

Harmonic Bridges: Enhancing Social Functioning in Children with Autism through Musical Scaffolding

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ABSTRACT

This study investigates the effectiveness of Musical Scaffolding in enhancing Social Functioning in children with Autism Spectrum Disorder (ASD). Social Functioning, a core human skill involving meeting & greeting, empathy etc., can be targeted through Music-based interventions. It was hypothesized that Musical Scaffolding would improve overall SF, particularly in sub-domains like Communication & Cognition, Emotional Control, within the experimental group as compared to the control group. A pre-post assessment design was employed, involving N=100 children (already diagnosed) with ASD. Divided equally, 50 children participated in the experimental group receiving bi-weekly 40-minute MT sessions for eight weeks. Music therapy incorporated rhythm and melody/swar-based activities. Tool used to measure SF is Social Responsiveness Scale, 2nd edition (SRS-2; Constantino & Gruber, 2012). Results demonstrated significant improvement in the experimental group's SF, with better post-intervention scores indicating reduced dysfunctionality. Statistical analysis revealed a significant difference in EF between the control and experimental groups.

Keywords: *Autism Spectrum Disorder; Music Therapy; Social Functioning; Musical Scaffolding*

Autism has become a Spectrum (known as Autism Spectrum Disorder, ASD) w.e.f. 2013 as amended by the American Psychiatric Association (APA), and defined as a developmental condition involving challenges with social communication and interaction, restricted interests, and repetitive behaviour (APA, 2013).

Social functioning refers to an individual's capacity to effectively perform and meet their social roles, a capability that is shaped by the surrounding social environment. This concept is fundamental to social work practice at all levels (Dictionary of Social Work, 2012, p. 51).

Musical scaffolding encompasses the supportive frameworks and techniques that assist individuals in acquiring and mastering musical skills. This approach involves offering guidance that aligns with a learner's existing knowledge, thereby promoting advancement in their musical abilities and understanding. It includes methods such as instructor feedback, collaboration with peers, and organized practice sessions, all of which help connect learners'

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current capabilities with the new concepts they need to grasp. This method not only facilitates the development of technical skills but also fosters creativity and exploration in music.

It has long been believed that the need for social connection is a fundamental component of the human experience and that it serves as a universal source of motivation (Baumeister & Leary, 1995). Autistic children experience significant challenges in social functioning compared to other neurodevelopmental disorders, as indicated by the pervasive difficulties they face in social interactions and relationships (Smith, 2020).

Research with children with additional disabilities has found, music can be important within everyday settings as a way to build relationships and regulate mood (Chou et al., 2019; Murphy & McFerran, 2017; Rushton & Kosyvakaki, 2021), ignite playfulness (Corke, 2011; Rushton & Kosyvakaki, 2020), and promote wellbeing (McFerran & Shoemark, 2013; Stensaeth, 2013).

Musical Scaffolding can be considered a good aid in increasing Sociality and Music as a helping tool increase learning not just Musical but also other skills like socio-emotional skills for children.

In a preschool setting for children with Autism Spectrum Disorder (ASD), teachers can use a method called "teacher modelling" to help students learn through a playful song. This approach involves showing the children how to perform the song, while they watch and copy the teacher. It also encourages them to interact with their classmates. This method is based on Bandura's social learning theory, which suggests that people learn by observing and imitating others (Kelly, 2009).

Objective:

To study the effect of Musical Scaffolding on Social Functioning among children with ASD (Autism Spectrum Disorder).

Hypotheses:

- **H1:** Pre-intervention scores of Experimental and Control groups would not differ significantly on Social Functioning in children with Autism Spectrum Disorder.
- **H2:** Post Music Therapy Intervention, Social-Functioning of children with Autism Spectrum Disorder in experimental group would be significantly better as compared to their pre intervention Social-Functioning.

METHODOLOGY

Sample:

In lieu of present research, a purposive sample of 100 children with Autism Spectrum Disorder ranging in age from 7 to 11 years (mean age of 9 ± 3.00 years) was selected randomly from Autism Centers, Punjab to participate in this study. These centers have already screened the autistic children under the criteria of DSM-5 or ICD-11. The due procedure was followed in accordance with the ethical standards of the responsible institutional committee on human experimentation. The participants were randomly allocated into an intervention group (n=50) who were given Musical Scaffolding as part of intervention for research; Control group (n=50) receiving no intervention.

