and logical thinking (HORN *et al*., 2020; PRANDI-GONCALVES and ABRAHAO e SOUSA, 2020). Singing can be helpful for people who have suffered a head injury, as it helps restore speech (MAGEE *et al*., 2017).

Singing is also an effective tool for solving speech problems, because with its help, one can improve pronunciation and speaking. Singing trains diction, which is important for those who suffer from stuttering, because the main problem of such people is the pronunciation of the first sound in a word, while in singing, the accents in speech are smoothed because the words smoothly pass into each other (AZEKAWA and LAGASSE, 2018; KARPOV *et al*., 2017). Studies have shown that the sooner a child suffering from stuttering starts singing lessons, the more likely the child can get rid of this problem (AZEKAWA and LAGASSE, 2018).

The study of STEGEMOLLER *et al*. (2017) involved 27 Parkinson's disease patients; the effects of 8 weeks of singing lessons on maintaining vocal function, breathing pressure, and quality of life in these patients were studied. Singing classes were conducted by certified music therapists. The study found that singing significantly improved maximal inhalation and exhalation pressure, phonation time, as well as voice quality and overall quality of life in Parkinson's patients (STEGEMOLLER *et al*., 2017).

By analyzing a person's voice, it is possible to determine not only their psychological state, but also their physical state. There is evidence that singing leads to the stimulation of the immune system: regular vocal training increases the synthesis of hydrocortisone and immunoglobulin-A (FANCOURT *et al*., 2015; SIENKIEWICZ, 2020). During singing, endorphins are released, which have a positive effect on all organ systems of a human body. Endorphins are the substances that are "responsible" for positive emotions (TRIMBLE and HESDORFFER, 2017; WHITEHEAD and ARMONY, 2018).

A lot of research is devoted to the impact of singing on a person's health, his/her physical and psycho-emotional state (BOSTER *et al*., 2020; REAGON *et al*., 2016; WANG and AGIUS, 2018). However, most

studies were conducted on a small sample of subjects; in addition, these samples were very heterogeneous in terms of age, presence of concomitant diseases, etc., which worsened the "purity" of a study. This research purpose is to study the effect of singing on the mental and physical state of a person in order to expand the understanding of the possibilities of using vocal therapy for the treatment of various pathological disorders.

The study purpose is to examine the impact of group singing on the overall well-being and psycho-emotional state of students.

Study objectives:

- To establish the prevalence of basic complaints (fatigue, tiredness, headaches, sleep disorders, emotional lability, and irritability) that affect overall well-being among students who have not engaged in singing and students who regularly engage in group singing.

- To determine the features of the psycho-emotional status of students who do group vocal training and students who have never done vocal training.

- To study possible positive influence of group singing lessons on the well-being and psycho-emotional state of students who have never studied singing before.

Materials and methods

Study sample and design

The study involved 180 students, including 71 (39.4%) boys and 109 (60.6%) girls aged 18 to 20 years (mean age 19.16 ± 0.49 years), who formed 2 groups. Group 1 consisted of 87 students (50 (57.5%) girls and 37 (42.5%) boys; mean age 19.03 ± 0.52 years), who have never studied vocal. Group 2 consisted of 93 students (59 (63.4%) girls and 34 (36.6%) boys; mean age 19.28 ± 0.47 years), who are permanently engaged in group singing. The studied groups were comparable in age and gender. At this stage, the

general well-being of the students was assessed, their complaints and psycho-emotional state were studied.

At the second stage of the study, 30 students (19 (63.3%) girls and 11 (36.7%) boys) were selected (of their own free will) out of 87 students who have never engaged in singing; they were engaged in singing group 3 times a week for 1.5 hours for 3 months. At this stage, students' general well-being was evaluated; their complaints and psycho-emotional state before and after 3 months of singing lessons were studied.

Students were included in the study according to the following criteria: age 18-20 years; for group 1 - no previous singing lessons; for group 2 - regular group singing for at least 2 years; signed consent to participate in the study. All participants studied in four different public schools in the same area for the convenience of conducting singing classes and their spatial accessibility for participants.

