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Impact of Music Therapy on Children with Attention Deficit/Hyperactivity Disorder

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ABSTRACT

Music therapy as a mechanism to improve several stress related problems and treat individuals with mental disorders has been proven. This study is aimed to assess the impact of music therapy on ADHD children. Children diagnosed with ADHD, in the age group of 10-12 years in Hyderabad schools, whose parents agreed to follow the music therapy are registered for the study. Fifteen children formed the study group. Another group of 10 normal children from the same demographics (school, class and age group) formed the control group. The experimental group is asked to take their regular medical protocol consisting of medications, diet, and exercise and school schedule. In addition, children are asked to listen to 6 songs of their choice from Carnatic music genre, for a duration of 40 minutes daily in one or two sessions, over a period of three months. Their mothers are trained to monitor them. IQ tests are administered at the beginning and at the end of the study for both groups. Diet survey by 24-hour recall method is conducted. By the end of the study period, the performance of the children improved by academic evaluations and in the regularity of classwork is assessed.

KEYWORDS: Music Therapy, Attention Deficit/Hyperactive Disorder, Medical Protocol, Carnatic music.

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INTRODUCTION

Music therapy, a listening program, is reported to filter classical music to improve ear function. Out of the 12 cranial nerves, 10 are linked to the ear, indicating the importance of musical sounds to nervous system [1, 2.] Music therapy works on the principle of coordination between the beats of music and that of heart rate and it brings a soothing effect on the body, mind and soul. Rhythms that are below normal heart rate, create calmness and tranquility while rhythms above heart rate create excitement and exhilaration. Specific ragas in Carnatic and Hindustani music are reported to help in language development, behavior, lifestyle and mental disorders [3-6]. For children with ADHD, music therapy bolsters attention and focus, reduces hyperactivity and strengthens social skills [7.] The current thinking in neuroscience is that auditory stimulation has a positive impact as pleasurable music increases dopamine levels in brain neurotransmitters responsible for regulating attention, working memory and motivation [8] ADHD children can use music therapy to train their brains for stronger focus and self-control in the classroom and at home [9] Such studies are scanty. The present study therefore concentrates on IQ tests, reported behavior by parents, class teachers , academic performance of ADHD children who were given music therapy.

MATERIALS AND METHODS

Inclusive schools in Hyderabad who enroll children with ADHD were identified. One school was randomly picked. In that school, children diagnosed with ADHD and in the age group of 10- 12 years were listed. Music therapy and its potential advantages are explained to these parents and parents who understood and agreed to follow the protocol were listed . Fifteen children (11 boys and 4 girls) were randomly selected as the experimental group. Their mothers were asked to select six songs liked by the child. The parents of the experimental group selected 6 classical songs of carnatic music (Mohana Raga and Sankarabharanam Raga). The ragas selected were approved by the music therapist. Parents were asked to play these songs for 40 minutes over one or two sittings daily. Songs, which are not comfortable to children, were changed. The protocol for experimental group consisted of medicines as prescribed by their doctor, regular diet, school schedule and exercise. To this group, music therapy was added. The study period was for three months, from the end of first term till the completion of second term. Another group of 10 normal children with no signs of ADHD are randomly selected from the same school, same class and same age group as the control group. Instructions are not given to them. Examination grades obtained at the end of the first term are recorded (Initial readings), music therapy was added , the grades obtained at the end of the second term are recorded (final readings) were compared .

A 15-item IQ test was administered at the beginning of the first term and end of the term, for experimental and control group. One day diet survey by 24 hour recall method was done to analyze the dietary pattern. The data is presented as percentages. The children with ADHD needed individual monitoring, therefore the study group was limited to fifteen only (Table 1). The first term results were taken as initial findings and after the music therapy, the end term results are taken to see the influence of music. The grades used for comparison are given in Table 2.

Table 1: Age Wise Distribution of Children

Age (Years)	Experimental group	Control group
10	6	2
11	2	6
12	7	2
Total	15	10

Table 2: Grade Card and Marks Range

Grade	Mark Range %	Mid-Point
A1	91-100	95
A2	81-90	85
B1	71-80	75
B2	61-70	65
C1	51-60	55
C2	41-50	45
D	33-40	35

RESULTS AND DISCUSSION

The results are presented as performance of ADHD children before and after music therapy with respect to IQ scores, diet survey analysis and examination of grades scored in the term examinations.

IQ scores of the experimental group is presented in Table 3. There is an overall improvement in the IQ test results. The increase is 17.3% in the 10 year group, 18.8% in the 11 year group and as high as 37.5% in the 12 year group. In the experimental group, child No 4 (10-year group) showed no improvement while a decrease of 2 points was seen in the child No. 6 of the same age group. In the 11-year age group both children improved, with a net increase of 18.8%. In the 12-year group, an increase of 37.5% is noticed. Music therapy showed a significant impact on the performance level of children of all ages, concluding that auditory stimulation can help to improve. In the case of control group, which was not exposed to music therapy, between the two children of the 10-year group one did not improve while the child No 2's IQ test value decreased. Similar trend is observed in the 11 and 12-year age groups.

