

# EFFECTS OF THERAPEUTIC LISTENING ON DEPRESSION AND PHYSICAL ACTIVITY IN SCHOOL GOING ADOLESCENTS: A RANDOMIZED CONTROLLED TRIAL

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## ABSTRACT

### Introduction

Depression is the prime cause of illness and disability in the world and is considered a major contributor to the global burden of diseases. Recently the Therapeutic Listening (TL) becomes a novel tool in the management of Depression. But it has minimal evidence and hence it need to be focused.

### Purpose

To estimate the effects of severity of depression, abdominal strength, balance, and overall Physical activity of school-going adolescents following therapeutic listening therapy (TLT).

### Methodology

The randomized controlled trial performed on 30 school-going adolescents with depression who were recruited through simple random sampling. They were allocated into a TLT and a Traditional Music therapy (TMT) group through block randomization. Both groups had received their respective interventions for 30 minutes a day, 3 days a week for 6 weeks. Depression Anxiety and Stress Scale- short version 21 (DASS-21), Physical Activity Questionnaire for adolescents (PAQ-A), Modified sphygmomanometer to measure abdominal strength, and sensabalance fitness board (Sensamove) were compared at baseline and 6 weeks post-intervention within and between the groups.

### Result

Statistically significant difference ( $p < 0.05$ ) were observed in all the outcome measures, except anxiety of DASS-21 in both the groups.

### Conclusion

TLT was found to be beneficial in improving depression and stress level, PA, and abdominal strength when compared to TMT. Both TLT and TMT have to potential to reduce anxiety.

### Keywords:

Anxiety; Children; Depression; Therapeutic listening; Music therapy.

## I. INTRODUCTION

Adolescence is a phase of life marked by significant biological, psychological, and social changes.<sup>1</sup> They were particularly prone to depression during the transition phase, which is characterized by emotional instability. In India, the Prevalence of depression and affective disorders among the adolescence ranges from 3%-68% in school-based studies, 1.2 to 21 % in the clinic-based studies, and 0.1 % to 6.94% in community-based studies.<sup>2,3</sup>

Depression is difficult to diagnose because of behavioral shifts associated with hormonal changes during this period. According to reports, more than 70% of children with depression do not receive adequate care. In recent years, Academic stress emerges as a considerable mental problem. It has been estimated that 10 to 30 percent of students experience related stress that affects their academic performance, psychosocial adjustment along their overall emotional and physical wellbeing.<sup>4,5</sup> Because of the interrelationship with physical, emotional, and social well-being, evidence suggests that physical activity is needed for healthy living.<sup>6</sup> Excessive fear of falling, which is often linked to depression, increases the risk of falling. Depression and the fear of falling are also linked to problems with gait and balance, and this connection is mediated by cognitive, auditory, and motor pathways.<sup>7</sup> Depression is a risk factor for falling on its own. Postural sway, history of falls, handgrip ability, and depressive symptoms were all shown to be determinants of repeated falls in one prospective analysis.<sup>8</sup> Individually, depressive symptoms can play a direct role in the promotion of falls.<sup>9</sup>

Therapeutic listening is a skill-based intervention that is based on developmental and neurological principles that possess implications for improving sensorimotor functions of the brain by providing stimulation through electronically altered music with greatly varying frequency patterns to the auditory system necessary for arousal, control, and modulation. The skills like attention, sensory integration (SI), social skills, communication, balance, and perceiving and navigating space are learned while listening to specialized music on headphones.<sup>10,11</sup>

Although TL therapy (TLT) has numerous benefits on various psychological disorders, there is a lack of intervention studies and outcomes on depression in school-going adolescents and Therapeutic listening, a novel tool on the other hand can prove to be low on cost, easily accessible, a highly compliant app-based clinical tool to help children improve their psychological well-being thus contributing to their academic performance. Hence, the need for the study is to find the effect of TLT on anxiety, stress, depression, abdominal strength, balance and overall physical activity (PA) school-going adolescents with depression. We hypothesis that, TLT may be effective in improving the severity of depression, PA, and balance in school-going adolescents with depression.