If at least one of the following criteria was present, a student was excluded from the study:

- age less than 18 years;
- examination period;
- sports (professional or amateur) or other hobbies;
- mental illness;
- clinically significant depression;
- cancer;
- any acute or aggravated chronic somatic illness;
- pregnancy;
- drug addiction;
- alcohol abuse;
- smoking;
- unwillingness/rejection to take part in the study.

The following research methods were used during the study: questionnaire method, anamnestic, bibliosemantic, clinical and psychopathological research methods.

When included in the study, all students were interviewed by a psychologist to rule out clinically significant psychological and psychiatric disorders, as well as to assess the psycho-emotional state.

In order to study general well-being, the main complaints that may impact it were studied: fatigue, headaches, sleep disorders, emotional lability, irritability. For this purpose, a questionnaire was used, where students in both groups answered questions concerning the presence and frequency of a particular complaint.

The Hospital Anxiety and Depression Scale (HADS) (ZINGMOND and SNAITH, 1983) was used to determine the level of depression (D) and anxiety (A); it is conventionally divided into two subscales: HADS-D (used to assess D level) and HADS-A (to assess A level). Each subscale is based on 7 questions with 4 possible answers. The answer to each of the questions is evaluated in points (from 0 to 3 points). Further, for each subscale, the scores for the answers to the questions are summed up. A total score of 0 to 7 - norm; 8 to 10 - subclinical D and/or A; ≥11, D and/or A was clinically significant. For a more in-depth assessment of D and A, the psychologist used the Hamilton scale: the HAM-D scale was used to study the D level of the examined students, and the HAM-A scale was used to study their A level.

Students' stress was assessed using the Perceived Stress Scale (PSS), which consists of 10 questions, the answers to which are scored from 1 to 5 and summed. A total sum of points from 0 to 6 - low stress level; from 7 to 19 points - average; from 20 to 30 - high; from 31 points or more - very high.

Emotional detachment was investigated using a questionnaire which consisted of 25 affirmation questions such as, "I notice that I look tired at the end of the work day", "Very often I am too strict with other people", "Very often I get lost in my thoughts when

communicating with others", etc. Students answered "Yes" or "No" to each statement. The results were evaluated using a standard key, with each match to the key being evaluated by 1 point. According to this methodology, there were five subcategories:

- incorrect emotion management, inability to control emotions;
- lack of expressiveness or flexibility of emotions;
- inadequacy in the display of emotions;
- a prevalence of negative thinking and emotions;
- emotional detachment.

For each of the subcategories, the sum of points was calculated according to the key (for each subcategory the maximum number of points was 5), as well as the total sum of points for the test as a whole (the maximum total number of points was 25). The higher the sum of points, the more pronounced the emotional problem when communicating in everyday life:

- the total score for the test from 0 to 5 indicates the absence of emotional problems when communicating with people;
- 6-8 points - in communicative interaction with people, some emotional problems sometimes arise;
- 9-12 points - emotions become a significant obstacle in communicative interaction with people;
- ≥13 points - emotions become a significant obstacle when communicating with people up to a disorganizing state.

If the total number of points is very low (0 to 2 points), it may indicate insincerity of a respondent in answering the questions.

The level of neuroticism was studied using a questionnaire, which consisted of 40 statements, the answers to which implied "Yes" or "No". The answer to the question "Yes" resulted in 1 point, while the answer "No" resulted in no points (0 points). Thus, after summing up the scores (the maximum number of which is 40),

the results were interpreted as follows: 0-12 points - the level of neuroticism of the respondent is low, 13-27 points - moderate, 28-40 points - high.

