Impact of Active and Passive Engagement in Musical Activity on Depression, Anxiety, and Stress Levels of NET/JRF Aspirants during COVID-19 Pandemic

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Abstract: The study evaluated whether musical activity has a significant impact on psychological parameters such as depression, anxiety, and stress among NET/JRF aspirants when the examination was delayed, and there was uncertainty of it due to the alarming situation caused by the continual rise of the Coronavirus Disease-2019 (COVID-19) in the country and worldwide. A cross-sectional, web-based study was conducted employing self-administered Google forms to gather data from a convenience sample of Indian students. The respondents of the form were allocated to four groups - the control group (neither engaged in musical activity nor were regular listeners of music), the active group (regularly engaged in musical activity), the passive (regularly listened to music) group, and an active-passive engagement group containing participant's who regularly engaged in both active and passive musical activity. Altogether 139 respondents were included in the study. Analysis of the collected data showed that all of the psychological variables studied showed a statistically highly significant difference (< 0.001) between the four groups. Multiple comparison tests also revealed that the studied variables in all the musical activity groups were significantly different ($p < 0.001$) from the control group. However, the variation in the parameters between the musical activity groups was not significant ($p > 0.05$). It was concluded that engaging in musical activity may considerably lower psychological distress in terms of depression, anxiety, and stress, in a worrisome, uncertain, and life-threatening situation of a pandemic when examinations are delayed or put on hold by the competent authorities.

Keywords*: Coronavirus, Impact, Music, Pandemic, Psychological health*

Introduction

The application of music to promote physical, mental, and overall health may be based on either receptive or interactive methods. The receptive method denotes listening to recorded or live music without any direct/active engagement to the musical activity, and hence it is a passive method. In contrast, the interactive method relies on a participatory approach. It is an active method since the subject directly participates in singing, instrument playing, songwriting, choir music, and so on (Chen et al. 2009: 191; Mathew et al. 2017: 7). Music is believed to have a significant impact on

the emotional, cognitive, physical, and social needs of an individual (Dobrzynska et al. 2006: 50). Hence, music is nowadays widely applied to boost psychological and overall health.

Psychological crises, such as depression, anxiety, and stress, have a global presence. Depression features sadness, decrement in social function, lack of interest in previously liked activities, increment in the susceptibility towards cognitive problems, increased psychological stress, lack of concentration, and decline in quality of life. Anxiety is characterized by worries, fear, and increment in tension followed by palpitations, sweating, and a rise in blood pressure. Stress is marked by "a non-specific and generalized response of the body to any demand made on the body" (Chatterjee and Mukherjee, 2019: 2009).

Many studies have found music to be effective in fighting against mental illness, stress, depression, anxiety, cardiovascular diseases, hypertension, and many other health ailments (Chatterjee and Mukherjee 2019: 2008; Chatterjee and Mukherjee 2020: 159; Kuhn 2002: 30; Sarkar and Utpal 2015: 11-12; Sunitha et al. 2018: 128; Tsoi et al. 2018: 568). These studies on the influence of music on physiological and psychological health have been done in a non-pandemic situation.

The most recently emerged pandemic, Coronavirus Disease-2019 (COVID-19), has caused havoc across the world. COVID-19 was first reported towards the end of 2019 in Wuhan, China. It took a few months for the new strain of the virus (coronavirus), causing the disease to reach India through human carriers (infected peoples). In India, it was spread to a large number of peoples via human-to-human transmission and even significantly contributed to mortality. The Government of India deployed lockdown in order to limit the disease from spreading. Various examinations, including National Eligibility Test/Junior Research Fellowship (NET/JRF) for lecturer ship and/or research, were postponed for the time being to safeguard the health of students. It needs to be mentioned that the NET/JRF examination is quite challenging, and its preparation is stressful and leads to perpetual physical and mental tension. The examination requires intense focus and sound knowledge to qualify. Only 6% of the candidates in a particular category are declared "qualified" by the National Testing Agency (NTA). This examination was scheduled to be held June, but was postponed by the NTA in May, due to the COVID-19 pandemic and was then supposed to be held in September. The significant restrictive changes in lifestyle like social distancing, and remaining confined at home due to lockdown, associated unpleasant situations, uncertainty about future and career are likely to induce psychological distress among the students.