Table 3: IQ Test Performance Levels of Children

Experimental Group (with ADHD)						Control Group (Normal Children)				
Age	**S. No**	**Initial value**	**Final value**	**Difference**	**% Increase**	**Age years**	**S. No**	**Initial Value**	**Final value**	**Difference**
10	1	9	12	3		10	1	12	10	-2
10	2	5	7	2		10	2	11	11	0
10	3	7	9	2		**Total**		**23**	**21**	**-2**
10	4	10	10	0		11	3	10	11	1
10	5	9	13	4		11	4	11	12	1
10	6	12	10	-2		11	5	9	7	-2
Total		**52**	**61**	**9**	**17.3**	11	6	9	13	4
11	7	8	9	1		11	7	11	12	1
11	8	8	10	2		11	8	9	7	-2
Total		**16**	**19**	**3**	**18.8**	**Total**		**59**	**62**	**3**
12	9	7	12	5		12	9	10	12	2
12	10	9	10	1		12	10	12	10	-2
12	11	5	7	2		**Total**		**22**	**22**	**0**
12	12	6	9	3						
12	13	7	10	3						
12	14	8	9	1						
12	15	6	9	3						
Total		**48**	**66**	**18**	**37.5**					

Additionally, grades and corresponding mid-level marks at end of first and second term (after three months of music therapy) for English, Mathematics, Science, and Visual Arts from the report cards are tabulated (Table 4). The grades obtained at the end of first term is the initial performance level and the grades at the end of second term indicates the performance after three months of music therapy.

Table 4: Subject Wise Academic Performance of Experimental Group

Age (Yrs)	Scores & %s	English		Math		Science		Visual Arts	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
10	D- 35	0	0	0	0	0	0	1	0
	C2- 45	3	0	1	0	1	0	1	1
	C1- 55	1	0	2	0	1	0	1	1
	B2- 65	1	4	2	2	4	0	2	4
	B1- 75	1	2	1	2	0	6	1	0
	A2 -85	0	0	0	2				
11	C2- 45	1	0	2	0	2	0	1	0
	C1- 55	1	0	0	0	0	0	0	0
	B2- 65	0	1	0	2	0	2	1	0
	B1- 75	0	1	0	0	0	0	0	2
12	C2- 45	3	0	3	0	4	0	0	0
	C1- 55	1	2	1	1	0	0	2	0
	B2- 65	2	5	0	5	2	5	5	2
	B1- 75	1	0	3	0	1	1	0	3
	A2- 85	0	0	0	1	0	1	0	2

In English subject, all 6 children of 10 year group were initially at 45-55% (3+1) , improved after music therapy to 65 - 75 % range. In case of mathematics, the scores were high; 2 children even scored 85% indicating that auditory stimulation has an impact on the performance [12.]

Even in science and visual arts a similar trend is observed in all age groups. Although the IQ test showed some slow or no progress, the academic test scores clearly showed the impact of music and significant progress in the performance level of children. In all the three age groups it is remarkable that there is marked improvement with some children scoring above 75 percent similar to scores of the normal children.

Table 5: Academic Performance of Control Group

Age Yrs	Scores& %	English		Math		Science		Visual Arts	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
10	C2- 45	1		1	1				
	C1- 55								
	B2- 65		1	1		2	1		
	B1- 75						1	1	1
	A2 -85	1	1					1	1
	A1				1				
11	C2- 45			1	1				
	C1- 55		1				1	1	
	B2- 65	3	1	2	1	3		1	
	B1- 75	1			1	1		2	2
	A2	1	2	2	3	2	4	1	2
	A1	1	2	1			1	1	2
12	C2- 45								
	C1- 55								
	B2- 65	1				1			
	B1- 75	1	1	1		1	1	2	
	A2- 85		1	1	2		1		
	A1								2

In the control group with normal children, the improvement is normal. Several children maintained their initial grade levels. In the 10 year group one child each in English, mathematics, science and visual arts maintained same levels (A2, C2, B2, B1 respectively). Similarly, in the 11year group of six children, in English at (A1), one at B1 level, two in Mathmatics at A2 level, one at B1 level, in Science one at A2. In Visual arts one at A1 and A2, in the 12 year group, one at B1, one at A2, one in B1 in English, Mathematics and Science. Thus, in the control group several children maintained the scores. In the case of experimental group all children improved their grades expect one or two. This confirms that music therapy served as a good auditory intervention to contribute to overall performance and improvement of the children [10-13]

The one-day diet survey of children with ADHD was probed (Table 6). It indicated that mothers chose foods that are liked by the child to avoid unnecessary hassle in feeding. This is more evident in the 10-year age group. The breakfast items or snack items were predominately fast foods or high fat foods like chips, cream biscuits, cookies, bread and cheese, waffles.

