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CULTURALLY RESPONSIVE MUSIC THERAPY FOR AUTISM SPECTRUM DISORDER (ASD): THE ROLE OF JAVANESE GAMELAN IN ENHANCING SOCIAL COMMUNICATION AND BEHAVIORAL ENGAGEMENT

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ABSTRACT

Impaired social interaction, joint attention, communication, and behavioural regulation are frequently linked to autism spectrum disorder (ASD) due to abnormal brain functioning. Despite the widespread use of music-based therapies to help children with ASD, these strategies are still mainly disjointed and poorly contextualised within cultural therapeutic practices. This study investigates the use of Javanese gamelan as a multifaceted, culturally sensitive treatment tool for kids with ASD. The study used a pilot case study methodology to examine a school-aged child with ASD's social and communication skills while engaging in gamelan-based therapeutic activities. With special focus on eye-gaze behaviour, social engagement, concentration, and communicative responsiveness across various interactional contexts, data were gathered through video-recorded observations and evaluated using a mixed-methods approach. The findings show that the multifaceted features of Javanese gamelan, such as adaptive instrument design, rhythmic counting systems, active musical participation, and culturally embedded interaction patterns, greatly enhanced the child's capacity for social interaction, communication, emotional responsiveness, and concentration span. During therapy sessions, the kid showed improved social responsiveness, decreased maladaptive behaviours, increased eye contact, and increased involvement in shared attention activities. Crucially, communication competence originated as a context-dependent phenomena influenced by culturally mediated interaction rather than as an isolated individual capacity. This study emphasises Javanese gamelan's potential as a cutting-edge, culturally sensitive music therapy paradigm for the treatment of ASD. By incorporating cultural heritage, multisensory involvement, and social communication skills into therapeutic design, the findings help to broaden current ideas on autism therapy. Practical implications for inclusive education, music therapy, and culturally grounded intervention programs for children with ASD are also provided by the study.

KEYWORDS: Javanese Gamelan, Autistic Therapy, Fun and Effective.

1. INTRODUCTION

Autism is a developmental disorder of the nervous system that results in suboptimal cognition, sensory function, and motor function. Impaired cognitive function results in difficulty concentrating, intellectual development, depression, aggression, temperamental behavior, and self-harm; impaired sensory function of the five senses has a less optimal impact on the functions of the senses of touch, hearing, vision, and spatial perception; meanwhile, impaired sensory function of motion results in body imbalance in static and dynamic conditions (Ummah & Yanti, 2025). As a result, autistic children reject direct eye contact and mutual interaction, find it difficult to communicate verbally or nonverbally, enjoy clapping or swinging their bodies, respond to their environment with excessive movement or vice versa, and some are also sensitive to food (Srinivasan et al., 2014). Not all of these symptoms are seen in the behavior of autistic children. Common symptoms are poor communication, suboptimal mutual interaction, poor understanding of gestures and improper use, repetitive motor movements and speech habits, persistent behavior patterns and interests, and distinctive body language (Alter-muri, 2017; Rickson et al., 2015). They also exercise less than normal children or their peers who develop their skills, and they lack team and non-team sports, as well as other independent physical activities such as cycling and swimming (Fadillah et al., 2022; Srinivasan et al., 2014).

Efforts to address autism have been made. As a result, an effective autistic therapy model includes physical movement, music, and activities that children enjoy. Physical movement is effective for autism therapy because structured physical activity can positively affect an autistic child's social interactions, communication, responses to the environment, and facial expressions. For example, autistic therapy begins with preparation and warm-ups, small-group exercises (one to five children), jogging, and learning to play ball (patting, throwing, catching, stepping on the ball), followed by large-group exercises (playing soccer cooperatively), and cooling down (singing goodbye songs and giving gifts), and requires participants to communicate with their friends during play; this approach is effective for physical interaction therapy, verbal communication, and eye contact (Zhao & Chen, 2018).