Given the background, it was evident that though music is known to exert physiological and psychological benefits, its impact on psychological health in a pandemic situation like COVID-19 has not yet been substantially studied. Hence, this present study was framed with an aim to assess the impact of active, passive as well as both active-passive engagement in musical activity on emotional disturbances, in terms of psychological distress symptoms such as depression, anxiety, and stress, in NET/JRF aspirants, during the period of uncertainty about the examination, owing to the COVID-19 pandemic.

Materials and Methods

Design of the study

The study was a cross-sectional study and relied on convenience sampling. The study was conducted between July 15 and July 25, 2020. Before the study, institutional ethical committee

approval was attained. A structured Google form was designed and was circulated in Facebook groups of NET/JRF aspirants of India. The form collected consent, necessary demographic information, and enquired - whether the subjects are engaged in any musical activity (singing/playing instruments/composing) or not, whether, in their daily life, they listen to music or not. Both the questions had yes/no as the answer options. If the subjects selected "yes" for any of the two queries, the form required them to choose the frequency (regular/infrequent), which best described their engagement to the musical activity or listening music. If the subjects selected "no" as their answer, the form allowed them to skip the question related to the frequency. Lastly, and most importantly, the form presented the Depression Anxiety Stress Scale (DASS-21) questionnaire to the subjects.

Instrument

***Depression Anxiety Stress Scale (DASS) -21*:** The DASS-21 manual (Lovibond and Lovibond, 1995: 1-42) having the questionnaire and related details, contained 21 items (queries), seven items each to investigate depression, anxiety, and stress. The subjects were required to assign a score between 0, 1, 2, or 3 to indicate how much the item applied to the subjects over the past week, where "did not apply to me at all" equals to 0, "applied to me to some degree, or some of the time" equals to 1, "applied to me to a considerable degree, or a good part of the time" equals to 2, and "applied to me very much, or most of the time" equals to 3. The depression, anxiety, and stress scores was calculated by adding up the scores of their respective seven items. The possible score range was from 0- 21 for the separate seven items, and from 0- 63 for the total score of 21 items. A higher score indicates more psychological distress. The *doubled DASS-21 score* for each of the three-dimensions, that is, depression, anxiety, and stress were obtained by multiplying each of the raw scores of DASS-21 by two, to make them equivalent to full-length (42 items) DASS scores. It is to be mentioned that the values obtained by doubling the DASS-21 scale scores are known to be equivalent to the scores obtained by using the full-length DASS scale. Satisfactory psychometric property has been seen previously on the DASS-21 scale (Henry and Crawford 2005: 227-239).

Procedure

There were 150 Indian student respondents to the Google form. Based on the responses obtained, the subjects were allocated into four categories - a control group, active group, passive group, and an active-passive engagement group. Criteria were set for inclusion in these four groups. Participants who were neither involved in musical activities nor listened to music were allocated to the control group. Active group subjects were those who regularly participated in any musical activity. Passive group subjects were those who listened to music regularly, whether recorded or live but did not directly participate in musical activities. People who were found to be involved in both active and passive musical activity were included in the active-passive engagement group. People who were infrequent in the self-declared musical activity, were excluded from the study, as they did not fit into the criteria to be allocated under any of the four categories. Thus from the responses obtained using the Google form, only 139 (88 males and 51 females) participants were found suitable to be allocated to one of the four categories.

Statistical analysis

The data obtained were presented as mean (M) and standard deviation (SD). Employing an one-way analysis of variance (ANOVA), it was analyzed whether there was any significant variation in depression, anxiety, and stress scores between the control group, and three musical activity groups formed in the study. The post-hoc-Tukey's HSD (honestly significant difference) test was applied when ANOVA showed a significant difference. A p-value of < 0.05 or lower was considered significant. To find the relative change between the control group and the experimental group (active/passive/active-passive engagement group), the percentage change was computed: the difference between two means (experimental group mean and control group mean) that are to be compared was calculated. The difference was divided by the original number (control group mean), and the answer obtained was multiplied by a hundred.