Table 6: Dietary Intake of Children

Age yrs	Breakfast		Mid-day	Lunch	Snacks	Dinner
10	1	Waffles	Murukulu, cookies	PavBhaji, bread	Bajji, milk, banana	Rice, dhal, egg curry
	2	Bread Jam, milk	Cucumber, chips	Potato fried rice, curd rice	Pop tarts, ice cream	Chapatis, chicken curry, curd rice.
	3	Mooli Paratas	Chips, biscuits	Chapati, bendi curry	Banana, bhel	Roti, dhal, cauliflower
	4	Choco cereal, milk	Popcorn, sweets	Pavbhaji buns, curds	Chicken roll, dates	Chicken biryani, raita, mutton curry
	5	Poha, milk	Popcorn, noodles	Pavbhaji, buns, curd rice	Cream cookies, chips,	Sambar rice, potato fry, curds
	6	Milk, bread cheese	Channa with butter	Spinach dal, rice, beetroot fry	Pav Bhaji, milk	Rice, rasam, carrot fry, brinjal curry
11	7	Poori, potato curry	Murkukulu. cookies	Pavbhaji, bread	Bajji, milk, banana	Rice, dhal, egg curry
	8	Poori, potato curry, milk	Chips, pineapple cake	Rice, dal, banana fry, curd rice	Murukulu, chocolates	Chapatis, chicken curry curd rice
12	9	Pori, potato curry	Pop corn	Rice, rasam, pav bhaji curry	Grapes, lassi	Rice, dal, dondi, curd rice
	10	Idli, bournvita	Biscuits, juice	Rice, dhal, bendi	Murukkulu, milk	Chicken rice, curd rice
	11	Curd rice, milk	Chips	Dhal, rice, rasam	Laddu	Rice, rasam, carrot, curd
	12	Idli, Horlicks, milk	Almonds, mixture	Rice, dal, banana fry, curd rice	Maggi noodles	Naan, butter, mutter, paneer, yoghurt
	13	Milk, bread, cheese	Boiled chana, butter	Rice, spinach dhal beetroot curry	Pavbhaji, milk	Rice rasam, carrot fry, brinjal curry
	14	Dosa, milk	Juice, chips	Rotis, rajma, rice, rasam, curds	Chips, apple	Rice, egg, dal, rasam, curd rice, milk
	15	Waffles	Carrot dip	Chicken sandwich, chips, orange juice	Yoghurt cheese sticks	Rice, papad, dal, cabbage fry, rasam,

These high fat foods can aggravate the hyperactivity usually present among these children [14]. This hyperactivity can in turn lead to negative trends in mental progress or it may be stagnant [15]. Protein foods like milk, chicken, soy products, fish, dals can prevent surges in blood sugar that may otherwise increase. Mother of one child informed that he was aggressive and did not listen to music properly and wanted the songs to be changed. The decision to change songs was done after the scores were taken. This indicates that not confirming to the guidelines (listening to music) probably resulted in negative trend. It was noticed, that the improvement is higher in the 11-year group than in the 10-

year group. In the 12 year group there is significant increase in scores (37.5%). For them, the food distribution between meals, breakfast and snacks is more organized, with mostly homemade meals and not including high fat foods. These children are also more mature with better ability to follow instructions at home. All these probably resulted in a higher performance as seen in IQ test scores.

The diet followed by the children is lacking in leafy vegetables and fruits. Only one child took spinach and another took cabbage. The requirement for this group is around 75 grams per day. In case of fruits, apple, banana / grapes were taken by all the children. Snacks and breakfast foods are either high fat foods or fast foods. Rasam (Pepper water) was included which has little or no nutrients. There is a need to focus on the dietary pattern. In spite of the lacunae found in the food intake, children exposed to music did show great improvement in the overall development. This significant improvement can be attributed to the impact of music. The teachers and mothers have informed that there is a considerable change in the behavior of children and they looked more balanced and would pay attention to instructions without much hesitation.

CONCLUSION

The study indicates the beneficial therapeutic effects of music therapy. This intervention can be implemented in children suffering from developmental delays and other childhood disorders related to mental development. Scope of music therapy is increasing, however efforts are required to popularize by emphasizing the scientific basis of music therapy and its benefits. More clinical trials and research on music therapy is needed in India. Music therapy with emphasis on listening to the right kind of music, brings the best in a normal individual helping one reach his fullest potential. Music is as fundamental as food, air and water to human life and it can add a new meaning to life.

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