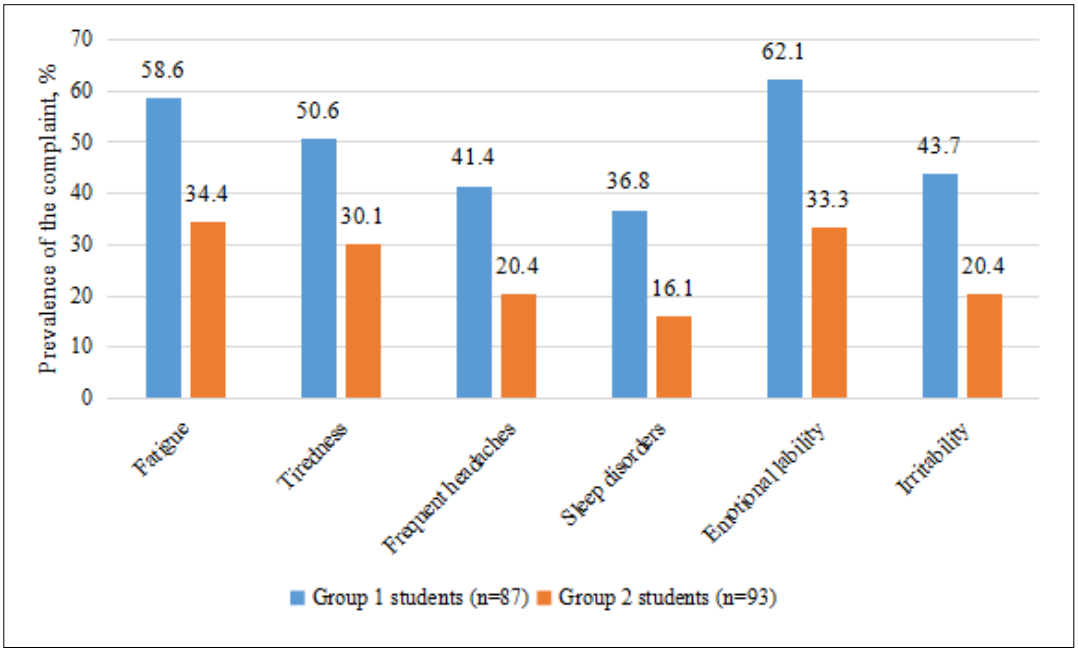
Statistical processing of data was performed using Statistica for Windows 10 Pro (Stat Soft inc., USA) and Microsoft Excel 2013 (Microsoft, USA). Mann-Whitney U-test was used when comparing groups for quantitative parameters. Wilcoxon signed-rank test was used when comparing quantitative parameters of group 1 at the beginning of the study and after 3 months of singing lessons. When comparing the prevalence of complaints and qualitative signs, the criterion χ^2 was used. Differences between comparison groups were considered statistically significant at $p<0.05$.

Observance of ethical norms. In conducting the study, all requirements and principles regarding research with human participants, regulated by international documents, were observed. The study protocol and informed consent form were reviewed and approved by the Ethics Commission of [BLINDED]. Only students who voluntarily agreed to participate in the study (both verbally and in writing) were included in the study. Since all of the students included in the study were over 18 years of age, they themselves signed an informed voluntary consent form to participate in the study. Each student was informed in detail at screening of the study's goals and objectives, expected results, and the fact that a student could withdraw from the study at any time.

Results

When studying the main complaints, which reflect the general state of the studied students, it was found that group 1 students, compared with group 2, significantly more often noted general fatigue, headache, and psycho-emotional tension (Figure 1).

Figure 1 - Comparative characteristics of the prevalence of major complaints among 1st and 2nd group students



*Note. * - Differences between comparison groups are statistically significant (p<0.05).*

The results of the corresponding Chi-square (χ2) statistics to determine the statistical significance of differences between groups are presented in Table 1.

Table 1 - Chi-square (χ2) statistics for the comparative characteristics of the prevalence of major complaints among 1st and 2nd group students

	Fatigue	Tiredness	Frequent headaches	Sleep disorders	Emotional lability	Irritability
χ2	10.6	7.85	9.3	9.94	14.89	11.23
p	0.002	0.006	0.003	0.002	0.001	0.001

Analysis of students' emotional state showed that group 1 students, compared to group 2, have statistically higher levels of D, A,

stress, as well as neuroticism (Table 2). Thus, the D level on the HADS-D scale was 1.62 times higher ($p<0.05$) for group 1 students compared to group 2 students, and the A level on the HADS-A scale was 1.52 times higher ($p<0.05$), respectively. In addition, stress was 1.48 times ($p<0.05$) higher in group 1 students compared to group 2. A similar picture was observed regarding the level of students' neuroticism, which was 1.57 times ($p<0.05$) higher for group 1 students.