Results

The age of the respondents in the study ranged from 22 to 27 years. The mean age of the respondents were 25 ± 4.1.

Table 1 showed that more males than females was the respondents of this study, and most of the respondents were master's degree holders.

Table 1: Characteristics of the study population

Variables	**Control Group** n= 38	**Active participant's group** n= 33	**Passive participant's group** n= 49	**Participant's engaged in both active and passive music** n=19
	Frequency	**Frequency**	**Frequency**	**Frequency**
Gender				
Male	20 (52.6)	19 (57.6)	38 (77.6)	11 (57.9)
Female	18 (47.4)	14 (42.4)	11 (22.4)	8 (42.1)
Educational Qualification				
Masters	29 (76.3)	26 (78.8)	34 (69.4)	15 (79.0)
Doctoral	9 (23.7)	7 (21.2)	15 (30.6)	4 (21.0)

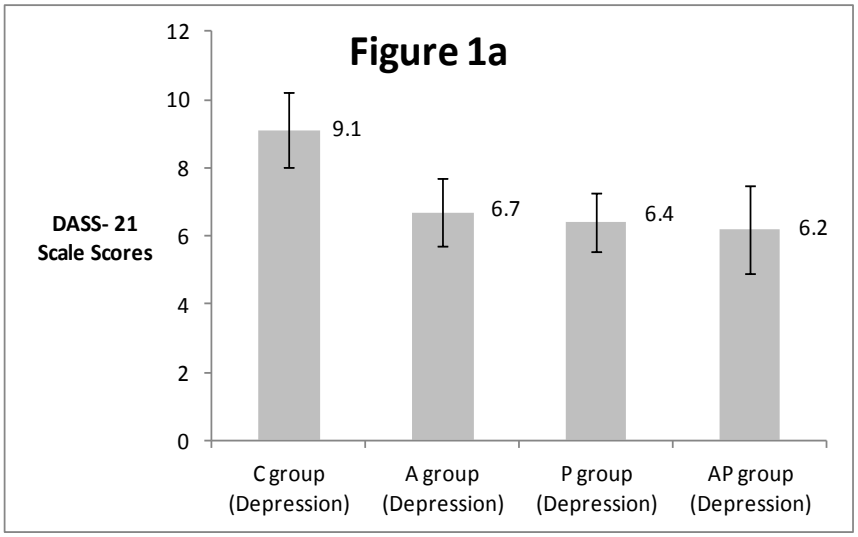
Note: The values within bracket are percentage (%).

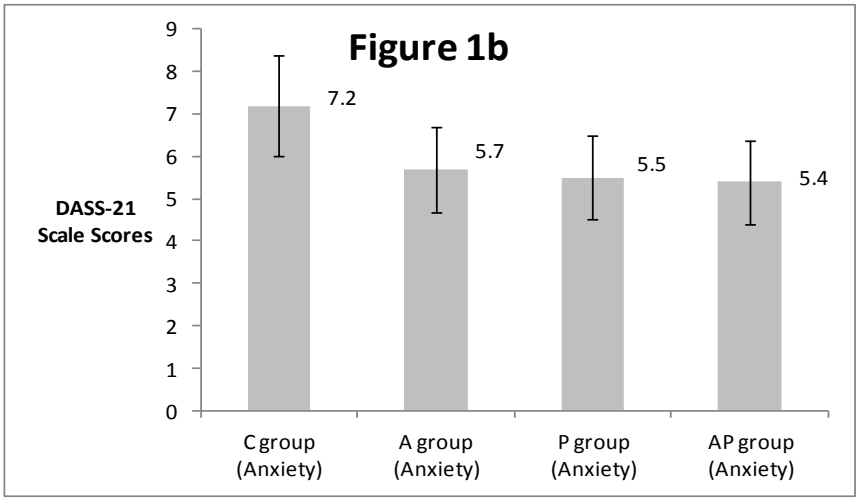
Table 2 presented the descriptive statistics (means and standard deviations) for the DASS-21 scale. **Figure 1a-c** shows the prime results, that is, the mean DASS-21 scores of depression, anxiety, and stress in a graphical manner. From Table 2, it was evident that in the active group, passive group, and active-passive engagement group, the mean values of the DASS-21 score of depression, anxiety, stress, and the total score, were found to be lower in comparison to the control group. Analysis with one way ANOVA showed that the observed lowering of the DASS-21 scores of depression, anxiety, stress, and the total score were highly statistically significant.

