

# Effect of Music Intervention on Behaviour Disorders of Children with Intellectual Disability using Strategies from Applied Behaviour Analysis

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## ABSTRACT

**Purpose:** *The effect of music intervention on mild and moderate Intellectually disabled children was studied in non-randomized pre-test post-test control group design at an Indian state (Jammu) J&K.*

**Method:** *The mild and moderate intellectually disabled children fulfilling inclusive and exclusive criteria were placed into control and experimental group. BASIC-MR part-B (pre-test) was administered on both the groups. Intervention in music activities using strategies from Applied Behaviour Analysis was introduced sequentially to the experimental group. Children in the control group were not involved in any additional activity. Both the groups were assessed after 6 months (post-test) to find out the effect of intervention.*

**Results:** *The mean difference between both the groups of mild and moderate intellectually disabled children was significant. In both mildly disabled children,  $F(1, 2) = 36.937, p = .026$  and moderately disabled children  $F(1, 13) = 71.686, p = .000$ , the effect of the music intervention was highly significant.*

**Conclusion:** *Music intervention program produced significant changes in the domains of violent and destructive behaviour and misbehaves with others domains of children with mild intellectual disability. In children with moderate disability, music intervention produced significant changes in the domains of violent and destructive behaviour, misbehaves with others, self-injurious behaviours, repetitive behaviours, hyperactivity, rebellious behaviours, and anti-social behaviours. Both mild and moderate intellectually disabled children didn't show any significant change in temper tantrums, odd behaviours and fears domains of behaviour disorders.*

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*Keywords: Applied Behaviour Analysis, Intellectual disability, Hyperactivity, Rebellious behaviours, Intervention.*

## INTRODUCTION

Music has been used for centuries as a therapeutic tool and for religious and other ceremonies too (Schmidt-Peters, 2000; Wigram et al, 2002). Active music therapy is effective on motor, affective and behavioural functions (Pacchetti et al, 2000). According to the National Coalition of Creative Arts Therapies Association (2010), dance/movement and music are forms of expressive and creative interventions that have been found to be effective in improving behaviour as well as self-expression. Music, if purposefully used, has been found effective in modulating mood change, modifying and managing behaviour (Jackson, 2003; Adamek and Darrow, 2005; Rickson, 2006).

Intellectual disability is a disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains (DSM-American Psychiatric Association (2013)). Landrek et al (2005) revealed that music therapy is a dynamic process through which children with intellectual disability interact with their environment and peers. American Music Therapy Association (2006) states that the repetition of songs enables intellectually challenged children to identify numbers, colours and objects, develop cognitive, behavioural, physical, emotional and social skills, and enhance communication. American Music Therapy Association (2006) also argues that involvement in music stimulates attention and encourages participation in educational settings. Music helps individuals who have behavioural-emotional disorders and children with communication problems, as well as attention, motivation and behavioural problems. Music therapy has been extensively used in the past four decades as a treatment for children with disabilities (Wigram et al, 2002; Nordoff and Robbins, 2007). Children with Down syndrome seem specifically responsive to music and show potential to be part of a music-making group (Wigram et al, 2002). In the presence of music, the cortisol level ceases to increase after a stressor (Khalifa et al, 2003). Music therapy, taught by a trained music therapist, helps children to understand the function of reciprocal communication and to learn to respond to other people (Eschen, 2002).

Behaviour problems tend to be more prevalent in individuals with intellectual disability than in the general population. It is difficult to diagnose and treat behaviour or psychological conditions as the intellectual disability becomes more

severe. Dykens (2000) suggested that adolescents and children with intellectual disabilities have a significantly greater risk of psychiatric disorders as compared to their peers without intellectual disability. Comparatively speaking, the incidence of behavioural disorders is 5 - 7 times more among people with intellectual disabilities (Dykens and Hodapp, 2001; Emerson, 2003; Bouras et al, 2004). Reiss (1994) noted that persons with intellectual disabilities are at higher risk of developing a mental illness than those with average intelligence. Stambough (1996) found music to be beneficial for students with intellectual disabilities. Music therapy is provided for children with early emotional damage, children with ADHD, and children who suffer from intellectual disability, brain damage, global developmental delay, or specific learning disorders, behaviour, communication, social, or attention problems not previously diagnosed (Wigram et al, 2002). The World Federation of Music Therapy indicated that music in a controlled music therapy session could include singing, instrument playing, listening, moving and creating new music (Birkenshaw, 1994; Schmidt-Peters, 2000; Wigram et al, 2002). Sound that includes pitch, volume and tone colour, is an integral part of music therapy sessions (Samson et al, 2002; Samson, 2003). Interactive children's songs, children's music from various cultures, and multisensory percussion instruments were also used during music therapy intervention (Farnan, 2007). In music therapy intervention, people with developmental disabilities were assisted and supported to experiment and improvise with different instruments and equipment, and were also encouraged to listen to music (Farnan, 2007).