Table 2 - Indicators of depression, anxiety, stress, and neuroticism in 1st and 2nd group students

Indicator	Study groups	
	Group 1 students (n=87)	Group 2 students (n=93)
HADS-A, points	6.21 ± 0.55*	4.08 ± 0.49*
HADS-D, points	5.42 ± 0.87*	3.35 ± 0.60*
PSS, points	23.49 ± 1.08*	15.86 ± 0.57*
Level of neuroticism, points	21.36 ± 1.49*	13.62 ± 0.85*
Note: * - differences are statistically significant compared to indicators for group 1 students ($p<0.05$).		

A more detailed study of students' emotional state showed that for group 1 students, emotional detachment was more pronounced (Table 3). For example, the overall emotional detachment score was 1.66 times ($p<0.05$) higher for students of group 1 compared to group 2. At the same time, inability to manage and control emotions in group 1 was 1.67 times ($p<0.05$) higher compared to group 2, inadequate display of emotions was 1.29 times ($p<0.05$) higher, prevalence of negative emotions - 2.11 times ($p<0.05$)

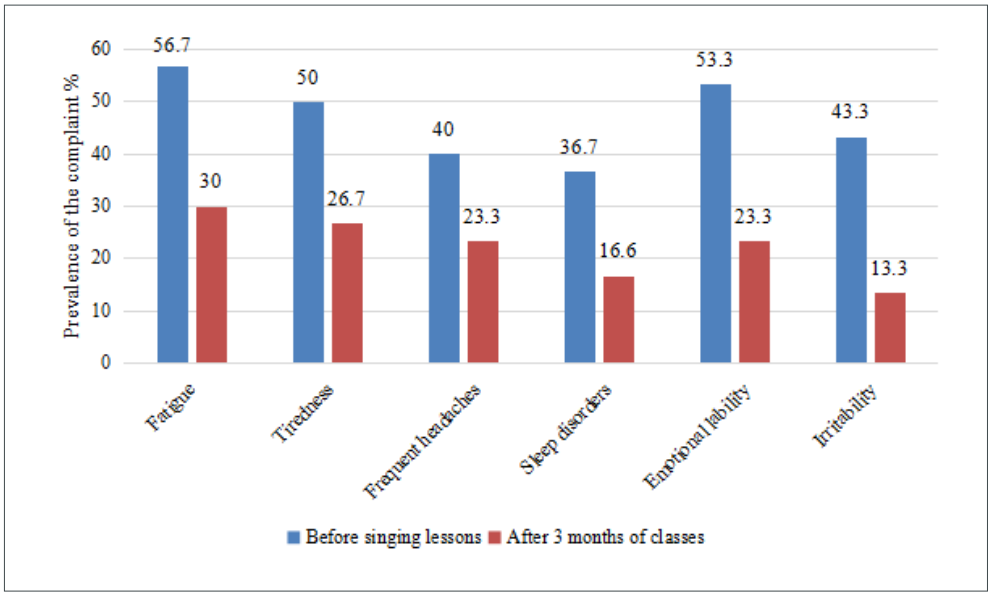
higher, lack of expressiveness of emotions and their flexibility - 1.41 times ($p<0.05$) higher, emotional detachment - 1.81 times ($p<0.05$) higher compared to group 2.

Table 3 - Emotional detachment among 1st and 2nd group students

Characteristics	Group 1 students (n=87)	Group 2 students (n=93)
Mismanagement of emotions, inability to control them, points	2.31 ± 0.24*	1.38 ± 0.14
Inadequacy in the display of emotions, points	1.10 ± 0.18	0.85 ± 0.09
Lack of expression, flexibility of emotion, points	1.47 ± 0.21	1.04 ± 0.13
Prevalence of negative emotions, points	2.09 ± 0.30*	0.99 ± 0.11
Emotional detachment, points	1.44 ± 0.18*	0.80 ± 0.09
Total score for the test	8.41 ± 0.75*	5.06 ± 0.46
Note. * - differences are statistically significant compared to indicators for students of group 1		

When comparing the prevalence of major complaints, which reflect general well-being, among group 1 students, before and after three months of regular group vocal training, it was found that the prevalence of related complaints decreased significantly (Figure 2). The results of Chi-square ($\chi 2$) statistics for students from Group 1 to determine the statistical significance of the differences observed in student test results are described in Table 4. There was also a trend ($p>0.05$) toward a decrease in the prevalence of fatigue, sleep disorders, and headaches after 3 months of regular group vocal training.