Table 2: Variation in the Depression Anxiety Stress Scale (DASS) -21 scores between the control group, active group, passive group, and active-passive engagement group

Scale	Control group (Mean ± SD) n= 38	Active participant's group (Mean ± SD) n= 33	Passive participant's group (Mean ± SD) n= 49	Participant's engaged in both active and passive music (Mean ± SD) n= 19	F-value (p-value)
DASS-21					
Depression (D)	9.1 ± 1.1	6.7 ± 1.0	6.4 ± 0.87	6.2 ± 1.3	61.988 (p < 0.001)*
Anxiety (A)	7.2 ± 1.2	5.7 ± 1.0	5.5 ± 0.98	5.4 ± 0.98	22.049 (p < 0.001)*
Stress (S)	8.8 ± 1.8	6.9 ± 1.6	7.0 ± 1.5	6.6 ± 1.7	12.838 (p < 0.001)*
Total Score = D+A+S	25.2 ± 2.8	19.3 ± 1.7	18.9 ± 2.3	18.1 ± 1.8	72.12 (p < 0.001)*

*Note: * Significant using One-Way ANOVA.*





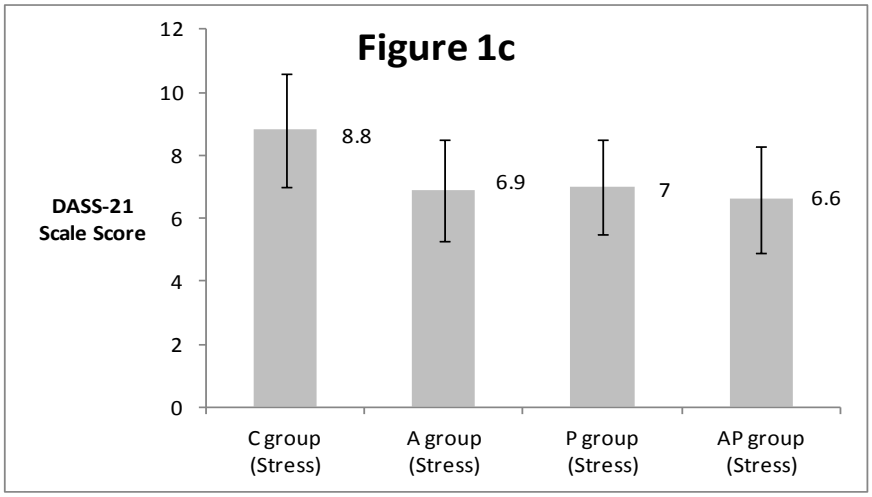


Figure 1a-c: DASS-21 score of depression, anxiety, and stress in the control group, active group, passive group, and active-passive engagement group (Note: C= Control group; A = Active group; P= Passive group; and AP = active-passive engagement group).

A post hoc comparison employing the Tukey's HSD test (**Table 3**) showed that the mean *depression score* of the active group (M = 6.7, SD = 1.0), passive group (M = 6.4, SD = 0.87), and active-passive engagement group (M = 6.2, SD = 1.3) were significantly lower from the control group (M = 9.1 , SD = 1.1).

Table 3: Multiple comparison- Post Hoc Tukey's HSD test: Depression scores of DASS-21

Pairwise comparison	Difference	Turkey HSD Q-statistic	95 % Confidence Interval		Critical Mean	p-value	Turkey HSD inference
			Lower CI	Upper CI			
C vs. A	2.34	13.6	1.715	2.979	0.63	0.000	p < 0.001*
C vs. P	2.69	17.2	2.123	3.271	0.57	0.000	p < 0.001*
C vs. AP	2.89	14.3	2.148	3.640	0.74	0.000	p < 0.001*
A vs. P	0.34	2.15	-0.248	0.947	0.59	0.43	p> 0.05 NS
A vs. AP	0.54	2.63	-0.217	1.311	0.76	0.25	p> 0.05 NS
P vs. AP	0.19	1.01	-0.519	0.915	0.71	0.89	p> 0.05 NS