## II. MATERIAL AND METHODS

The study was designed to see the effectiveness of therapeutic listening (TL) therapy on depression and PA in school-going adolescents with depression. Based on selection criteria (table-1) 30 in school-going adolescents with depression were screened for this assessor-blinded randomized control trial. The study protocol has adhered to the ethical principles laid by, declaration of Helsinki (Revised 2013), National guidelines for biomedical and health research involving human participants by the Indian Council of Medical Research (ICMR), 2017, national ethical guidelines for biomedical and health research involving human participants by Indian Council of Medical Research (ICMR), 2017 and was approved by the institutional ethical committee. Consent for participation in the study was obtained from the participants and their parents/guardians before the start of the study. The selection criteria for the study participants were mentioned in Table 1.

**Table 1:** Selection criteria for the recruitment of participants.

INCLUSION CRITERIA	EXCLUSION CRITERIA
Shool going adolescents with depression (DA)	Any previous history of diagnosed depression by parent response.
Aged 13-18 years	Under antidepressant/antipsychotic medication for the past 6 months.
Both female and male	Recent history of ear infection Refuse to participate in the study.
<b>Participants with Depression (Assessed by Children depression Inventory 2)</b>	Deafness and Systemic illness

The Sample size was not estimated for this feasibility trail, as it was executed to determine the practical feasibility in executing the trial. From the result of this feasibility trial, the sample size will be estimated for the large sample size study. Hence, for this pilot feasibility trial, a sample size of 12 per group were fixed as recommended.<sup>12</sup> Anticipating 20% drop-outs, n=15 samples were recruited in each group, totaling sample size of

n=30. Before the allocation into groups, baseline measures of the subject’s demographic characteristics and pre-intervention scores of the outcome measures, DASS-21, PAQ-A, Modified Sphygmomanometer, and Senso balance were recorded by qualified Physiotherapist (QP).

All the recruited participants were randomly allocated into a TL therapy (TLT) group and a Traditional Music therapy (TMT) group through block randomization with a 6×5 matrix using concealed envelopes with 6 individuals (3 for TMT and 3 for TLT). Both groups had received their respective interventions for 30 minutes a day, 3 days a week for 6 weeks. The graphical description of the study protocol was displayed in Figure 1.

