Música Hodie | ISSN: 2317-6776 DOI: 10.5216/mh.v21.69759

The Effect of Music Training on Mental Health among High School Students

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Abstract: Understanding how music lessons affect mental health allows, among other things, to improve education and therapeutic outcomes. This study of 112 high school students aged 12 to 17 years seeks to determine whether there is a positive correlation between musical activity and the mental state of children. All students underwent two surveys and art therapy session at baseline and at the end of experiment. The results of the study show music training positively correlates with mental health and has a beneficial effect on students' well-being. The limitations of the study include the small sample size and subjective research method.

Keywords: Mental health. Physical health. Musical activity. High school students.

Resumo: Compreender como as aulas de música afetam a saúde mental permite, entre outras coisas, melhorar a educação e os resultados terapêuticos. Este estudo com 112 estudantes do ensino médio de 12 a 17 anos busca determinar se existe uma correlação positiva entre a atividade musical e o estado mental das crianças. Todos os alunos foram submetidos a duas pesquisas e sessões de terapia de arte no início e

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no final do experimento. Os resultados do estudo mostram que o treinamento musical se correlaciona positivamente com a saúde mental e tem um efeito benéfico no bem-estar dos alunos. As limitações do estudo incluem o pequeno tamanho da amostra e o método subjetivo de pesquisa.

Palavras-chave: Saúde mental. Saúde física. Atividade musical. Estudantes do ensino médio.

Submetido em: 23 de julho de 2021

Aceito em: 25 de setembro de 2021

Introduction

Many studies highlight benefits of music to mental and physical health (CHANDA and LEVITIN, 2013; HARRISON, 2013; MIRANDA *et al*., 2012). The effects of listening to and participating in music are mostly positive, but negative consequences may also be present. Music has the power to reduce anxiety, stress, and symptoms of depression. Although some studies provide no evidence to support the above claim, inconsistencies regarding the impact of music on humans may be associated with the improper recruitment of respondents and insufficient sample size.

Investigating the major challenges of music integration, TSIRIS *et al*. (2016) focused on five inter-related areas of interdisciplinary dialogue, namely academic training of music and health practitioners, interdisciplinary practice projects, collaborative research, academic publishing, and professional expectations. The results are consistent with a more recent work (REIGERSBERG, 2017), where a lack of interdisciplinary and international collaboration was labelled as one of the key challenges in the research on the relationship between music and health.

A systematic review of earlier findings showed that music listening had a stimulating effect on cortical and subcortical responses (CLARK *et al*., 2016). This suggests that listening to music has a beneficial effect on physical performance. LENETTE *et al*. (2016) investigated the impact of participatory music and singing on the mental health of asylum seekers in Australia. The study found that this sort of activity worked as magic in easing the consequences of traumatic experience. PAPINCZAK *et al.* (2015), however, reported a slightly different result. A qualitative study on individuals aged 15-25 years showed that music listening had the potential to affect relationship building, emotions, and cognition. At the same time, authors failed to find a direct link between music listening and well-being. This may be associated with an insufficient methodology, which did not take other factors underpinning

mental health into account. Similar results were obtained when interviewing citizens above age 50 (HALLAM and CREECH, 2016). Participants reported that engaging in musical activities not only helped them bring down their levels of stress and depression but it also was supportive in times of bereavement. In addition, the study offered some evidence that music can enhance one's sense of confidence and creativity. A similar conclusion was made when exploring the effects of group drumming (PERKINS *et al*., 2016). A study with a pretest-posttest design revealed that listening to relaxing music could help overcome mental exhaustion, improve cognitive-motor performance (GUO *et al*., 2015), and alleviate distress (MCFERRAN *et al*., 2018). Music therapy also has been proven effective in dealing with grief-specific experiences (ILIYA, 2015).

Many studies exist on the music therapy effect on depression (AALBERS *et al*., 2017; GARRIDO and SCHUBERT, 2015; LEUBNER and HINTERBERGER, 2017). Literature meta-analysis argues that music can be used to treat depression (ZHAO *et al*., 2016), it may help people in prison (CHEN *et al*., 2016) and those with dementia though (PETROVSKY *et al*., 2015). In addition music therapy helped inmates reduce anxiety and depression, increase self-esteem, and improved music therapy was more effective for younger participants and those with lower levels of education (CHEN *et al*., 2016). Other studies indicate a significant improvement in the well-being of children with autism after the music therapy interventions (BIELENINIK *et al*., 2017; BRODER-FINGERT *et al*., 2017; MÖSSLER *et al*., 2019). It should be noted that in the sections "Introduction" and "Discussion" there is no clear distinction between the description of experiments based on music therapy and in the form of conducting music lessons. This is directly due to the fact that music therapy often involves conducting music lessons, and not just passive listening to music.