Note:
C= Control group; A = Active group; P= Passive group; and AP = active-passive engagement group.
** Significant using Post Hoc Tukey's HSD test; NS = Not significant.*

A post hoc- Tukey's HSD test (**Table 4**) showed that the mean *anxiety score* of the active group (M = 5.7, SD = 1.0), passive group (M = 5.5, SD = 0.98), and active-passive engagement group (M = 5.4, SD = 0.98) were significantly lower from the control group (M = 7.2, SD = 1.2).

Table 4: Multiple comparison- Post Hoc Tukey's HSD test: Anxiety scores of DASS-21

Pairwise comparison	Difference	Turkey HSD Q-statistic	95 % Confidence Interval		Critical Mean	p-value	Turkey HSD inference
			Lower CI	Upper CI			
C vs. A	1.48	8.39	0.835	2.138	0.65	0.000	p < 0.001*
C vs. P	1.67	10.4	1.081	2.266	0.59	0.000	p < 0.001*
C vs. AP	1.71	8.18	0.941	2.480	0.77	0.000	p < 0.001*
A vs. P	0.19	1.11	-0.430	0.803	0.62	0.85	p> 0.05 NS
A vs. AP	0.22	1.04	-0.565	1.012	0.79	0.89	p> 0.05 NS
P vs. AP	0.04	0.18	-0.703	0.776	0.74	0.99	p> 0.05 NS

Note:
C= Control group; A = Active group; P= Passive group; and AP = active-passive engagement group.

** Significant using Post Hoc Tukey's HSD test; NS = Not significant.*

A post hoc- Tukey's HSD test (**Table 5**) showed that the mean *stress score* of the active group (M = 6.9, SD = 1.6), passive group (M = 7.0, SD = 1.5), and active-passive engagement group (M = 6.6, SD = 1.7) were significantly lower from the control group (M = 8.8, SD = 1.8).

Table 5: Multiple comparison- Post Hoc Tukey's HSD test: Stress scores of DASS-21

Pairwise comparison	Difference	Turkey HSD Q-statistic	95 % Confidence Interval		Critical Mean	p-value	Turkey HSD inference
			Lower CI	Upper CI			
C vs. A	1.96	6.97	0.928	2.999	1.03	0.000	p < 0.001*
C vs. P	1.86	7.28	0.922	2.803	0.94	0.000	p < 0.001*
C vs. AP	2.21	6.64	0.988	3.433	1.22	0.000	p < 0.001*
A vs. P	0.10	0.38	-0.879	1.080	0.98	0.99	p> 0.05 NS

Note:
C= Control group; A = Active group; P= Passive group; and AP = active-passive engagement group.
** Significant using Post Hoc Tukey's HSD test; NS = Not significant.*

A post hoc- Tukey's HSD test (**Table 6**) showed that the mean *total scores* of DASS- 21 of the active group (M = 19.3, SD = 1.7), passive group (M = 18.9, SD = 2.3), and active-passive engagement group (M = 18.1 , SD = 1.8) were significantly lower from the control group (M = 25.2 , SD = 2.8).

Table 6: Multiple comparison- Post Hoc Tukey's HSD test: Total scores of DASS-21

Pairwise comparison	Difference	Turkey HSD Q-statistic	95 % Confidence Interval		Critical Mean	p-value	Turkey HSD inference
			Lower CI	Upper CI			
C vs. A	5.82	15.36	4.426	7.214	1.39	0.000	p < 0.001*
C vs. P	6.24	18.14	4.979	7.512	1.27	0.000	p < 0.001*
C vs. AP	7.03	15.70	5.380	8.672	1.65	0.000	p < 0.001*
A vs. P	0.42	1.18	-0.894	1.744	1.32	0.83	p> 0.05 NS
A vs. AP	1.20	2.63	-0.481	2.892	1.69	0.25	p> 0.05 NS
P vs. AP	0.78	1.81	-0.802	2.364	1.58	0.75	p> 0.05 NS

*Note: C= Control group; A = Active group; P= Passive group; and AP = active-passive engagement group. * Significant using Post Hoc Tukey's HSD test; NS = Not significant.*

The DASS-21 mean scores of depression, anxiety, stress, and total score of the active group as compared with the control group are presented: depression (6.7 vs. 9.1), which indicated the percentage decrease to be 26.4 %; anxiety (5.7 vs. 7.2), which indicated the percentage decrease to be 20.8 %; stress (6.9 vs. 8.8), which indicated the percentage decrease to be 21.6 %; and the total score (19.3 vs. 25.2), which indicated the percentage decrease to be 23.4 %.