## **Objectives**

The present research aimed to study the effect of music intervention on behaviour disorders of children with mild and moderate intellectual disability using strategies from Applied Behaviour Analysis.

## **Hypotheses**

There is no significant difference in the adjusted mean scores of behaviour disorders of experimental and control group subjects (children with mild and moderate intellectual disability) by considering pre-behaviour disorders as covariate.

## METHOD

### Study Setting

The researcher selected 5 special schools in Jammu district of Jammu & Kashmir state, India, with a total population of children with mild intellectual disability (N=45, male=30, female =15), children with moderate intellectual disability (N= 58, male =36, female= 22), and children with severe intellectual disability (N= 26, male= 17, female= 09). Permission to conduct research was granted by the heads of the respective institutions. The Principals selected two teachers/instructors with work experience of 5 years and more, who could systematically implement the music intervention as planned.

### Sample Size

To begin with, there were 26 children, but only 21 completed the intervention as 3 children were unable to continue due to health problems and 2 left the school. The final study sample consisted of 21 children with mild and moderate intellectual disability. Of these, 5 were children with mild intellectual disability and 16 were children with moderate intellectual disability. The children were placed in a control group (mild male n = 3, moderate male n = 05, moderate female n = 02) and an experimental group (mild female n = 02, moderate male n = 07, moderate female n = 02). The classification of children by their age and Intelligence Quotient is given in Table 1.

Consent forms were signed by the legal guardians after they were explained the study procedure in detail. Children were allowed to voluntarily withdraw from the trial without giving any reason. A unique number was assigned to every trial and was kept in locked cabinets with the researcher.

**Table 1: Classification of Children with Mild and Moderate Intellectual Disability by Age and Intelligence Quotient**

Type of Disability	Group	Classification	N	Min	Max	Mean	SD
Mild	Control	Age (Yrs)	03	9.41	16.91	12.106	4.170
		I.Q.	03	54.54	63.72	60.116	4.897
	Experimental	Age (Yrs)	02	13.16	13.16	13.160	.000
		I.Q.	02	56.99	64.58	60.785	.366
Moderate	Control	Age (Yrs)	07	13.00	16.00	14.600	1.199
		I.Q.	07	37.50	45.66	41.478	3.301
	Experimental	Age (Yrs)	09	6.0	14.00	9.813	3.054
		I.Q.	09	35.71	36.19	45.293	.759

In the control group, 70.0% of the sample represented the urban area while 30.0% represented the rural area. In the experimental group, 100% of the sample represented the urban area. So, a total of 85% of the sample belonged to the urban area and 15% of the sample belonged to the rural area.

### Sampling

Non-randomised sampling procedure was followed by applying inclusion and exclusion criteria to the selected children.

Inclusion criteria:

1. Children of both sexes, between 6 - 17 years of age.
2. Children with mild and moderate intellectual disability as identified by an I.Q. test.
3. Children who could follow instructions and perform activities during intervention.
4. Children attending the Special schools 5 days per week, for 5 hours a day.

Exclusion criteria:

1. Children with severe and profound intellectual disability due to their poor response in following intervention procedures.
2. Children who were on anti-depressant or sedative medication.
3. Children who had severe behaviour disorders or destructive behaviour, judged as being at risk by teachers or care staff.