This study presents a comparative analysis of data from art therapy sessions and surveys of children aged 12-17 years. The study hypothesizes that music training positively correlates with

mental health and the aim of the study is to confirm or reject this hypothesis.

Materials and Methods

Study design

This study is a pretest-posttest design in which high school students aged 12-17 years underwent a series of surveys on their mental health with a fixed interval of 3 weeks (Appendix 1). Surveys were deigned to compare mental health of students before (pre-test) and after (post-test) 3 weeks of music training. Also the aim of the pretest was to assess the prior music training with participants. In general, students were given 6 music lessons, each of which was 1 hour. A pre-test and a post-test both comprised of two surveys and an art therapy session. In addition, all participants were interviewed to determine their perception of the effect of music training.

Music training consisted of students listening to music classics, such as Johann Sebastian Bach, Wolfgang Amadeus Mozart, Franz Schubert, and Ludwig van Beethoven (42 compositions were offered during the training period), playing musical instruments (such as piano, guitar, and a drum set), and practicing choral singing. First, students were given an hour-long lecture explaining the basics of playing musical instruments and then they were allowed to improvise. Musical instruments to play and the choral repertoire were selected by students independently.

Participants and data sets

A total of 112 high school students took part in this study. Previously, there were 136 students, but 22 of them refuse for not explained reasons. It should be noted there were 2 irrelevant

results with extremely low scores among surveys. They were not taken into account. All participants were randomly divided in two groups: an experimental group and a control group (56 students per group). Each group underwent a pre-test and a post-test. The survey results represent 8-item data sets, which were compared within groups. Difference between pre-test and post-test values between the experimental group and control group was analysed using the Student's t test.

Inclusion and exclusion criteria

Age of students was from 15 to 17 year old (medium deviation is about 7.2 mounts). Students who met the following criteria were enrolled in the study: having both parents who earn a median income and fair academic performance. Fair academic performance was considered from 60 to 89 scores. Exclusion criteria were poor and excellent academic performance because it could be a source of stress. Other family backgrounds were excluded since any family-related challenges could cause students' stress levels to rise.

Gender and financial position were not taken into account, because this factors presumably are not influence on results.

Survey procedure

All participants were given two 8-item surveys (Appendix 1) before and after the experiment. The first survey contained 1-10 scale questions about the subjective perception of one's own mental health. Note that this survey can provide objective results when obtained under the supervision of child psychologists, but this may cause stress in children. The second survey contained 1-10 scale questions about general condition and dominant emotional state. Also, participants received art therapy where they

were asked to draw on a self-selected theme. The results of the art therapy were analysed via the procedure of independent artwork assessment. This procedure has 8 scales: intensity, colour type, number of colours used in the drawing, hand pressure, accuracy, space covered by the drawing, theme, and number of objects included in the drawing. Each scale can score from 1 to 10. The pre-test and post-test findings were averaged.

It should be noted scale of appraisal was conducted by author of this research and confirmed by 4 independent specialists in area of psychology. Also, they help to evaluate influence of music trainings on mental health by art therapy.

Surveys and art therapy were conducted in 10 days.

Data analysis and statistical processing

Prior to data analysis, all data sets or samples were tested for normality using the Shapiro-Wilk test (the Shapiro-Wilk test). For this, the following formula was applied:

$$W = \frac{1}{s^2}\left[\sum_{i=1}^{n} a_{n-i+1}(x_{n-i+1} - x_i)\right]^2 \quad (1)$$

Ethics

Data collection was conducted anonymously (all answers were collected by 3 volunteers from student and given researches without names of participants). Non-members of the research team were not involved in data collection to avoid stress among students. As the respondents were children, a psychologist was present during the experiment. Prior to the experiment, parents gave their children permission to participate in the experiment and use the data obtained. After the experiment, all the information obtained was processed using special programs.

Results

Survey results from the control group and experimental group are depicted in Tables 1 and 2, respectively. The first column lists the research methods (survey and art therapy) and the second column lists the research items (survey questions and criteria of art therapy assessment). The third and fourth columns show the averaged results of the pre-test and post-test, respectively.

As it can be seen in Table 1, the control group scored higher on the first survey 1 and lower on the second survey. The difference between the pre-test and post-test values is slight, suggesting that training without music has its benefits but not as impressive as with music. It also seems that students who do not take music training are likely to suffer some side-effects of training, such as sleeping without feeling refreshed, fatigue, constant tiredness, and lack of interest and motivation for learning something new or performing physical activities. This research does not claim that music is the only activity that can alleviate the above side-effects. At pre-test, the highest scores were 8.11 (survey 1), 6.07 (survey 2), and 6.98 (art therapy); the lowest scores were 7.16 (survey 1), 5.12 (survey 2), and 6.11 (art therapy). For post-test the highest points are 8.12 (survey 1), 6.13 (survey 2), and 6.89 (art therapy), whereas the lowest are 7.05 (survey 1), 5.19 (survey 2), and 6.14 (art therapy).