The DASS-21 mean scores of depression, anxiety, stress scores, and total score of the passive group as compared with the control group are presented: depression (6.4 vs.9.1), which indicated the percentage decrease to be 29.7 %; anxiety (5.5 vs. 7.2), which indicated the percentage decrease to be 23.6 %; stress (7.0 vs. 8.8), which indicated the percentage decrease to be 20.4 %; and the total score (18.9 vs. 25.2), which indicated the percentage decrease to be 25 %.

The DASS-21 mean scores of depression, anxiety, stress, and total score of the active-passive engagement group as compared with the control group is presented: depression (6.2 vs. 9.1), which indicated the percentage decrease to be 31.9 %; anxiety (5.4 vs. 7.2), which indicated the percentage decrease to be 25 %; stress (6.6 vs. 8.8), which indicated the percentage decrease to be 25 %; and the total score (18.1 vs. 25.2), which indicated the percentage decrease to be 28.2 %.

It should be noted that the DASS -21 scores were made equivalent to the full-length DASS scale scores by doubling. The doubled DASS-21 scores were exposed to the same statistical treatments as the DASS-21 scores. The obtained results are not presented in the manuscript since they mirrored the exact trend/pattern of results obtained using the DASS-21 scale. However, the summary statistics of the doubled DASS-21 scores are presented in **Table 7** to serve as reference values for future studies.

Table 7: Summary statistics (Mean and SD) of the Doubled DASS-21 Scores

Scale	Doubled DASS-21 Scores/ Standardised Scores [a]			
	Mean + SD	**Mean + SD**	**Mean + SD**	**Mean + SD**
Depression (D)	18.1 ± 2.1	13.4 ± 2.0	12.8 ± 1.74	12.4 ± 2.6
Anxiety (A)	14.4 ± 2.4	11.4 ± 2.0	11.0 ± 1.96	10.8 ± 1.96
Stress (S)	17.6 ± 3.6	13.8 ± 3.2	14.0 ± 3.0	13.2 ± 3.4
Total Score = D+A+S	50.4 ± 5.6	38.6 ± 3.4	37.8 ± 4.6	36.2 ± 3.6

As For the different groups, the raw scores of DASS- 21 were multiplied by two and then the mean and standard deviation were calculated to obtain the standardised score.

Discussion

The present study evaluated the impact of the engagement in musical activity (active/passive/active-passive engagement) on depression, anxiety, and stress, in a sample of NET/JRF aspirants, during a situation in which there were unprecedented delays and unpredictability about the said examination due to the COVID-19 health crisis.

The present study's findings clearly revealed that depression, anxiety, and stress levels were significantly less in subjects who reported either active or passive or active-passive engagement in musical activities during the COVID-19 pandemic. Thus, it may be said that engagement in musical activities may bring notable improvements in the psychological health of students in hard times. A very recent foreign study conducted in Italy during the same pandemic found similar beneficial effects of music on stress and well-being in terms of improvement in tiredness, sadness, fear, and worries (Giordano et al. 2020: 1-6). However, unlike the present study, this foreign study considered studying only the impact of passive musical activity. Moreover, the foreign study was done on clinical staff's with a much broader age range (22-59 years), whereas the present study were done on NET/JRF aspirants and hence included younger (22 to 27 years) subjects only. The foreign study investigated the stress concerning the workplace (COVID-19 care hospital), whereas the present study explored psychological distress centering around the NET/JRF examination during a pandemic situation.