## Study Tools

1. Seguin Form Board Test (Goel and Bhargava, 1990) was used to assess intelligence quotient through visual discrimination, matching, speed, accuracy, eye-hand coordination and visual-motor skills. It consists of 10 geometrical shaped wooden blocks and a large form board with recessed corresponding shapes. The children were asked to match wooden blocks on the form board and place them on it. Test-retest was done after an interval of 20 days so as to check reliability of the scale where  $r(25) = 0.81$ .
2. Behavioural Assessment Scale For Indian Children-MR (Part-B) (Peshawaria and Venkatesan, 1992) was used to assess current level of problem behaviour in the child. It consists of 75 items grouped under 10 domains as violent behaviour, temper tantrums, misbehaves with others, self-injurious behaviour, repetitive behaviour, odd behaviour, hyperactive behaviour, rebellious behaviour, antisocial behaviour, and fears. The number of items in each domain varies. Each item was scored on three levels of severity of problem behaviour, i.e., score '0' for never, '1' for occasionally, '2' for frequently. Test-retest reliability coefficient was  $r(12) = .69$ , after time interval of 30 days. Construct validity was found at pre-test post-test level which was statistically significant ( $p < .001$ ).
3. Socio Economic Status Scale (Meenakshi, 1985) was used to assess socio-economic status of children, under 4 areas such as finance, property, education and social status. It is a point scale, with points ranging between 3 and 10 depending upon the component of the variable under assessment. For testing reliability, test-retest was done where  $r(35) = .81$ ,  $p < .01$ , with time interval of 30 days.

## Study Design

Non-randomised pre-test post-test control group design was used in a quasi-experimental research with experimental and control groups. The study sample was assigned to an experimental group and a control group by matching groups on the basis of their chronological age and intelligence.

## Data Collection

Seguin Form Board Intelligence test was administered individually to all the children at 5 special schools to find their I.Q. The procedure adopted was in

compliance with the directions and guidelines of the SFB test manual. On the basis of I.Q. scores, children were categorised into mild, moderate and severe intellectual disability as per the International Classification of Diseases-10 criteria (WHO, 1992). Children fulfilling inclusive and exclusive criteria were placed into control group and an experimental group. Data on Socio-economic status scale were collected from the parents/ guardians of selected children during the parent teacher meeting. BASIC-MR (part-B) was administered to both the groups as pre-test. Intervention was introduced sequentially to the experimental group in the 2 selected schools of Jammu city, where cooperation to implement the intervention was sought. The children in the other 3 schools were taken as the control group. Children in the control group continued with their everyday activities and were not involved in any additional activity. Assessment after 6 months (post-test) was done on completion of the music intervention programme with both the control group and experimental group, to find out the effect. Each child was tested individually by the researcher during the pre-test and post-test.

## **Music Intervention Programme**

### **Teaching Strategies**

The present research focussed on interventions using methods and teaching strategies derived from Applied Behaviour Analysis, such as Verbal instructions, Modelling of the desired skill, Prompting (clueing, physical prompt, verbal prompts), Task Analysis (breaking tasks down into smaller, teachable steps), Shaping (approximations of the desired behaviour were reinforced until the target behaviour was achieved) and Feedback which was specifically positive in nature, praising the student's efforts and rewarding desired behaviour.

### **Time Schedule**

All the experimental conditions were carried out for 60 minutes during school hours, 5 days a week for 24 weeks. During the 60-minute sessions, the time was divided for each activity such as the first 10 minutes for greeting the children with songs, 15 minutes for vocalising or singing songs, 25 minutes for playing the musical instrument (drum), and the last 10 minutes for a final song.

### **Programme**

Music intervention was carefully designed and implemented in such a way that every child was allowed a chance for individual expression during the

intervention. A range of activities adopted sequentially during the music sessions were:

1. Greeting song which included rhymes and soft music at the start of session.
2. Instructor encouraged every child to vocalise or sing songs individually and also in a group. The instructor divided songs into separate parts that necessitated the participation of each child to successfully bring the song to completion.
3. Instructor then directed every child to play the drum. Drum beating was taught sequentially through teaching strategies derived from Applied Behaviour Analysis. For children with intellectual disabilities, this can be a powerful tool to help release anger by beating the drum and still feel safe enough to express his/her feelings. Instrumental dialogue can develop through drumming or the use of other instruments (Wigram and De Backer, 1999; Wilmot, 2004).
4. A final song to close the session, which included rhymes or songs for children. Instructors maintained a daily log of all the activities and also recorded the reason if activities were not performed.

### **Data Management and Analysis**

Statistical analysis of the data obtained with the BASIC-MR (part-B) was performed using Statistical Package for Social Sciences (version 16.0 for Windows). Descriptive and inferential statistics were used to analyse and describe the data pertaining to behaviour disorders of children with mild and moderate intellectual disability. Correlation coefficient was used to determine the relationships between pre-test and post-test scores. Means, standard deviation values and ANCOVA were also used to analyse the data.

