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# Relaxation Value of Music and Biofeedback in Relation to Musicality

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The present investigation was designed to study the comparative relaxation value of electromayograph (EMG) biofeedback training and instrumental music on musicality groups (high-musicality group and low-musicality group). All participants ($N$ = 60) were medium on Extraversion and Neuroticism as determined by Hindi version of Eysenck Personality Inventory (Gupta & Poddar, 1979). A control group design with pre-post assessment was adopted. Alpha EEG was the dependent variable. It was found that music-treatment had significantly higher relaxation value for the participants with high-musicality as compared to those with low-musicality who relaxed more with biofeedback-treatment.

*Keywords:* music, musicality, relaxation, biofeedback, behavioral medicine, extraversion, neuroticism

Behavioural medicine employs methods that can help in reconstructing personality and changing the life-style of an individual. It emphasizes the role of psychological factors in physical illness and a wide variety of behavioural problems. There is a variety of therapeutic techniques that can be enlisted under the heading of behavioural medicine such as biofeedback, progressive muscular relaxation, *shavasan* (a yogic technique of bringing about deep relaxation to the innermost core of one's being by creating 'corpse-like' stillness in each and every part of the body), diaphragmatic breathing and other alternatives like music, meditation, electrostimulation magnate therapy, etc. These techniques alter behaviour pattern, give symptom relief, and bring brief actual changes in organ systems like decrease in pain, sweating, air way resistance in the lungs, etc.

There is a need for using new powerful research techniques for strengthening basic therapeutic methodology and for increasing

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understanding about the mechanism that affect the physical and mental health of individuals. Behavioural medicine techniques are considered to be useful for stress management and ameliorating many of the side-effects of medical treatment such as pain, anxiety, nausea, fatigue, negative thinking, etc. Research in the area of therapeutic effectiveness of such techniques is almost negligible in India.

Music is not only entertaining but it also has tension-diffusing value in the atmosphere of competition, rivalry, complexes, and unfamiliarity (Ramakrishnan, 1990) and helps in concentrating and meditating upon universal centre (Yati, 1987). The curative value of music has its roots in ancient history. This idea was not restricted to some cultures but was prevalent in different parts of the world. The effects of music on behaviour are mentioned in the Vedas, the Bible, early Buddhist texts, and in the writings of Confucius, Plato, Aristotle, and Pythagoras. A primitive physician Shamn gave the viewpoint of *Shamnism* which refers to musicotherapy as a method for treating various psychophysical diseases. According to this view, diseases develop due to imbalance in the rhythm of body and mind and music helps to regain this balance (Rani, 1991). Pinto (1994) holds that melodies induce a feeling of well-being which translates into regularized cardiac function, lowered blood pressure, and the appearance of alpha and theta wave frequencies in the EEG. Music has therapeutic value, as according to a research it had an almost magical effect on the students suffering from high anxiety levels at school (Sharma, 2006).

Biofeedback is feedback from a measuring instrument that yields moment to moment information about a biological function (Kothurkar, 1985). It is based on cognitive behavioural treatment procedures applied in medical setting. Biofeedback training includes voluntary control of the physiological processes and reinforcing method of rewards the person obtains by way of encouraging knowledge of results. This leads to clinical improvement in associated psychosomatic, psychological or neuromuscular disorders. Electromyograph (EMG) biofeedback heightens proprioceptive awareness of the mechanisms of muscle flexure and develops voluntary control over dysfunctional, semivoluntary, or involuntary muscle activity. It is useful in training relaxation of an over active muscle both at rest and inactive moments (Basmajian, 1989).

Paul (2001) reported that biofeedback and relaxation training have proven to be promising treatments for children who suffer from migraine headaches. Biofeedback programme is designed to help uncovering body's natural ability to counter the wear and tear that

everyday stress has on one's health. It helps the person to learn how to activate, balance, release, and recover from them for optimal health. It helps to restore physical, mental, and spiritual health (Chopra, Ornish, & Wel, 2006). Biofeedback training shows improved memory and concentration, more ease in falling asleep, better sleep continuity, and significant improvement in mental relaxation (Muto, Zhang, & Howarth, 2006).