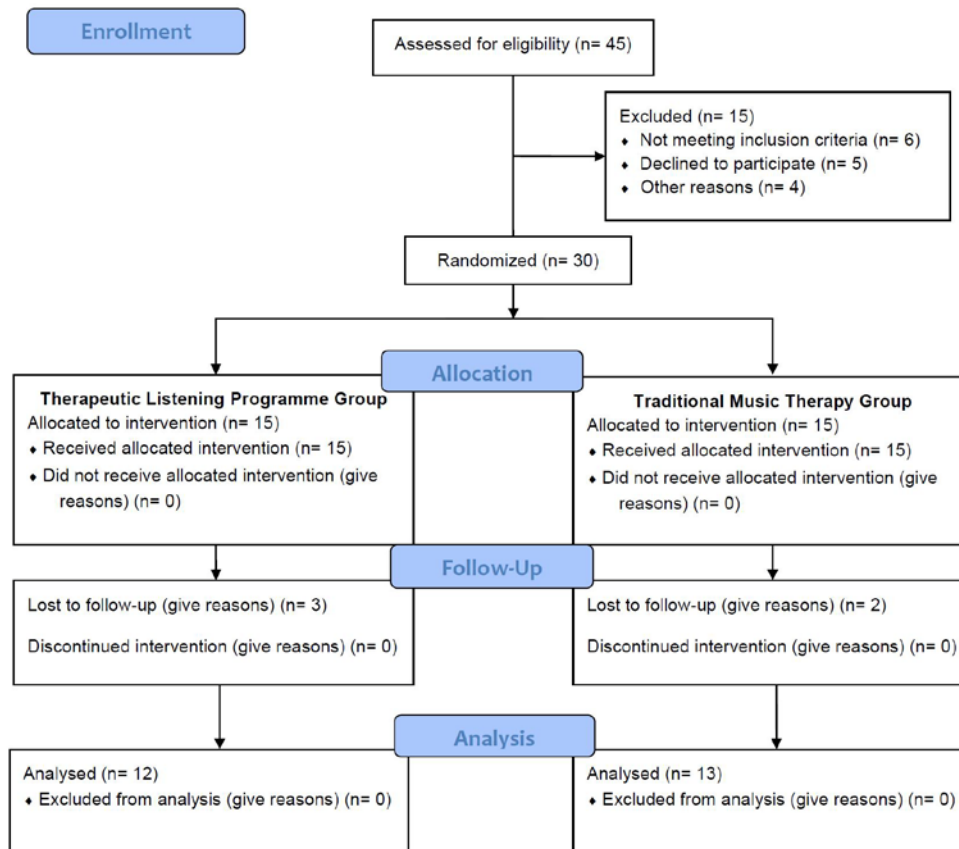


Figure 1: Graphical description of the study protocol

### III. STUDY INTERVENTION

The Detailed week-wise intervention program is given in Table 2.

Table 2: Week wise details on Therapeutic listening program

S.No.	Total Duration	Mode	Weeks	Album Title	Dose
1.	3 weeks	ENGAGEMENT	Week 1	Razzberry jamz	30 min per session once a day, 3 days a week
			Week 2	Nature pops	
			Week 3	Early Mozart	
2.	2 weeks	INTERACTION	Week 4	Baroque for modulation	30 min per session once a day, 3 days a week
			Week 5	Bach for modulation	
3.	1 week	DISCRIMINATION	Week 6	Mozart strings #1	30 min per session once a

					day, 3 days a week
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Participants were instructed to avoid activities that required intense focus and that would distract them from listening, such as watching TV or playing video games during listening sessions using High-quality Sennheiser headphones as displayed in Figure 2. Pre and Post Outcome parameters assessed by an independent blinder before and after 6 weeks of intervention for both groups.



**Figure 2:** High-quality Sennheiser headphones used in the study

#### **Outcome measures**

##### **Children’s Depression Inventory- Teacher (CDI-2)**

CDI-2 teacher used as screening tool contains 12 items including questions about emotional problems and functional problems. Teachers marked one of the three statements regarding the most appropriate for the past two weeks. For the half of the items, the negative statement is first, for the half the order is reversed. Therapist calculated the total raw scores, T- scores and percentile ranks by sex and age groups. The total scores reflect the overall extent of depressive symptoms, their age specific manifestations, and associated functional difficulties. The emotional program scale score mirrors item endorsements that tap dysphoric affect including sadness and guilt, as well as the neuro vegetative symptoms of depression. The functional program scale score taps symptoms that have evident functional consequences with regard to peers, school, and family life (for e.g., declining school grades, difficulty getting along with others due to irritability).

Based upon inclusion criteria adolescents who were classified under high-average, elevated, and very elevated were included in the study.

##### **Depression Anxiety Stress Scale – Short Form (DASS-21)**

DASS – 21 is used to check the severity for depression, anxiety, and stress. The depression scale measures dysphoria and sadness, the anxiety scale focuses on physiological arousal and fear while the stress scale examines states of tension and stress. Students were asked to score every item on a scale from 0 (did not apply to me at all) to 3 (applied to me very much). Each question was based on experiences in the preceding seven days. Questions on the DASS – 21 are representative of the full scale, however for scoring purposes each result was multiplied by two to enable interpretation across the measure. These scores are derived from a set of severity ratings, which are labelled as “normal”, “mild”, “moderate”, “severe” or “extremely severe”.

In this study, DASS-21 was used as an outcome measure tool. Pre - Post outcome of same were taken before and after the intervention.

##### **Physical Activity Questionnaire-Adolescents (PAQ-A)**

The PAQ-A is a simple self-report tool designed to assess moderate to vigorous physical activity for high school students with ages 14-20 years approximately (grades 9-12) over the past week. The PAQ includes nine items (eight items for PAQ-A), each scored on a 5-point scale. The values were averaged to create a composite score with a higher value indicative of a higher activity level. The first question provides a physical activity checklist

including over twenty different kinds of sport and exercise activities asking the students how many times they do each in the past seven days. The next six questions examine their activity level in different school settings at certain periods in the last seven days (PE, recess, immediately after school, evening, weekends). The seventh question requires the students to summarize their general activity levels from among five different statements. The eighth question asks students to report their frequency in physical activities for each day of the previous week. The last one talks about their health issues which may have affected their physical activity.

In this study, PAQ-A was used as an outcome measure tool. Pre - Post outcome of same were taken before and after the intervention.