Table 1 - Findings from the control group

Research Method	Item	Control Group	
		pre-test	post-test
Survey 1	1	7.23	7.62
	2	7.16	7.05
	3	8.04	7.16
	4	7.65	7.94
	5	7.52	8.03
	6	8.11	8.12
	7	7.93	7.11
	8	7.21	7.34

Survey 2	1	5.42	6.12
	2	5.86	6.04
	3	5.12	6.13
	4	5.97	5.78
	5	6.03	5.39
	6	6.07	5.86
	7	5.63	5.93
	8	5.72	5.19
Art therapy	1	6.23	6.89
	2	6.75	6.87
	3	6.93	6.54
	4	6.11	6.72
	5	6.86	6.14
	6	6.12	6.54
	7	6.56	6.73
	8	6.98	6.15

As it can be seen in Table 2, post-test values are significantly higher than the pre-test ones, suggesting that music training has a positive impact on the mental health of students. At pre-test, the highest scores were 8.12 (survey 1), 6.13 (survey 2), and 6.89 (art therapy); the lowest scores were 7.51 (survey 1), 5.65 (survey 2), and 6.17 (art therapy). For post-test the highest points are 9.89 (survey 1), 8.85 (survey 2), and 9.03 (art therapy). At the same time, the lowest are 8.98 (survey 1), 8.17 (survey 2), and 8.00 (art therapy). As can be seen above, the two groups were comparable in terms of initial status. The Student's test will make it possible to qualitatively assess the difference between the samples and confirm or reject the research hypothesis.

Table 2 - Findings from the experimental group

Research Method	Item	Experimental Group	
		pre-test	post-test
Survey 1	1	7.86	9.12
	2	7.56	9.04
	3	7.98	9.64
	4	8.12	9.87
	5	8.03	9.56
	6	7.64	9.45
	7	7.94	8.98
	8	7.51	9.89
Survey 2	1	5.78	8.85
	2	5.98	8.65
	3	5.67	8.43
	4	5.88	8.24
	5	6.13	8.86
	6	6.12	8.34
	7	5.94	8.52
	8	5.65	8.17

Art therapy	1	6.17	8.44
	2	6.45	8.67
	3	6.34	8.78
	4	6.76	8.00
	5	6.57	9.03
	6	6.89	8.98
	7	6.34	8.72
	8	6.22	8.45

Tables 3 and 4 present results of the normality test. This test is necessary because adherence to normal distribution is essential for applying the Student's test. Other factors include interdependence of samples and the sample size of at least 4.

The first column of the Tables 3 and 4 lists the research methods and the second column lists the parameters of the sample and the test statistic. The first three rows show the averaged value of the sample, variance and sample size, respectively. Rows four and five present empirical and tabular values of normality. Note that samples follow normal distribution if the empirical value of normality is larger than the tabular one. The third and fourth columns contain pre-test and post-test values, respectively. As in can be seen in Tables 3 and 4, all samples follow normal distribution and thus the Student's t test can be employed.

Table 3 - Results of the Shapiro–Wilk test (control group)

Shapiro-Wilk Test			
Research Method	Values	Control Group	
		pre-test	post-test
Survey 1	<x>	7.61	7.55
	s^2	1.05	1.3520
	n	8	
	W	0.0532	0.0004
	Wcr	0.8180	

Survey 2	<x>	5.73	5.81
	s^2	0.7584	0.8298
	n	8	
	W	0.1017	0.5982
	Wcr	0.8180	
Art therapy	<x>	6.57	6.57
	s^2	0.9440	0.6036
	n	8	
	W	0.0920	0.4561
	Wcr	0.8180	

Table 4 - Results of the Shapiro–Wilk test (experimental group)

Shapiro-Wilk Test			
Research Method	Values	Experimental Group	
		pre-test	post-test
Survey 1	<x>	7.83	9.44
	s^2	0.371	0.9159
	n	8	
	W	0.0655	0.1717
	Wcr	0.8180	
Survey 2	<x>	5.89	8.51
	s^2	0.2393	0.4816
	n	8	
	W	0.0020	0.3903
	Wcr	0.8180	
Art therapy	<x>	6.47	8.63
	s^2	0.4572	0.7803
	n	8	
	W	0.0486	0.0168
	Wcr	0.8180	

Results of the Student's t-test are depicted in Table 5. The first column lists the research methods. The second column lists the values obtained during the analysis. The first two rows (after rows "Shapiro-Wilk Test" and "Values") show data on variance and sample size, respectively. Rows three and four present empirical and tabular t-values. The t-test was aimed at testing the research

hypothesis. In this case, if the calculated t-value is greater than the tabular one, then it (research hypothesis) is proved. Otherwise, it is rejected.