Musicality as a trait of personality denotes the ability to enjoy music aesthetically (Deutch, 1982). A person of high-musicality seeks to appreciate the aesthetic content of music that lies deep at the bottom of tone, time, and colour of the musical composition. Every human being is born with the some level of capacity to develop musicality (Gordon, 1997). The proclivity of musicality varies in individuals and is thought to be stable overtime after childhood (Serefine, 1986).

Brandstrom (1999) discovered two broad views of musicality--an *absolute* view and a *relativistic* view. An absolute view is that musicality is inherited and can be measured by music achievement such as performing, composing, and improvising. The relativistic view is that all humans are capable of being musical. Musicality is about the relationship between man and the music (Zimmerman, 2001). Musicality is the level of one's ability to experience music as meaningful, informed by sensitive discernment, and broad understandings through each particular musical role engagement in which one becomes involved (Reimer, 2003).

The key question of this study is to examine the effectiveness of biofeedback and music for mental relaxation on the groups formed on the basis of musicality. Persons high on musicality are found to be extraverted and emotional (Wilson, 1984). Szucharewa and Ossipowa (1986) were of the view that persons who are extremely extraverts are surely genius in music. It is, therefore, assumed that persons having high-musicality may respond to music better than biofeedback. The rationale is that low extraverts condition better because they are hypersensitive to stimulus cues and the conditionability of high extraverts is poor because the discrimination between stimulus cues is lacking (Eyesenck, 1967). Hence, the participants low on musicality will respond more to biofeedback because one of the bases of biofeedback is operant conditioning i.e., learning through positive reinforcement. The following hypotheses are formulated:

1. Two groups of subjects, one having high and the other having low scores on musicality test, are likely to differ in mental

relaxation under music-treatment; high-musicality group is expected to exhibit more relaxation than the low-musicality group.

2. The two groups, one high and the other low in musicality, are likely to differ under biofeedback-treatment; low-musicality group is likely to respond better than the high-musicality group.
3. Both the experimental groups are likely to exhibit higher levels of relaxation than the control group at both levels of musicality.
4. The two musicality groups might be affected by the two treatment conditions differently, showing interactive effects.

## Method

### *Experimental Design*

A between subject randomized block design involving two levels of musicality (high and low) and three levels of experimental conditions (two relaxation producing treatment conditions i.e., music and biofeedback and a controlled condition) was used. The replication of the design needed 6 (2×3) cells. In each cell of the design there were 10 participants. Alpha EEG per second of each participant was measured before and after the treatment. The difference between these pre-post values was used as the effect of experimental condition.

### *Sample*

The sample drawn from the female student population of Punjabi University, Patiala included 60 partcipants in all, 30 having high-musicality and 30 having low-musicality scores. All subjects were psychologically and physiologically normal and none of them was taking any medication. All of them had medium scores on Extraversion and Neuroticism.

For sample selection, firstly, Hindi version of Eysenck Personality Inventory (EPI; Gupta & Poddar, 1979) was administered on 450 female students to screen the students having medium scores on Extraversion and Neuroticism. For this, norms developed for Hindi version of EPI were used. Out of 450, 110 students fell in this category. Then Indiana-Oregon Music Discrimination Test (Long, 1965) was administered on these 110 students. Finally, 60 students

according to their musicality scores were classified into high-musicality group and low-musicality group on the basis of the criteria for of mean±0.5 *SD*. The criteria for musicality groups were high-musicality = 56 and above, and low-musicality = 42 and below.

## *Instruments*

*Indiana-Oregon Music Discrimination Test.* It is a standardized test for measuring musicality consisting of 43 items (Long, 1965). The test has been validated with the scores obtained on the test of tonal-imagery. The coefficient of correlation is .45. Its split half reliability coefficient with the Spearman-Brown formula is .82.