### **Modified Sphygmomanometer**

To assess the abdominal strength the modified sphygmomanometer was inflated to 100 mmHg and its valve was kept closed to remove the folds from the inflatable portion then, the pressure was reduced to 20 mmHg, and the valve was closed again to prevent any leakage. The inflated part of the device was placed on the sternum below the jugular notch.

The assessment of abdominal muscles was conducted with adolescents sitting on a chair without armrest, feet supported, knees bent at 90 degrees and hands relaxed and resting on the thighs. The students were instructed not to perform any compensatory movement while checking the abdominal strength. Prior to the strength assessment a demonstration and familiarization to the equipment and the procedure was performed. During testing, the students were instructed to perform a maximal isometric contraction for five seconds as displayed in Figure 3 and the peak force was calculated. The participants received verbal commands to initiate the movement and to hold the contraction; “one, two, three and now! force...force... relax!”

Three trials were obtained with 15 seconds rest interval in between the repetitions. The mean score of the obtained values was calculated.

In this study, Modified Sphygmomanometer was used as an outcome measure tool. Pre - Post outcome of same were taken before and after the intervention.



Figure 3: Therapist measuring abdominal strength by modified sphygmomanometer

### **The SensBalance Fitness Board (Sensamove)**

The SensBalance Fitness Board (Sensamove) (Figure 4) consists of a moveable platform, a touch screen, a computer, and a safety rack around the platform to hold on. The apparatus is a USB wired gear connected to a

computer that can be used in different places (indoor and outdoor testing, without low temperatures, rainy and high humidity weather conditions) and it has different build-in neuromuscular tests. The subjects were instructed regarding the way they should put their feet on the balance miniboard, without the shoes and about the position of the body during the tests. The tests consisted of 20 seconds both feet standing position as shown in Figure 5, following the miniboard balance protocols, sensors in the miniboard measures the acceleration of the moveable platform, this signal provides real-time feedback to each subject having visual feedback in real time of the way they were performing by looking on the computer display. While standing on the unstable platform, every small movement of the participant will displace the platform and perturb the balance system. When the platform is perfectly balanced the maze is horizontal and the ball lies still. The static balance tests consisted in keeping the red ball of the test's protocol as close as possible to the centre of the target.

In this study, The SensBalance Fitness Board (Sensamove) was used as an outcome measure tool. Pre Post outcome of same were taken before and after the intervention.



Figure 4: SensBalance Fitness Board (Sensamove) setup



**Figure 5:** Therapist measuring sensa balance readings

#### Data analysis

The collected demographic and outcome measures were assessed for their normality using Shapiro-Wilk test. As the data does not follow normal distribution, all the descriptive were expressed in mean (95% confidence interval) for continuous variables and median with interquartile ranges for discrete variables. Wilcoxon signed rank test was adopted to find out the differences within TLP Group and TMT group for pre-post intervention changes. While Mann-Whitney U test was used to compare the changes in median values of DASS-21, Sensa Balance, abdominal strength and PAQ-A changes between TLP Group and TMT Group at baseline and end of 6 week intervention. The data were analysed using statistical software, statistical package for social science (SPSS), IBM SPSS version 20.0 (Armonk, NY: IBM Corp.). The p-value  $\leq 0.05$  was considered to be statistically significant.

#### IV. RESULTS

Thirty school going adolescents suffering from depression were recruited for the study. The demographic characteristic of the institutionalized adolescents suffering from depression recruited were displayed in Table 3. There exists no significance difference ( $p > 0.05$ ) between the two groups in their demographic dimensions. Pre and post intervention changes among the outcome measures in control group and experimental group were tabulated in Table 4 and Table 5 respectively. There exists significant difference ( $p < 0.05$ ) in all the outcome measures, DASS-21, Sensa Balance, abdominal strength and PAQ-A in TLP group. But only significance difference were observed in two subscales, anxiety and stress of DASS-21 in TMT group. Pre and post intervention comparison in outcome measures between TMT group and TLP group were tabulated in Table 6 and Table 7 respectively. Statistically significant ( $p < 0.05$ ) difference as observed in post intervention comparison between the groups, except the anxiety of DASS-21.