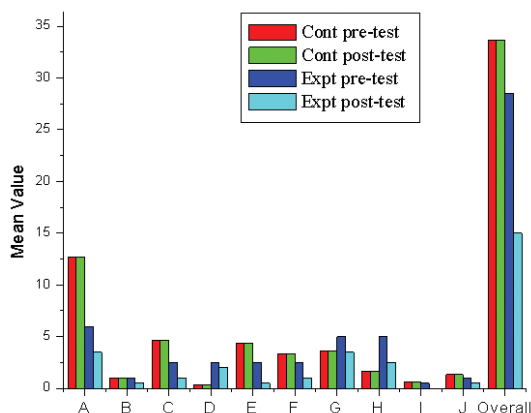
## **RESULTS**

The scores on the Socio Economic Status scale were  $N = 20$ ,  $M = 58.45$ ,  $SD = 22.76$ . Of the total sample, 3.8% of the children belonged to above-average socio-economic status, 38.5% belonged to average socio-economic status, 23.1% belonged to below-average socio-economic status and 34.6% of the children belonged to poor socio-economic status. No child belonged to the high socio-economic group. The correlation between the pre-test and post-test scores of the control group and the experimental group of children with mild and moderate intellectual disability

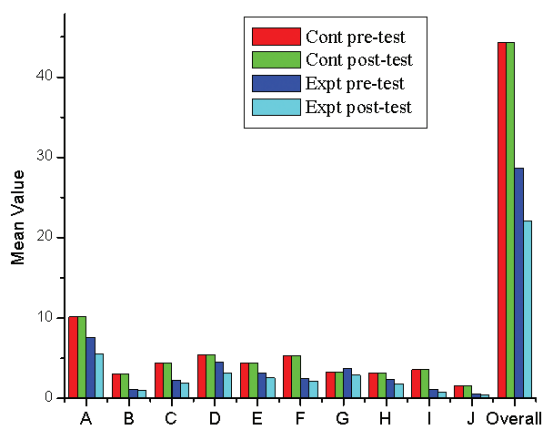


was highly significant. The comparison of mean pre-test and post-test scores of different domains of the control and experimental groups are represented in Figures 1 and 2.

**Figure 1: Comparison between pre-test and post-test scores of Control and Experimental group of Children with Mild Intellectual Disability on Behavioural Assessment Scale For Indian Children-Mental Retardation part-B (Behaviour Disorders)**



**Figure 2: Comparison between pre-test and post-test scores of Control and Experimental group of Children with Moderate Intellectual Disability on Behavioural Assessment Scale For Indian Children-Mental Retardation part-B (Behaviour Disorders)**

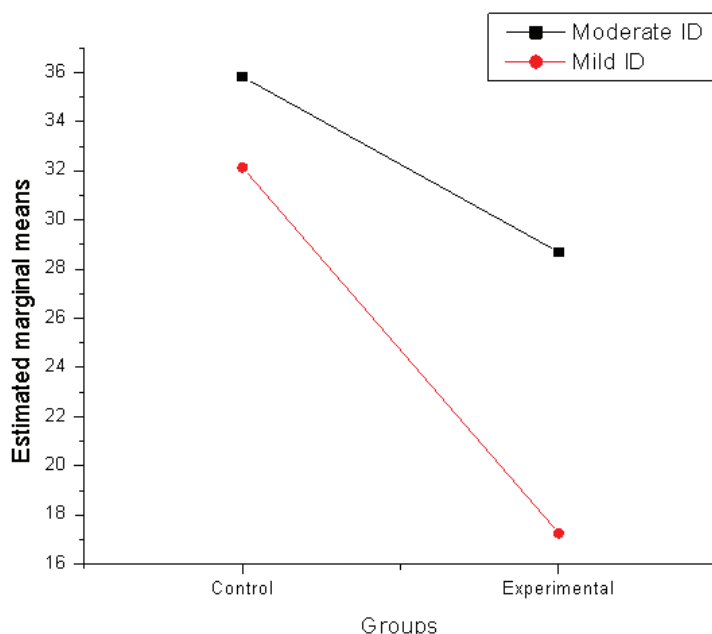


On comparing the results of mean values of both mild and moderate intellectual disability, it was found that the children with mild intellectual disability had lower post-test scores (mean) in the experimental group as compared to children with moderate intellectual disability in all the domains of behaviour disorders.