It should be noted that in the present study, apparently, the calculated relative percentage change between the control group and the experimental groups (active/passive/active-passive engagement group) indicated that passive musical engagement, as well as both active-passive engagement were somewhat more effective than the active musical engagement in lowering depression, anxiety and, stress. However, the post hoc examination of the means values of depression, anxiety and, stress in the different musical activity groups, following significant one- way ANOVA, indicated that neither of the musical activities was significantly more effective than the other.

An earlier study conducted in 2018 showed that passive musical activity may restrict behavioral problems and anxiety in older adults. The authors of this particular study further concluded that passive musical activity is more efficient and convenient to implement than active musical activity (Tsoi et al. 2018: 568). Earlier studies have also shown that Indian classical music effectively decreases depression, anxiety, and stress levels (Chatterjee and Mukherjee, 2019: 2008; Sunitha et al. 2018: 128) in a non-pandemic situation.

Other authors have raised concerns that the COVID-19 period may adversely affect the mental well-being of health professionals (Soklaridis et al. 2020: 133) and the general population (Roy et al. 2020: 1). Studies have also pinpointed that COVID-19 may universally contribute to depression, anxiety, stress, and there is a need to focus attention on dealing with mental health issues during the ongoing pandemic (Bhagat, 2020: S36). Hence, to support the restoring of psychological health, cost-effective and easily implementable measures are necessary. The evidence generated by the present study is a step forward in the direction of seeking an effective measure to promote mental health. It needs to be mentioned that music therapy is a proven method to uplift psychological health (Witusik and Pietras 2019: 240). This present study is possibly the first study on the Indian population to show that music has the potential efficacy in benefitting the psychological health of the aspirants of NET/JRF amidst the COVID-19 situation.

Based on existing literature, the improvement in psychological variables seen in the present study may be attributed to the decreased activity of the hypothalamus-pituitary-adrenal axis, leading to the lowering of the stress hormone, cortisol in the blood (Chanda and Levitin 2013: 179-186). Music is also known to bring positive changes in the emotional sphere by affecting the limbic system concerned with emotions (Dalla Bella et al. 2009: 376), attenuate stress caused from

environmental factors (Pfeifer et al. 2019: 68), and reinstate sympathetic and parasympathetic balance (Li and Dong 2012: 81-83). These physiological changes on exposure to musical activity lower tension, stress, anxiety, and promote positive feelings.

An earlier study has found that people engaged in active musical activity may have a better functioning immune system than people engaged in passive musical activity (Kuhn 2002: 30). Another study showed greater perceptions of enjoyment and comfort in participants of active musical activity than participants of passive musical activity (Silverman and Leonard 2012: 390). These previous studies lead to the notion that this present study will also show that the active participation in musical activity is more effective at affecting psychological health than passive participation. However, no such trend was seen in the present study, which made it clear that the observed results cannot be generalized across studies, owing to the differences in sample size, mode of musical engagement, research design and, several other factors.

There are certain limitations of this study- This study does not provide any evidence of causal nature. However, it gives possible explanations for the results based on available literature. Due to the ongoing coronavirus health crisis, no field surveys were conducted, and the study entirely depended on self-reports provided by the respondents over the web. Hence, biases may have crept into the results. This study did not take into consideration the intricacies of the musical activity of the subjects. Although the present study included males and females, the sample predominantly represented males.

Future studies should maintain a balance between the male and female ratios while sampling. More robust studies are needed to strengthen the findings of the study. Future studies may be undertaken to investigate the impact of different music styles and intensities on various psychological variables.

Conclusion

The findings of the present study provided valuable insights into the beneficial impact of active, passive, and active-passive musical activities on the psychological health of NET/JRF aspiring students in times of public health crisis. The findings suggest that during the COVID-19 crisis, or in a similar pandemic situation of the future, music may be employed as an effective non-pharmacological intervention or alternative intervention to prevent psychological health from deteriorating among students aspiring to appear in different examinations. This may lead to overall good performance in the examinations.

Acknowledgements

We are thankful to all the participants of the study. We also express sincere gratitude to Senior Physician Dr. Amal Chatterjee, Ex-Medical Officer, West Bengal Health Services, for helping the authors to complete this study.

Funding Sources: Nil.

Conflicts of Interest: None declared.

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