**Table 3:** Demographic dimensions of the sample recruited between control and experimental group

Demographic dimensions	TMT Group (n=13)	TLT Group (n=12)	p-value
Age (years)	15.3 (14.9 to 15.8)	15.5 (14.8 to 16.2)	0.769
Height (cm)	165.3 (160.5 to 170.1)	165.1 (161.4 to 168.8)	0.894
Weight (kg)	54.7 (47.0 to 62.3)	64.9 (52.8 to 76.9)	0.168

BMI (kg/m <sup>2</sup> )	19.1 (16.3 to 21.9)	23.9 (19.6 to 28.1)	0.123
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**Table 4:** Pre and post intervention changes among the outcome measures in TMT group

Outcome measures	Pre-Intervention	Post-Intervention	p-value
D-Anxiety	10.0 (5.2 to 14.8)	5.5 (2.2 to 8.9)	0.042
D-Stress	17.1 (12.8 to 21.3)	9.7 (4.7 to 14.7)	0.012
D-Depression	7.5 (3.6 to 11.5)	8.3 (5.4 to 11.2)	0.671
Balance-Center	0.5 (0.4 to 0.5)	0.5 (0.4 to 0.5)	0.944
Balance-front	0.6 (0.2 to 1.1)	0.7 (0.3 to 1.2)	0.735
Balance-back	0.5 (0.4 to 0.5)	0.4 (0.3 to 0.5)	0.059
Balance-left	0.5 (0.3 to 0.6)	0.4 (0.3 to 0.5)	0.507
Balance-right	0.5 (0.3 to 0.6)	0.4 (0.3 to 0.5)	0.149
Abdominal strength	6.5 (5.0 to 8.0)	7.2 (5.2 to 9.1)	0.261
PAQ-A	2.3 (2.1 to 2.5)	2.5 (2.3 to 2.8)	0.126

**Table 5:** Pre and post intervention changes among the outcome measures in TLT group

Outcome measures	Pre-Intervention	Post-Intervention	p-value
D-Anxiety	9.8 (7.1 to 12.6)	1.3 (0.5 to 1.9)	0.002
D-Stress	14.9 (11.6 to 18.2)	2.1 (1.1 to 3.1)	0.002
D-Depression	9.7 (6.5 to 12.6)	3.0 (1.9 to 4.1)	0.003
Balance-Center	0.7 (0.4 to 0.8)	0.3 (0.1 to 0.6)	0.041
Balance-front	0.6 (0.4 to 1.1)	0.2 (0.1 to 0.3)	0.003
Balance-back	0.5 (0.3 to 0.8)	0.3 (0.1 to 0.6)	0.043
Balance-left	0.5 (0.3 to 0.7)	0.3 (0.2 to 0.4)	0.048
Balance-right	0.8 (0.2 to 1.4)	0.1 (0.1 to 0.2)	0.002
Abdominal strength	6.1 (4.1 to 8.2)	8.6 (7.1 to 10.2)	0.002
PAQ-A	2.2 (1.9 to 2.5)	0.4 (0.2 to 0.5)	0.002



**Table 6:** Pre intervention outcome measures between TMT group and TLT group

Outcome measures	TMT Group (n=13)	TLT Group (n=12)	p-value
D-Anxiety	10.0 (5.2 to 14.8)	9.7 (5.9 to 13.4)	0.979
D-Stress	17.1 (12.8 to 21.3)	15.9 (12.3 to 19.5)	0.406
D-Depression	7.5 (3.6 to 11.5)	8 (4.7 to 11.3)	0.123
Balance-Center	0.5 (0.4 to 0.5)	0.5 (0.4 to 0.5)	0.152
Balance-front	0.6 (0.2 to 1.1)	0.6 (0.3 to 0.9)	0.979
Balance-back	0.5 (0.4 to 0.5)	0.5 (0.4 to 0.6)	0.270
Balance-left	0.5 (0.3 to 0.6)	0.5 (0.3 to 0.6)	0.979
Balance-right	0.5 (0.3 to 0.6)	0.5 (0.3 to 0.6)	0.611
Abdominal strength	6.5 (5.0 to 8.0)	6.2 (5.1 to 7.3)	0.503
PAQ-A	2.3 (2.1 to 2.5)	2.4 (2.3 to 2.5)	0.852