*Hindi version of Eysenck Personality Inventory (EPI).* Form A (Eysenck & Eysenck, 1964) developed by Gupta and Poddar (1979), a highly reliable and valid tool for measuring Extraversion (E) and Neuroticism (N) traits of personality, was utilized. Its test–retest correlations for three subscales are: E = .80; N = .82; L (Lie) = .76 and the correlation between the scores of English and Hindi version are: E = .91; N = .90; L=.87 (for men) and E = .92; M = .93; L = .90 (for women) as reported by Gupta (1987).

*Integrated Alpha EEG Monitor (EBF 5000).* It is an electronic apparatus prepared by Medicaid Systems. It measures alpha activity accumulated during a specified time period that shows mental-relaxation of the participants.

*Electromyograph (EMG) Biofeedback Biotrainer (MBF-4000).* It is an electronic apparatus, prepared by Medicaid Systems, that was used for biofeedback-treatment.

*Music.* A cassette having half an hour instrumental flute played in *Rag* (Indian classical music) '*Desi Todi*' without *tabla* (Indian drum). This was used for giving music-treatment. Cassette Player with headphones was utilized.

## *Procedure*

For music-treatment the participants were subjected to the instrumental flute music for half an hour daily for twenty days. They were seated in such a way that they could not look at each other, and were instructed to enjoy music through headphones till the music continued. For biofeedback-treatment, each subject was given frontal muscle relaxation individually with electronically operated EMG biofeedback trainer for half an hour daily. The treatment lasted for

twenty such sessions. For control group no treatment was given to the participants. For all three groups alpha EEG per second were measured after and before experimental conditions to obtain pre-post difference in alpha EEG to measure effect of independent variables on dependent variable.

## Results and Discussion

Hartley test (Winer, 1971) showed homogeneity of variance in the data. The data were treated by ANOVA and Newman-Keul's tests were used in multiple comparisons. The results have been presented in Table 1 through Table 5.

The mental relaxation value under music-treatment in the two musicality groups differed from each other. The high-musicality group exhibited more relaxation than the low-musicality group. These results led to accept the first hypothesis (Table 1).

Table 1

*Mean and Standard Deviations of Relaxation Scores for High and Low-musicality Groups on Different Experimental Conditions*

| Experimental conditions | High-musicality group ($n = 30$) | | Low-musicality group ($n = 30$) | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Music | 0.63 | 0.06 | 0.42 | 0.06 |
| Biofeedback | 0.36 | 0.08 | 0.67 | 0.07 |
| Control group | 0.25 | 0.04 | 0.29 | 0.05 |

The results in Table 1 indicate that the method of biofeedback training has an edge over the method of music in the case of low in musicality individuals. This confirms our second hypothesis. *Figure 1* represents the mean difference in a bar diagram form. These results are in line with the results of Eysenck (1967) showing that introverts due to their better conditionability have more relaxation gains under biofeedback-treatment which is a broad based behavior technique. We may recall here the views of Wilson (1984) pointing out that persons who are high on music are found to be extraverted. We may, therefore, presume that the persons low on extraversion may respond better to biofeedback training.