**Table 3: Results of Analysis of Covariance in Control group and Experimental group of Children with Mild and Moderate Intellectual Disability (Univariate Tests)**

Type of Disability		Sum of Squares	df	Mean Square	F	p
Mild	Contrast	223.759	1	223.759	36.937*	.026
	Error	12.116	2	6.058		
Moderate	Contrast	159.934	1	159.934	71.686**	.000
	Error	29.003	13	2.231		

\* P < .05, \*\*P < .01



**Figure 3: Graphical representation of Estimated Marginal Mean of post-test of Mild and Moderate Intellectual Disabled children**

Results of Analysis of Covariance (ANCOVA) of children with mild intellectual disability in table 3 indicated that adjusted  $F(1, 2) = 36.937$ ,  $p = .026$ , which is significant at .05 level. It indicated that adjusted mean scores of behaviour disorders of the experimental and control groups differ significantly by considering pre-behaviour disorders as covariate. Thus, the null hypothesis that "There is no significant difference in the adjusted mean scores of behaviour disorders of experimental and control group subjects (children with mild intellectual disability) by considering pre-behaviour disorders as covariate" is rejected. Further, the adjusted mean score of behaviour disorders of experimental group was 17.256,  $SE=1.838$ , which is significantly lower than that of the control group whose adjusted mean score of behaviour disorders was 32.163,  $SE= 1.474$  (Figure 3). The covariates appearing in the model were evaluated at the pre-test value of 31.600. Based on estimated marginal means, the mean difference between experimental and control groups of mild intellectual disability is 14.906 and std. error 2.453, which is significant at the .05 level. Similarly, the adjusted mean scores of behaviour disorders of experimental and control group subjects (children with moderate intellectual disability) can be compared by considering pre-behaviour disorders as covariate. Results in table 3 indicated that adjusted  $F(1, 13) = 71.686$ ,  $p = .000$  which is significant at .05 levels. It indicated that adjusted mean scores of behaviour disorders of the experimental and control groups differ significantly by considering pre-behaviour disorders as covariate. Thus, the null hypothesis that "There is no significant difference in the adjusted mean scores of behaviour disorders of experimental and control group subjects (children with moderate intellectual disability) by considering pre-behaviour disorders as covariate" is rejected. Further, the adjusted mean score of behaviour disorders of the experimental group was 28.691,  $SE = .525$ , which is significantly lower than that of the control group whose adjusted mean score of behaviour disorders was 35.826,  $SE= .603$  (Figure 3). The covariates appearing in the model were evaluated at pre-test value of 35.500. The mean difference between experimental and control groups of moderate intellectual disability is 7.135 and std. error .843, which is significant at the .05 level. It is being reflected that the effect of music intervention was highly significant on children with mild and moderate intellectual disability when both experimental and control groups were matched with pre-behaviour disorder scores.

**Table 4: Results of Analysis of Covariance of different domains of behaviour disorders of Children with Mild and Moderate Intellectual Disability on Behavioural Assessment Scale For Indian Children-Mental Retardation (part-B) (Univariate Tests).**

Type of Disability		Domains	df	F	P
Mild	A	Violent and Destructive Behaviour	1, 2	22.911*	.041
	B	Temper Tantrums	1, 2	1.600	.333
	C	Misbehaves with others	1, 2	20.085*	.046
	D	Self-injurious Behaviour	1, 2	.296	.641
	E	Repetitive Behaviour	1, 2	10.500	.083
	F	Odd Behaviour	1, 2	11.433	.077
	G	Hyperactivity	1, 2	10.667	.082
	H	Rebellious Behaviour	1, 2	5.000	.155
	I	Anti-social Behaviour	1, 2	1.562	.338
	J	Fears	1,2	8.450	.101
Moderate	A	Violent and Destructive Behaviour	1,13	43.054*	.000
	B	Temper Tantrums	1,13	.551	.471
	C	Misbehaves with others	1,13	8.730*	.011
	D	Self-injurious Behaviour	1,13	17.297**	.001
	E	Repetitive Behaviour	1,13	7.240*	.019
	F	Odd Behaviour	1,13	3.921	.069
	G	Hyperactivity	1,13	9.049**	.010
	H	Rebellious Behaviour	1,13	10.254**	.007
	I	Anti-social Behaviour	1,13	5.881*	.031
	J	Fears	1,13	2.511	.137