**Table 7:** Post intervention outcome measures between TMT group and TLT group

Outcome measures	TMT Group (n=13)	TLT Group (n=12)	p-value
D-Anxiety	5.5 (2.2 to 8.9)	1.3 (0.5 to 1.9)	0.098
D-Stress	9.7 (4.7 to 14.7)	2.1 (1.1 to 3.1)	0.016
D-Depression	8.3 (5.4 to 11.2)	3.0 (1.9 to 4.1)	0.001
Balance-Center	0.5 (0.4 to 0.5)	0.3 (0.1 to 0.6)	0.019
Balance-front	0.7 (0.3 to 1.2)	0.2 (0.1 to 0.3)	<0.001
Balance-back	0.4 (0.3 to 0.5)	0.3 (0.1 to 0.6)	0.046
Balance-left	0.4 (0.3 to 0.5)	0.3 (0.2 to 0.4)	0.087
Balance-right	0.4 (0.3 to 0.5)	0.1 (0.1 to 0.2)	<0.001
Abdominal strength	7.2 (5.2 to 9.1)	8.6 (7.1 to 10.2)	0.042
PAQ-A	2.5 (2.3 to 2.8)	0.4 (0.2 to 0.5)	<0.001

## V. DISCUSSION

The result inferred from the analysis proved both the therapeutic listening given through Sennheiser filtered headphones and traditional music given through normal headphones were equally effective in bringing statistically significant changes in anxiety school going adolescents. But statistically significant difference ( $p < 0.05$ ) were observed in all the outcome measures, DASS-21, Sensa Balance, abdominal strength and PAQ-A in TLP group. This shows that the sound-based intervention mechanism model given as an auditory stimulus triggering the vestibular system thereby making changes in the brain by addressing the stress, anxiety and depression changes in this study.

Similar study on Music Therapy Interventions for Stress Reduction in Adults with MID (Mild Intellectual Disabilities) ( $n=13$ ) was conducted by Martina de Witte et. al in 2020 from different countries and clinical institutions in Europe. Study revealed that music therapists used little to no receptive (e.g., music listening) interventions for stress reduction, preferring instead to use active interventions based primarily on musical improvisation. The findings indicate that three therapy goals for stress relief can be distinguished. The goal of "synchronizing" can be viewed as a subgoal because it frequently comes before working on the other two goals of "tension release" or "direct relaxation," which can also be viewed as two approaches to stress reduction in adults with MID through music therapy interventions. Furthermore, the tempo and dynamics of music are regarded as the most important musical components for relieving stress in adults with MID.<sup>13</sup>

A review and meta-analysis were conducted to assess the effectiveness of music-based interventions in reducing levels of stress or anxiety among pregnant women ( $n = 1261$ ). Meta-analyses were performed to compare the effects of a music-based intervention in Five studies with a total of 1261 women on stress and anxiety to a control group receiving routine antenatal care. Maternal anxiety was significantly reduced by music interventions. No significant effect on general stress or pregnancy-specific stress was found.<sup>14</sup>

This is in accordance with any sound-based intervention given to the vestibular through the auditory system triggering the vestibular nuclei will bring the desirable changes in the brain for the behavioral changes like anxiety and stress. The sound waves vibrate the ear drum, which is connected to the ear bones (malleus, incus, and stapes) in the middle ear, which mechanically carry the sound waves to the frequency-sensitive cochlea (35 mm in length) with the basilar membrane in the inner ear. Sound waves are converted into neural signals by the cochlear hair cells and transmitted to the brain via the auditory nerve. The cochlear hair cells aid in the transmission of sound to the brain. The primary structures used in sound transduction are the stereocilia of the hair cell, which sits on the basilar membrane. Acoustic stimulation causes the stereocilia to bend, sending a signal to the auditory nerve and, eventually, the auditory cortex, allowing sound to be processed by the brain.<sup>15</sup>

However, the stress anxiety and depression parameters addressed by both the tools used in TLT and TMT group failed to prove one dominant over the other in reducing anxiety when compared with the between group analysis. This draws our attention towards the modulation in dosages of the intervention either in terms of music provided or the duration in order to explore the desirable changes. In other view, the anxiety found in the subject screened may not come from Long duration Pathological background due to which the intervention tool may not act sensitive for these participants and anxiety reported through the subjective scale may be from the immediate transient non consistent personal episode at their family or peer group, exam stress at school level faced by the study participants.