Figure 2 - Prevalence of major complaints before and after 3 months of group vocal training among group 1 students



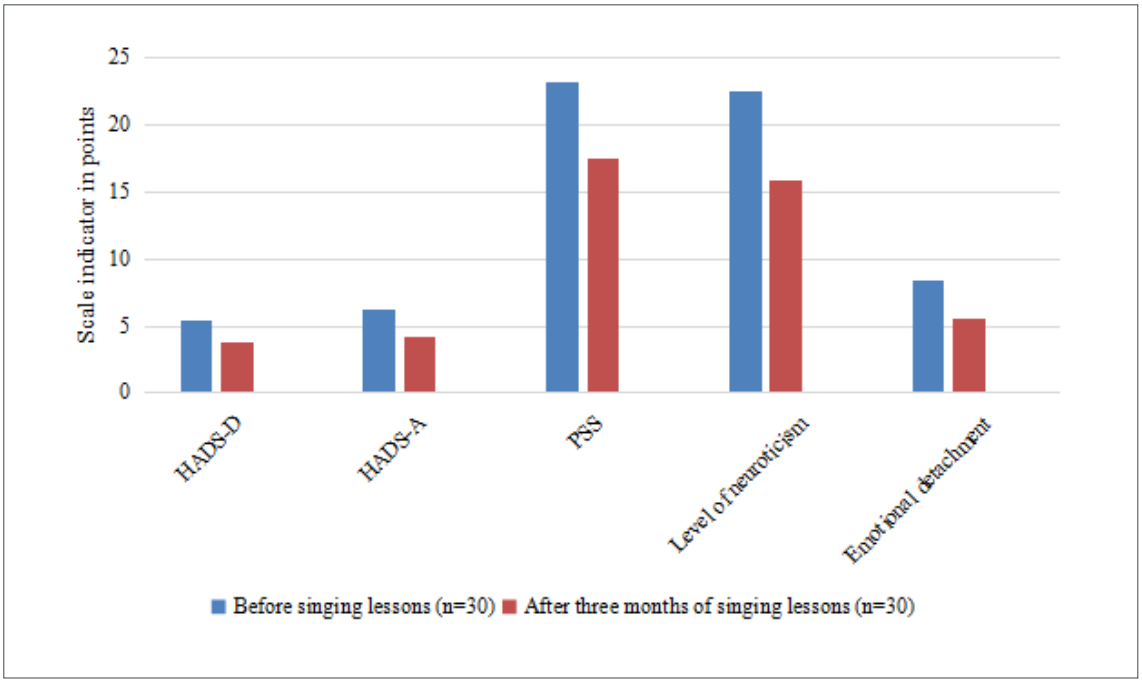
*Note. * - differences are statistically significant in comparison with indicators before the beginning of singing lessons (p<0.05).*

Table 4 - Chi-square (χ2) statistics for the prevalence of major complaints before and after 3 months of group vocal training among group 1 students

	Fatigue	Tiredness	Frequent headaches	Sleep disorders	Emotional lability	Irritability
χ2	4.34	6.31	8.63	14.69	5.71	6.65
p	0.038	0.012	0.003	0.001	0.017	0.010

Positive dynamics in group 1 students was also observed after 3 months of group vocal training regarding the indicators of D, A, stress, neuroticism, and emotional detachment (Figure 3).

Figure 3 - Dynamics of depression, anxiety, stress, neuroticism, and emotional detachment in students of group 1, before and after 3 months of group vocal lessons



*Note. * - differences are statistically significant in comparison with indicators before the beginning of singing lessons (p<0.05).*

Thus, the level of D on the HADS-D scale after 3 months of group vocal training decreased 1.45 times ($p<0.05$) as compared to the initial level, the level of anxiety on the HADS-A scale - 1.46 times ($p<0.05$), the level of stress (PSS) - 1.33 times ($p<0.05$). In addition, after vocal lessons, the level of students' neuroticism decreased - by 1.42 times ($p<0.05$) compared to the baseline, as well as emotional detachment - by 1.50 times ($p<0.05$) respectively.