As it can be seen in Table 5, the calculated t-value of the control group is not large enough, suggesting that there is no significant difference in mental health between assessments. At the same time, the calculated t-value of the experimental group is greater than the tabular one. Thus, the research hypothesis may be accepted.

Table 5 - Comparative results of the Student's t-test

Research Method	Values	Student's t-test	
		Control Group	Experimental Group
Survey 1	s^2	0.3002	0.1609
	n	8	
	t	0.1095	4.0235
	tcr	2.36	
Survey 2	s^2	0.1985	0.0901
	n	8	
	t	0.1739	8.7071
	tcr	2.36	
Art therapy	s^2	0.1935	0.1547
	n	8	
	t	0.0050	5.5078
	tcr	2.36	

The results of the interview showed that around 95% of respondents had a positive perception of one's own mental health at the end of the music training.

Discussion

The results obtained in this study are consistent with other studies in this field (CRAWFORD *et al*., 2017; LE CLERCQ *et al*., 2016; MARSH, 2017). For example, it was found that music therapy can help children under 17 years of age undergoing therapeutic interventions to achieve an improvement of health-related quality

of life and feel better (UGGLA *et al*., 2018). Doctors can use music to slow down hear rates of their patients and help them relive pain (LONGHI *et al*., 2015). However, this may not help to reduce blood pressure in patients with severe conditions (UGGLA *et al*., 2016). Clinical studies reported a decrease in depression and an increase in self-esteem among children taking 13 weeks of music therapy (PORTER *et al*., 2017). Music also has been proved to significantly reduce the level of fatigue in both children undergoing immunisation and their parents (YINGER, 2016).

The beneficial effect of music therapy on the physical and mental health of children was also highlighted by other authors (CIRIK and EFE, 2018). Music has helped individuals to better cope with stressful situations and reduce aggression. It may be used to enhance communication skills of children (SHARDA *et al*., 2018; SPIRO and HIMBERG, 2016) but its effect on family or social functioning may not be significant (PORTER *et al*., 2017). SPIRO and HIMBERG (2016) revealed several ways in which music links to our communicative behavior: movement, facial behavior, and rhythmic activity. The recent studies revealed that music therapy improved the general well-being of children with various mental disorders (BRINGAS *et al*., 2015; HABIB *et al*., 2016; HOHMANN *et al*., 2017). Similar to methodology used in this work was methodology applied in the study of relationship between music and communication (SHARDA *et al*., 2018) but the study period was much longer, between 8 and 12 weeks. Based on the results of that study, it can be stated that music therapy has a long-lasting effect on auditory-motor performance. In the study of children exposed to poverty and abuse, it was found that musical activity positively correlated with well-being, but the outcome of the music therapy varied from child to child (KIM, 2015).

Study limitations

The research has several limitations that can somewhat distort the findings. First, it was assumed that comparison data sets are

independent, but the results of the pre-test can influence those of the post-test. Nevertheless, since all samples are homogeneous and follow a normal distribution, this factor is likely to have little effect on data. Second, the study is limited by the small sample size. Framework of this experiment was proven by Research Ethics Committee.

Conclusions

This study focused on determining whether there is a positive correlation between music training and mental health. For this, a sample of high school students aged 12 to 17 years was exposed to 6 hour-long music lessons where they were engaged in listening to music, playing music, and signing. Based on normally distributed data analysis, it was found that subjective perceptions of one's own mental health among individuals in experimental group improved significantly when compared to the control group. This indicates a positive correlation between music training and mental health.

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Appendix 1

Survey 1

1. On the scale 1 to 10, how sociable are you?
2. On the scale 1 to 10, how eager are you to communicate and build relations?
3. On the scale 1 to 10, what is your current stress level?
4. On the scale 1 to 10, what is your current mood?
5. On the scale 1 to 10, what is your general mood during the day?
6. On the scale 1 to 10, how often do you laugh?
7. On the scale 1 to 10, how eager are you to receive new information?
8. On the scale 1 to 10, how satisfied are you with the way things are going?

Survey 2

1. On the scale 1 to 10, how would you describe your well-being?
2. On the scale 1 to 10, how would you rank your appetite?
3. On the scale 1 to 10, how well can you cope with the current physical workload?
4. On the scale 1 to 10, how well can you cope with the current mental workload?
5. On the scale 1 to 10, how tired do you feel during the day?
6. On the scale 1 to 10, how well do you sleep?
7. On the scale 1 to 10, how interested are you in learning?
8. On the scale 1 to 10, how interested are you in performing physical activities?

Publisher

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