\* P < .05, \*\*P < .01

Results in table 4 indicated that the music intervention programme produced significant changes in the domains of behaviour disorders such as violent and destructive behaviour  $F(1, 2) = 22.911$ ,  $p = .041$ , and misbehaves with others  $F(1, 2) = 20.085$ ,  $p = .046$ , of children with mild intellectual disability but their control group did not show any significant difference in these domains of behaviour disorders. Similarly, in children with moderate intellectual disability, music

intervention produced significant changes in the domains of behaviour disorders such as violent and destructive behaviour  $F(1,13) = 43.054$ ,  $p = .000$ , misbehaves with others  $F(1,13) = 8.730$ ,  $p = .011$ , self-injurious behaviour  $F(1,13) = 17.297$ ,  $p = .001$ , repetitive behaviour  $F(1,13) = 7.240$ ,  $p = .019$ , hyperactivity  $F(1,13) = 9.049$ ,  $p = .010$ , rebellious behaviour  $F(1,13) = 10.254$ ,  $p = .007$ , and anti-social behaviour  $F(1,13) = 5.881$ ,  $p = .031$ . Both groups of children with mild and moderate intellectual disability did not show any significant change in the domains of temper tantrums, odd behaviour and fears, at .05 level of significance.

## DISCUSSION

Music is used to treat children and adolescents with mental disorders in many European countries. The influence of music on persons with intellectual disability has been widely investigated in the West but there is little research in India. The present study is an effort to highlight beneficial effects of music on children with intellectual disability in India.

Present study assessed the effect of intervention in music activities which is similar to that of Surujal (2013) who assessed the contributions made by music to improve learning in the classroom among children with intellectual disabilities through a qualitative approach. Three focus group interviews were conducted using interpretative phenomenological analysis procedures to analyse the data. Results indicated that music is positive medium that contribute significantly to the learning experience of children with intellectual disabilities and the themes that emerged were confidence in communicating, concentration and behaviour. Conclusion of the present research that music intervention using strategies from Applied Behaviour Analysis was effective in reducing behaviour disorders among children with intellectual disabilities is similar to that of Sze and Yu (2004) who concluded that normal teaching strategies accompanied by music benefits the learner emotionally as it releases tension. Present research concluded that music has significant effect on behaviour disorders of intellectually disabled children, which is inconsistent with that of Grimm and Pefley (1990) who concluded that music helps children with learning difficulties, mental illness and intellectual disability. Gold et al, (2005) in a meta-analysis of four studies with merely moderate methodological quality, gave similar conclusion to that of present research that active music therapy may be more effective for clients with psychosis.

In the present study, the sample represented both rural and urban populations and belonged to below-average, average and poor socio-economic status. Therefore,

the results could be generalised and replicated in other states of India where the socio-economic, cultural, geographical and political environment is similar.

This programme of music intervention can be part of the daily curriculum for children and adults with mild and moderate intellectual disability as it adds recreation and fun-filled excitement to their daily routine and can produce a practical change in the special educational practice. Only trained instructors are required, who could systematically implement the music intervention following the teaching strategies, teaching programme and time plan as mentioned in the module. Instructors should be strict in implementing the programme as planned and should be flexible simultaneously to the individual needs. It is further suggested that this programme can also be tested on children and adults with behaviour disorders, destructive behaviour, and on certain mental disorders. It can also be used as treatment for depression and anxiety among children and adults with intellectual disability.

## **CONCLUSION**

The findings have important implications for parents, special teachers, developmental and clinical psychologists and researchers by highlighting the fact that involvement with music in any form (listening, instrumental, etc.) should be made a compulsory part of their daily routine. Music enhances mood, and these children are benefited greatly from upbeat, rhythmic music that they can sing and play instruments. It provides a positive relaxing experience and can also ease stress and anxiety by reducing muscle tension and slowing down the heart rate. Hence, music intervention can be part of the treatment of the psychosocial and physiological aspects of an intellectual disability.

### **Limitations**

Children with severe and profound intellectual disability were excluded from the study. Also there was no follow-up after the post-test.

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