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Inclusion criteria:

- Children with mild & moderate levels of ASD
- Children with at least 3 months of admission in the Autism Centers
- Currently receiving only Medication, Occupational, Neuro, and Speech Therapy

Exclusion criteria:

- Children with ASD of severe level will be excluded from the study
- Children with comorbidity like Mental Retardation, Schizophrenia, Language disorders etc. will not be considered for the said purpose.

Design:

Pre-Post Experimental-Control group design was adopted. All the participants and their parents were addressed and rapport was established. They were administered Social Responsiveness Scale, 2nd edition (SRS-2; Constantino & Gruber, 2012). The assessments were conducted before intervention (on the baseline assessment sessions), and after the intervention (on follow up assessment sessions). No intervention was given to the controlled group.

Measure:

Social Responsiveness Scale, 2nd edition (SRS-2; Constantino & Gruber, 2012): The SRS-2 is a standardized, norm-referenced caregiver report questionnaire used to screen for ASD risk and to document patterns of ASD symptomatology for treatment planning purposes. Caregivers are asked to rate 65 items about their child's behavior over the past six months using a Likert scale from 1 (Not True) to 4 (Almost Always True). An overall Total *T*-score is calculated. Higher scores indicate more ASD-like behaviors. *T*-scores greater than or equal to 60 indicate elevated ASD symptomatology. The SRS-2 School-Age Form has strong psychometric properties in clinical (ASD) and non-clinical standardization samples. Internal consistency reliability is $\alpha = .95$ and $.97$, respectively. In DS, high internal consistency reliability ($\alpha = .94$ for males and $.96$ for females) and concurrent validity with the SCQ-Lifetime ($r = .53$) were reported by Channell et al. (2015).

RESULTS

Table 1: Musical Scaffolding based tasks with description for the sessions of the Experimental Group:

Sessions	Objective	Tasks
(1,2) Introductory Sessions	Rapport Building and assess initial musical responses	Icebreaker activities using familiar songs
(3-5) Free-Play Session	Sensory testing (Hypo or Hyper; Sound& Touch)	Use of variety of musical instruments (e.g., drums, bells, flutes) to observe the child's reactions to different levels, pitches of sounds.
(6,-10) Teaching Session	Fostering patience and listening skills	Turn-taking games with instruments
Further Sessions	Building Social-Skills	Use body percussion (clapping, tapping) along with rhythmic instruments
Performance	Review of goals set in	Play different types of music (happy,

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Sessions	Objective	Tasks
Sessions	previous sessions	sad, angry) and have children act out corresponding emotions.
Feedback	Caregivers noting child's reactions to various musical elements at home	Children practiced social roles while engaging with music

Table 2: Groups Comparison in Pre-Score:

SRS	N	Experimental Group		Control Group		F value	p value
		Mean	SD	Mean	SD		
Motivation	100	17.51	1.96	17.50	2.02	0.001	0.972
Awareness	100	19.14	2.08	19.04	2.12	0.113	0.737
Restriction	100	19.95	2.38	19.91	2.45	0.014	0.907
Communication	100	26.48	2.67	26.69	2.71	0.305	0.582
Cognition	100	21.98	2.47	22.05	2.68	0.037	0.848
Total	100	105.06	6.81	105.19	6.64	0.019	0.891

ANOVA Summary of Pre-Score:

SRS	Source of Variance	Sum of Squares	df	Mean Square	F	p value
Motivation	Between Groups	.005	1	.005	0.001	0.972
	Within Groups	785.990	198	3.970		
	Total	785.995	199			
Awareness	Between Groups	.500	1	.500	0.113	0.737
	Within Groups	873.880	198	4.414		
	Total	874.380	199			
Restriction	Between Groups	.080	1	.080	0.014	0.907
	Within Groups	1154.940	198	5.833		
	Total	1155.020	199			
Communication	Between Groups	2.205	1	2.205	0.305	0.582
	Within Groups	1432.350	198	7.234		
	Total	1434.555	199			
Cognition	Between Groups	.245	1	.245	0.037	0.848
	Within Groups	1310.710	198	6.620		
	Total	1310.955	199			
Total	Between Groups	.845	1	.845	0.019	0.891
	Within Groups	8955.030	198	45.227		
	Total	8955.875	199			