When comparing the results of groups 1 and 2, as well as when comparing the results within group 1, there were no statistically significant differences between genders, neither when examined using The Hospital Anxiety and Depression Scale (HADS) (Figure 3, Tables 2 and 3), nor in major complaints survey (Figures 1 and 2, Tables 1 and 4). Due to the lack of significant differences, relevant statistics are not presented in detail to reduce the length of the article.

Discussion

The main study objectives were to establish the features of psycho-emotional status and the differences in the overall well-being of students in groups 1 and 2, as well as to explore the possible positive impact of group singing lessons on the well-being and psycho-emotional state of group 1 students. The study did not include students who did sports (amateur or professional) or hobby, as this could affect the psycho-emotional state and general well-being of the study subjects. Other factors, such as a disease or bad habits, that influenced the studied indicators were also excluded from the study.

The study found that students who engaged in group singing on a regular basis had a more satisfactory overall condition compared to those who never engaged in singing. This is confirmed by the fact that group 1 students more frequently, compared to group 2, reported fatigue ($p<0.05$), tiredness ($p<0.05$), headaches ($p<0.05$), sleep disorders ($p<0.05$), emotional lability ($p<0.05$), irritability ($p<0.05$) (see Figure 1). It is noteworthy that group 2 students, compared to group 1, had significantly lower levels of D ($p\leq0.05$), A ($p\leq0.05$), stress ($p\leq0.05$), and neuroticism ($p\leq0.05$) (see Table 1). Because of this, students who are engaged in singing are more emotionally stable, proactive, optimistic, calm, socialized, and independent. Emotional lability, lack of initiative, self-centeredness, difficulties in communication, and negative experiences were more common for group 1 students. All of these personality traits of students from 1st and 2nd groups are confirmed by the results of studying emotional detachment (see Table 2). According to the results, the main emotional detachment issues among group 1 students were the inability to manage and control emotions and the predominance of negative emotions. The study results testify to the positive impact of singing lessons on the general well-being and psycho-emotional state of students. This is also confirmed by the results of studying group 1 students at the beginning of study and after 3 months of group singing lessons. It was found that after 3 months of group singing, there was a significant decrease in

fatigue ($p<0.05$), emotional lability ($p<0.05$), and irritability ($p<0.05$) (see Figure 2). There was no significant difference in the prevalence of tiredness, sleep disorders, and headaches at the beginning of study and after 3 months of singing lessons, and there was only a trend toward a decrease in their prevalence ($p>0.05$). Perhaps a more significant reduction in tiredness, headaches, and sleep disorders requires more singing lessons. The reliable decrease in the levels of D ($p<0.05$), A ($p<0.05$), stress ($p<0.05$), neuroticism ($p<0.05$), and emotional detachment ($p<0.05$) in group 1 students at the beginning of study and after 3 months of regular group singing indicates a positive influence of group singing lessons (see Figure 3). Such a positive impact of singing on the well-being and psycho-emotional state of students is due to the fact that it is one of the ways of self-expression and conveying to others one's vision and worldview. Thanks to singing lessons, there is an intensification of creative activity and the formation of independence (BOSTER *et al*., 2020). This intensifies the production of endorphins (hormones of joy) in the brain, which contributes to the prevalence of positive emotions and activates the limbic system, which is called the "emotional part of the brain". This is due to the fact that music plays an important role in the formation of all our emotions, regulation of vegetative functions, biorhythms, and memory processes (WHITEHEAD and ARMONY, 2018; SIENKIEWICZ, 2020). When the investigated students started vocal training, they got a new favorite occupation, their social circle expanded, etc. All this contributes to improving both somatic and physical well-being: achieving emotional release, reducing anxiety, inner tension, spiritual cleansing, entertainment, distraction, etc.