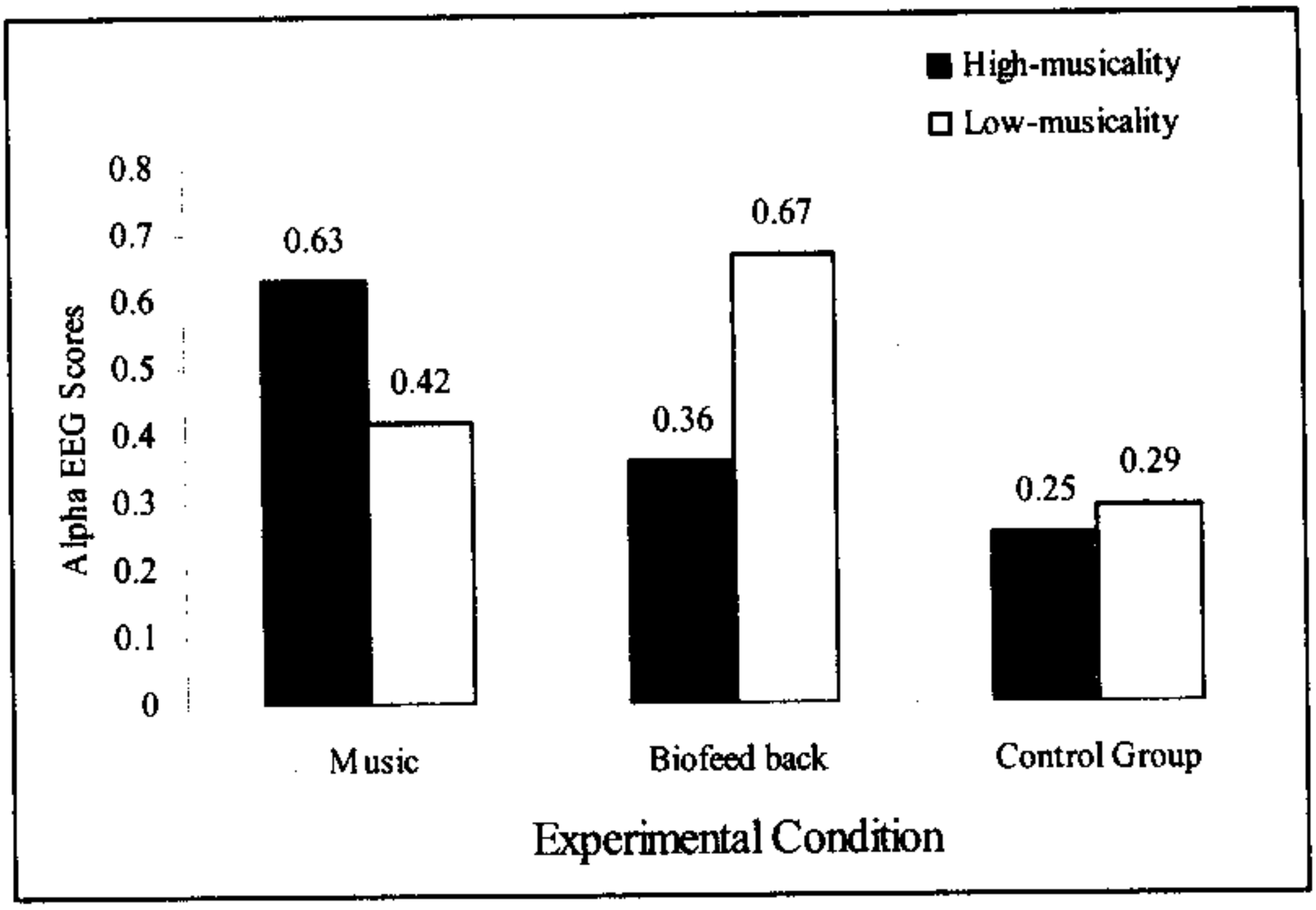


*Figure 1.* Average relaxation scores representation of high and low-musicality groups on different experimental conditions.

The difference of relaxation value under music and biofeedback treatments between high and low musicality level groups is significant, but high and low musicality groups do not differ significantly in control group for their relaxation value as they were not given any treatment for relaxation (Table 2).

Table 2

*Results of Analysis of Variance Comparing Alpha EEG Scores of High and Low-musicality Groups on Different Experimental Conditions*

| Source of variation | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| Music | 0.26 | 2 | 0.3 | 45.83* |
| Biofeedback | 0.48 | 2 | 0.48 | 100.00* |
| Control group | 0.01 | 2 | 0.01 | 2.08 |
| Within experimental conditions (Error) | 0.26 | 54 | 0.00 | |

*$p < .01$.

High and low-musicality groups differ significantly in their relaxation scores under both the treatments (Table 3). High-musicality group benefited more under music-treatment in comparison to

biofeedback, whereas low-musicality group benefited more under biofeedback-treatment in comparison to music-treatment (Table 1, *Figure 1*).