The abdominal strength and physical activity measured through modified sphygmomanometer and PAQ respectively in TLT group changed significantly in within and between group analysis. This significant change strikes the auditory intervention impacting the vestibular system (vestibular nuclei and descending vestibular pathway (middle vestibular spinal tract, reticulo spinal tract)) which innervates the abdominal muscles neurophysiologically.

Karthikbabu et.al conducted an observer-blinded pilot randomized controlled trail to examine the effects of trunk exercises using physio ball as against the plinth, on trunk control and functional balance in patients with acute stroke ( $n=30$ ).<sup>16</sup> On an unstable surface (physio ball), the experimental group performed task-specific trunk exercises, while the control group did so on a stable surface. For three weeks, both groups did one hour of trunk exercises per day, four days per week. According to the findings, both groups improved in trunk control and

functional balance, but the experimental group improved significantly more than the control group. As a result, it can be concluded that physio ball exercises are more effective than plinth exercises in improving trunk control and functional balance in acute stroke patients.<sup>16</sup>

Another study was conducted to analyze the effect of dynamic surface exercises on trunk control and gross motor functions in children with quadriplegic CP (n=30, age 6-12 years). The children were randomly assigned to one of two groups: DSET (dynamic surface exercise training) or standard physiotherapy training, a training programme was received that lasted 60 minutes, four days a week for six weeks. As a result, it can be concluded that the experimental group differed significantly from the control group. Children with spastic quadriplegic CP aged 6–12 years improved trunk control and gross motor function performance after six weeks of dynamic surface exercise therapy combined with standard physiotherapy.<sup>17</sup>

There were significant changes between TLT and TMT group over balance as examined by sensamove static balance in center, front, back, left right was checked. TLT group improved significantly in balance parameters measured by, sensamove static balance when compared to TMT group. Since balance was a tertiary objective and outcome of this study, there was no baseline measure initiated for measuring balance for the subjects to be included in the study. The study population did not show any balance deficits, this might be one of the reasons where the intervention did not change the balance significantly. Chriss Sharrock conducted a similar study in which he looked at the relationship between core stability and athletic performance in male and female collegiate athletes. A total of 35 participants took part in a series of five tests and performed three trials of each test in a randomized order double: leg lowering (core stability test), 40-yard dash, T-test, vertical jump, and medicine ball throw. The medicine ball throw was found to have a negative correlation with abdominal strength. The most strongly correlated variable to core strength was gender, with males having a mean measurement of 47.43 degrees of double leg lowering compared to females having a mean of 54.75 degrees.<sup>18</sup>

Depression, anxiety and stress are common in school going adolescent children. Due to various factors such as increase in study work load, stress under family circumstances, lack of appropriate peer group interaction etc, the number of physical playing hours and entertainment have drastically reduced with increase in study demands in the education sector. Adolescent is one of the stage where the students enter towards higher education. Play and entertainment is one of the stress buster activity for this population. In recent days, therapeutic listening is a specialized tool with modulated and regulated music compressed and provided through specialized headphones in order to reach and impact the brain to reduce stress anxiety and depression and other behavioural problems. The study result recorded the therapeutic sennheiser headphones was effective when compared to standardized music therapeutic tool which has been used to reduce stress, anxiety and depression. This tool also showed significant changes in increasing the abdominal strength level among school going adolescent through its auditory vestibular spinal pathway. Through this study we suggest and recommend therapeutic listening tool as an effective tool in stress, anxiety and among school going adolescent along with other traditional intervention programmes.

Limitations of the study were, the generalizability of the result to school going adolescents having depression might be affected as we have recruited the adolescents from single school, therefore further multicenter trials with a large number of subjects are needed to confirm our study result. Secondly, there was a lack of follow up of study participants to find out the improvement was carried out. Further studies should assist the long term affects of therapeutic listening on depression in school going adolescents.

## VI. CONCLUSION

The pilot Feasibility trial of TLT and TMT in treating on depression in school going adolescents were verified. TLT have demonstrated significant change in depression, anxiety, stress, static balance, abdominal strength and physical activity in treating school going children when compared to TMT. Further studies with large trials are required to validate these findings.

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