The use of musical elements (rhythm, dynamics, and timbre) when used for autism therapy can create an atmosphere that provokes children to communicate unconsciously, give meaning to their interactions, make interactions more open, provide a musical giving and receive experience, make communication more intensive, children are more sensitive to non-verbal cues and expressive movements, and can help develop vocabulary through conversation. and improve expressive coordination (Drossinou-Korea & Fragkouli, 2016; Thompson & Mcferran, 2015; Wimpory & Nash, 1999). Playing music simultaneously in an autistic therapy program makes parent-child encounters more meaningful and keeps them in a state of social interaction for longer than without music (Salvador & Pasiali, 2017). Music used for autism therapy at home can improve their social interaction in the family and society and improve the quality of parent-child relationships (Rickson et al., 2015); while doing work while listening to music results better than without music (Dieringer et al., 2017). Playing music can also improve the skills and emotional responses as well as the learning and thinking abilities of autistic children (Anca, 2015).

Autistic therapy activities that are tailored to the patient's pleasure make them effective, as they can motivate the child to participate in intervention activities (Eversole et al., 2016). Forms of computer or video games, watching television broadcasts or movies, playing board or cards and going to the cinema are activities that autistic children enjoy that can be used as a reference for the preparation of therapeutic activities; while visiting family or going to parties are activities that children are less interested in (Katuuk et al., 2023). Swimming is a rather preferred activity, while an unpreferred activity is carrying out time-limited tasks (Eversole et al., 2016).

Javanese gamelan can also reduce autism disorders. Playing Javanese gamelan has a positive effect on the facial expressions of autistic children, increases their concentration, encourages children to interact, and reduces bad habits. Utilizing the practice of playing Javanese gamelan can stimulate visual, auditory and tactile sensations so as to trigger positive emotions and these emotions stimulate the reaction of positive facial expressions (Sartika & Rohmah, 2013); while playing Javanese gamelan can also increase concentration, encourage patients to interact, and reduce bad habits, for example reducing the habit of muttering (Raharja, 2014).

Although previous studies have shown that physical activity, music therapy, and enjoyable activities can help improve social interaction and behavioral responses in children with Autism Spectrum Disorder (ASD), most research still examines these three approaches separately.

Research on music therapy generally focuses on improving social communication and social engagement in children with ASD through musical activities (Rolvsjord, 2016; Thompson & McFerran, 2015), whereas research on physical activity places greater emphasis on improving social interaction and communication through structured physical activity programs (Lappi, 2018). In addition, research specifically addressing the use of Javanese gamelan as a therapeutic medium for ASD remains very limited and generally focuses only on general behavioral observation. In fact, the integration of physical movement, musical stimulation, and child-preferred activities has the potential to provide more optimal multisensory stimulation for children with ASD. Therefore, this study offers an autistic gamelan therapy model based on Javanese gamelan that is modified according to the characteristics of children with ASD, such as instrument shapes resembling toys, smaller instrument sizes, the use of popular Javanese songs, and simpler learning methods. The novelty of this study lies in the integration of physical movement, traditional music, and culturally responsive enjoyable activities within a single ASD intervention model. Accordingly, this study aims to analyze the effectiveness of autistic gamelan therapy in enhancing social communication, concentration, and behavioral engagement in children with ASD at Bina Anggita Special School for Autism, Yogyakarta.

The above discussion gives an idea that the success of autism therapy is effective if it contains physical movements, uses music, and the activities are enjoyed by children. I will combine these three elements and apply them to autistic therapy using Javanese gamelan. Conventional Javanese gamelan was modified into autistic gamelan (the shape was modified into a toy shape, the size was reduced, using Javanese popular songs, the learning method was simplified, children were given the opportunity to sing in front of their friends) were used for therapy for students of the Bina Anggita Special School for Autism, Yogyakarta. Therapy was carried out for six months and in the seventh month the change in behavior was measured.

2. RESEARCH METHODOLOGY

2.1. Research Design

This research is a qualitative research or research that tests the results of interventions (Cruz & Tanti, 2017); while the design is Single Subject Research (SSR). SSR design is a study with a single subject (individual or group), functioning as an intervention group and a control group. This research design is suitable for individual research or types of research that do not require specific situations, such as normal distribution. This design can be used to test behavioral interventions implemented in educational research (Alnahdi, 2015).