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Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	p value
Motivation	0.217	1	198	0.642
Awareness	0.215	1	198	0.643
Restriction	0.165	1	198	0.685
Communication	0.002	1	198	0.966
Cognition	1.366	1	198	0.244
Total	0.001	1	198	0.972

Table 3: Groups Comparison in Post-Score:

SRS	N	Experimental Group		Control Group		F value	p value
		Mean	SD	Mean	SD		
Motivation	100	14.92	1.97	18.81	1.95	197.440**	0.000
Awareness	100	17.22	1.89	20.35	1.97	131.438**	0.000
Restriction	100	17.64	2.06	20.99	2.37	113.599**	0.000
Communication	100	20.58	3.10	28.56	2.70	376.830**	0.000
Cognition	100	19.92	2.32	23.16	2.72	82.038**	0.000
Total	100	90.28	6.02	111.87	6.63	581.231**	0.000

ANOVA Summary of Groups Comparison in Post-Score:

SRS	Source of Variance	Sum of Squares	df	Mean Square	F	p value
Motivation	Between Groups	756.605	1	756.605	197.440**	0.000
	Within Groups	758.750	198	3.832		
	Total	1515.355	199			
Awareness	Between Groups	489.845	1	489.845	131.438**	0.000
	Within Groups	737.910	198	3.727		
	Total	1227.755	199			
Restriction	Between Groups	561.125	1	561.125	113.599**	0.000
	Within Groups	978.030	198	4.940		
	Total	1539.155	199			
Communication	Between Groups	3184.020	1	3184.020	376.830**	0.000
	Within Groups	1673.000	198	8.449		
	Total	4857.020	199			
Cognition	Between	524.880	1	524.880	82.038**	0.000

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SRS	Source of Variance	Sum of Squares	df	Mean Square	F	p value
	Groups					
	Within Groups	1266.800	198	6.398		
	Total	1791.680	199			
Total	Between Groups	23306.405	1	23306.405	581.231**	0.000
	Within Groups	7939.470	198	40.098		
	Total	31245.875	199			

Test of Homogeneity of Variances				
SRS	Levene Statistic	df1	df2	p value
Motivation	0.597	1	198	0.441
Awareness	0.936	1	198	0.335
Restriction	0.503	1	198	0.479
Communication	0.941	1	198	0.333
Cognition	4.071	1	198	0.045
Total	1.450	1	198	0.230

Table 4: Groups Comparison in Follow-up Score :

SRS	N	Experimental Group		Control Group		F value	p value
		Mean	SD	Mean	SD		
Motivation	100	15.77	1.90	19.04	1.95	143.919**	0.000
Awareness	100	18.03	1.89	20.47	2.09	75.005**	0.000
Restriction	100	18.45	2.04	21.16	2.37	75.251**	0.000
Communication	100	22.11	2.85	28.55	2.68	270.740**	0.000
Cognition	100	20.95	2.35	23.16	2.72	37.829**	0.000
Total	100	95.31	6.39	112.38	6.68	341.186**	0.000

ANOVA:

SRS	Source of Variance	Sum of Squares	df	Mean Square	F	p value
Motivation	Between Groups	534.645	1	534.645	143.919**	0.000
	Within Groups	735.550	198	3.715		
	Total	1270.195	199			
Awareness	Between Groups	297.680	1	297.680	75.005**	0.000

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SRS	Source of Variance	Sum of Squares	df	Mean Square	F	p value
	Within Groups	785.820	198	3.969		
	Total	1083.500	199			
Restriction	Between Groups	367.205	1	367.205	75.251**	0.000
	Within Groups	966.190	198	4.880		
	Total	1333.395	199			
Communication	Between Groups	2073.680	1	2073.680	270.740**	0.000
	Within Groups	1516.540	198	7.659		
	Total	3590.220	199			
Cognition	Between Groups	244.205	1	244.205	37.829**	0.000
	Within Groups	1278.190	198	6.456		
	Total	1522.395	199			
Total	Between Groups	14569.245	1	14569.245	341.186**	0.000
	Within Groups	8454.950	198	42.702		
	Total	23024.195	199			

SRS	Levene Statistic	df1	df2	p value
Motivation	0.256	1	198	0.614
Awareness	2.720	1	198	0.101
Restriction	1.278	1	198	0.260
Communication	0.101	1	198	0.751
Cognition	2.591	1	198	0.109
Total	0.170	1	198	0.681