Table 3

*Results of Analysis of Variance Comparing Alpha EEG Scores on Three Experimental Conditions for High and Low-musicality Groups*

| Source of variation | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| Experimental conditions for high-musicality | 0.79 | 2 | 0.38 | 79.16* |
| Experimental conditions for low-musicality | 0.74 | 2 | 0.37 | 77.08* |
| Within experimental conditions (Error) | 0.26 | 54 | 0.00 | |

*$p < .01$.

It is clear from the analysis reported in Table 4 that musicality and experimental conditions including the control group interact at $p < .01$ level of significance. The relaxation effects of various experimental conditions vary significantly irrespective of the musicality levels. Similarly, the high and low-musicality groups differ significantly with all types of experimental conditions including the control group.

Table 4

*Results of Analysis of Variance for Musicality and Experimental Conditions on Alpha EEG Scores*

| Source of variation | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| Musicality | 0.06 | 1 | 0.06 | 12.5* |
| Experimental conditions | 0.87 | 2 | 0.43 | 89.5* |
| Musicality x Experimental conditions | 0.64 | 2 | 0.32 | 66.66* |
| Within experimental conditions | 0.26 | 54 | 0.00 | |

*$p < .01$.

The independent effect of musicality differs significantly in music and biofeedback-treatment and the control group ($p < .01$). The main effect of experimental conditions including control-group varied significantly in the high and low-musicality groups ($p < .01$). The interaction between musicality and experimental conditions is also significant.

The results of Newman-Keul's test reveal that in high-musicality group, the effect under music-treatment differs significantly with that under biofeedback and also with no treatment. The position is similar in low-musicality group. The Newman-Keul's test results (Tables 5) also show that both music and biofeedback differ significantly with the control-group on both the levels of musicality. It is evident from the results that both methods of treatment i.e., music and biofeedback have adequate relaxation value irrespective of the musicality levels, but a look on the means shows that music is more effective as compared to biofeedback.

Table 5

*Significance of Difference between Means by Newman-Keul's Test for High and Low-musicality Groups and Alpha EEG Scores*

| | Ordered means | | | | | |
|---|---|---|---|---|---|---|
| | Control (c) | Biofeedback (b) | Music (a) | *r* | q.99(r,27)√MsError/n | *p* |
| | | High-musicality group[a] | | | | |
| Mean | 0.20 | 0.36 | 0.62 | | | |
| c 0.20 | | 0.16 | 0.42 | 3 | 0.05 | .01 |
| b 0.36 | | | 0.26 | 2 | 0.05 | .01 |
| Range (r) | | 2 | | 3 | | |
| | | Low-musicality group[b] | | | | |
| Mean | 0.29 | 0.41 | 0.67 | | | |
| c 0.29 | | 0.12 | 0.38 | 3 | 0.09 | .01 |
| a 0.41 | | | 0.26 | 2 | 0.08 | .01 |
| Range (r) | | 2 | | 3 | | |

*Note.* [a]$n = 30$. [b]$n = 30$.

Keeping in view the complexity of human organism, it was difficult to take gender as an independent variable at that initial moment. Though, the present investigation carries this limitation of generalization for considering only female participants, still it can be considered as an important step towards the formulation of a theory regarding the effectiveness of two behavioural medicine techniques as far as their relaxation value is concerned. Further research is in progress on the subjects of various age groups of men and women.

There are all types of opinions about the effectiveness of music. The cognitive view of music holds that musical experience is a

matter of cognition than perception. However, generally it is thought that responding to music is an inborn tendency in humans; and musicality mainly relates to the tendency of appreciation of music in the individuals with varying degrees. Whether, it is the imbalance in the rhythm of body and mind; whether there is any specific centre for musical perception or it has an psychoanalytic explanation; whether it relates to cognition or perceptual acuity or any other such fragmented view, one thing seems to be quite appealing that all of these factors are the components of a wider concept of musicality. The question of measurement of musicality certainly creates some problems for the researcher, but one has to rest on some available techniques which have been used and tested as standardized techniques.

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