The obtained results are consonant with the data of other studies, in which the effect of singing on the general well-being and health of people has been studied (MELLOR, 2013; REAGON *et al*., 2016; WELCH *et al*., 2014). In a meta-analysis of 18 studies conducted by REAGON *et al*. (2016), it was shown that group singing can have a positive effect on mood, A, D, and quality of life (REAGON *et al*., 2016). However, it should be noted that all the analyzed studies were

heterogeneous, both by age and by nosology of the study groups, performed with significant methodological limitations. In a study of 6,087 children between the ages of 7 and 10 in the United Kingdom, it was found that the more a child develops his/her talent for singing, the more favorable his/her emotional state, which was manifested by a positive impact on his/her self-esteem, a sense of his/her social involvement (WELCH *et al*., 2014). In the study of STEWART and LONSDALE (2016), in which 375 study subjects between the ages of 18 and 78 participated, positive effects of singing on the psycho-emotional state of singers were found, but it was notable that group and choral singers reported better psychological well-being compared to solo vocalists. The study authors interpret the results in such a way that it is not the singing itself that plays a role in the improvement of the psychological well-being of the studied persons, but it is the membership in a group (STEWART and LONSDALE, 2016). However, it is worth noting that the age range of those studied is very wide, there is no comparative analysis of the psychological state of the singers depending on the age groups, and also depending on the presence/absence of somatic diseases. A study in China involving 56 patients who had chronic obstructive pulmonary disease (COPD) with concomitant depression found that comprehensive COPD therapy together with group singing (for 6 months) significantly improved patients' quality of life and reduced depression, with more favorable results compared to the patient group using traditional COPD therapy (LIU *et al*., 2019). In a study by WERNER *et al*. (2017), which involved 117 elderly people from a nursing home with dementia, 12-week sessions of therapeutic group singing (2 p/week for 40 minutes) more significantly reduced depression symptoms compared to those who engaged in recreational group singing (mean difference 4.50, 95% CI 2.51 to 6.50, $p<0.001$). In contrast, a systematic review of 467 studies of the effects of singing on depression and anxiety in elderly people with mild dementia reported no significant effects of singing; but the same review also said that its methodological aspect has some limitations (PETROVSKY *et al*., 2015). As can be seen from the analysis of existing today studies devoted to the

impact of singing on the general and psycho-emotional state, one can talk about the positive impact of regular and constant singing exercises on the studied indicators. However, the data are quite contradictory, there are a lot of questions concerning the research design, the correctness of sample formation, and a number of other methodological aspects. The present study tried to take these points into account; there was quite strict approach to the formation of comparison groups, considering a fairly large number of criteria for inclusion and exclusion from the study.

Conclusions

Thus, group 2 students had a more satisfactory general state compared to group 1, as well as a more favorable psycho-emotional state. Group 2 also had significantly lower levels of depression on the HADS scale (1.62 times ($p<0.05$) compared to group 1), anxiety on the HADS-A scale (1.52 times ($p<0.05$)), stress (1.48 times ($p<0.05$)), neuroticism (1.57 times ($p<0.05$)), emotional detachment (1.66 times ($p<0.05$)). Group 1 students, after three months of group vocal training, showed a decrease in fatigue (from 56.7% to 30.0%, $\chi2 = 4.34$, $p = 0.038$), emotional lability (from 53.3% to 23.3%, $\chi2 = 5.71$, $p = 0.017$), irritability (from 43.3% to 13.3%, $\chi2 = 6.65$, $p =0.010$). They also showed 1.45 times decrease in depression on the HADS-D scale ($p<0.05$) compared to baseline, anxiety on the HADS-A scale (1.46 times) ($p<0.05$), stress (PSS) (1.33 times) ($p<0.05$), neuroticism (1.42 times) ($p<0.05$), emotional detachment (1.50 times) ($p<0.05$). This indicates the positive impact of group singing on the general and psycho-emotional state of students. The obtained results can serve as the basis for the development of measures to prevent psycho-emotional disorders in persons of young age.

Prospects for further research

The prospect for further research is to study the effect of singing on students' respiratory function.

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Publisher

Federal University of Goiás. School of Music and Performing Arts. Graduate Program in Music. Publication in the Portal of Periodicals UFG.