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Table 5: Comparison of Experimental group on Pre, Post, Follow-Up Intervention for SRS Total; Comparison of Control group on Pre-Post, Follow-Up Intervention for SRS Total;

Time (I) – Time (J)	Mean Difference (I-J)	Std. Error	p value	95% CI Lower	95% CI Upper
Pre-Score – Post Score	14.780**	0.450	0.000	13.685	15.875
Pre-Score – Follow Up	9.750**	0.405	0.000	8.764	10.736
Post Score – Follow Up	-5.030**	0.246	0.000	-5.628	-4.432

DISCUSSION

The present study aimed to assess the impact of Musical Scaffolding on the Social functioning among children with Autism Spectrum Disorder and to analyse the significance of its effect post MT. Few other studies also reflect that autistic children and their parents use music to scaffold and interact in everyday life—for communication, for play, and for navigating everyday routines.

Overall, the findings suggest that Musical Scaffolding proved to be an effective phenomenon being not just musical but also involving the ‘Transfer of learning’, a concept which involves learning various social, emotional, behavioral responses through musical instruments and applying learnt behavior in other everyday activities. What emerged was the positive impact and value of music as a shared, mutual space where the children were able to express themselves and be understood. During therapy sessions, it was observed that children started greeting by saying hello, or at least made hand gestures to initiate meeting, few of them also learnt to touch the feet of elders.

In terms of **Emotional Control**, there have been notable changes such as fewer tantrums, less lying on the floor, and a decrease in shouting and crying. These behaviors have been replaced by enjoyment derived from playing the same melodies with peers and parents. In the sessions, calming rhythmic musical stimuli, also facilitated the reduction in aggression levels in hyper-sensitive children by addressing their sensory needs.

The current study specifically sought to address the gap identified in prior research by focusing on the sensory needs of autistic children. This was achieved by categorizing participants into hypo- and hypersensitive groups at the beginning of the sessions, allowing for tailored musical activities as part of an Active Musical Scaffolding approach. Supporting this approach, a review conducted by M. Geretsegger et al. (2014) in the *Autism* journal emphasized the importance of differentiating between children with autism who are hypersensitive (over-responsive to sensory stimuli) and those who are hyposensitive (under-responsive). Many existing studies combine children with varying sensory profiles, which can obscure the true effects of music therapy. It is crucial to recognize that children with hypersensitivity may respond differently to musical stimuli compared to their hyposensitive peers. This lack of sensory subgroup analysis is addressed by this present study.

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Post-Therapy results reveal that overall composite scores in Experimental group decreased on the SRS (Social Responsiveness Scale); showing clearly positive effects produced by Music Therapy in the experimental group.

In line with the previous researches, a study showing positive outcomes from music therapy interventions; Ghasemtabar, M., Amini, M., & Ranjbar, N. (2015) reported a strong effect size (standardized mean difference = 1.06) on social skills among a smaller sample of 13 children with ASD compared to a control group of 14 other children.

Therefore, hypotheses of this research that Music therapy would enhance Social Functioning has been supported. The results are also in line with the previous researches which indicated that there is positive impact of Music Therapy on autistic children.

Out of all the 5 Subsets, **Communication & Cognition subsets showed greater improvements** in Experimental group; Motivation showed least. In consistent with the present study's results, research by Bieleninik et al. (2017) also found similar results that there are multifaceted benefits of music therapy, particularly its effects on communication skills, social interaction, and emotional regulation, with improvements in verbal and non-verbal communication, such as eye contact, vocalizations, and gestures. However, it had a lesser effect on motivation compared to its impact on communication. Some children showed limited motivation to engage voluntarily with the therapy outside of structured settings. Thus, motivation can remain a more challenging area for children with autism, and its improvement might require additional therapeutic strategies.

Also to note, in the follow-up assessment, scores on the SRS showed a slight increase, indicating that the overall effect of music therapy persisted, albeit not at the same level as before. However, it is important to note that these scores still reflected a decrease when compared to the pre-intervention scores.

CONCLUSION

According to this study, the children's experiences with music offered valuable insights into the potential for musical play among autistic children. This research presents a practical, engaging, and innovative approach that is informed for individuals on neurodiversity. The therapist's use of North Indian cultural music during the scaffolding process also has important implications for how musical programs and access to music for autistic children can be developed in the future, especially in the North Indian region.

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Conflict of Interest

The authors declared no conflict of interest.

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