The SSR design was used in this study. The goal is to test the influence of Javanese gamelan playing practice on changes in the behavior of the players. A group of autistic children were given practice playing Javanese gamelan and singing children's toy gending and popular Javanese gending twice a week for 90 minutes and six months and in the seventh month their behavior changes were measured to be compared to pre-intervention behavior.

2.2. Participant

Participants of this therapy were selected based on research needs (Cruz & Tanti, 2017). The participants of this therapy are autistic children who can concentrate for at least 10 minutes and can communicate; while based on the instrument he plays, the requirements of the drum player are coupled with being able to feel the Javanese gending phrase; Demung players, Saron Barung and Saron Penserus already know numbers; while players of Tap, Kenong, Kempul, and Gong, coupled with the requirement of being able to make steady beats using continuous counts while playing while beating.

Table 1. List of Trainees.

No	Name	Age	Level	Musical Instruments	Autism Level	School Hours
1.	Cindy Widhoretno	13 years old	SDLB	Kendang	Mild	07.00 - 12.00
2.	Vicaris Arkha H	12 years old	SDLB	Demung	Mild	07.00 - 16.00
3.	R L Ruchky Henrico	16 years old	SDLB	Saron Barung 1	Mild	07.00 - 12.00
4.	Toriq Rayhan Akbar	9 years old	TKLB	Saron Barung 2	Mild	07.00 - 12.00
5.	Gagana Pangesti	14 years old	SDLB	Saron Penerus	Mild	07.00 - 16.00
6.	Riva Kurniawan	12 years old	SDLB	Ketuk	Mild	07.00 - 12.00
7.	Raihan Tsany Arhab	9 years old	SDLB	Kenong	Mild	07.00 - 12.00
8.	Nanda Setiarini	9 years old	SDLB	Kempul	Mild	07.00 - 12.00
9.	Aksa Mutiandaru P.	12 years old	SDLB	Gong	Mild	07.00 - 12.00

2.3. Gamelan Instrument Modification

The gamelan used in this study is a modified Javanese gamelan. Modifications are made so that (Suyanto & Jihad, 2013) attract students' attention and interest and they are easy to use. Modifications include the number of scissors or tools used, their size, shape, and coloring. This autistic gamelan ensemble consists of kendang, demung, barung saron, successor saron, ketap, kenong, kempul, gong, and vocals. This ensemble was chosen because it meets the minimum requirements of the Javanese gamelan musical aspects (there are rhythm instruments, main melody instruments, vocals, and colossomic instruments).

The ensemble consists of four octaves. Autistic gamelan does not use the lowest octave or octave region for the gong ageng because it is adjusted to the character of the gending being played. The gendings of the smooth form where the sound distance between the gongs is not long (approximately eight seconds) are not suitable when using the gong in the area of the tone because the gong resonates long and this makes the presentation of the gending unpleasant, because the sound of the gong intersects with each other, a knodization that is not desired in Javanese gamelan.

Table 2. Autistic Tone Region.

Tone / shear region		Tone Sequence																										
		2	3	5	6	1	2	3	5	6	1	2	3	5	6	1	2	3	5	6	1	2	3	5	6	1	2
1.	Gong Suwukan					x	x																				
2.	Kempul							x	x	x	x	x															
3.	Kenong											x	x	x	x	x											
4.	Ketuk											x															
5.	Demung									x	x	x	x	x	x	x											
6.	Saron barung													x	x	x	x	x	x	x	x	x					
7.	Saron penerus																			x	x	x	x	x	x	x	x

Modifications also occurred to the size of the gamelan. This autistic gamelan is smaller than conventional Javanese gamelan. Modifications are made because when children play gamelan which is large in size, they are uncomfortable; The weight is too heavy for them so they get tired easily, the large size of the gamela causes the position of the body when beating is uncomfortable, for example squatting and making it tired quickly. This size adjustment aims to make them comfortable when playing the gamelan so that the goal of improving their quality of life is achieved.

Table 3. Comparison of Size of Autistic Gamelan and Conventional Gamelan.

Instrument	Pelog	Length		Slendro	Length	
		G Autis	G Conventional		G Autis	G Conventional
Demung	1	30 cm	38 cm	1	31 cm	37 cm
	2	29 cm	37 cm	2	30 cm	36.5 cm
	3	28 cm	36.5 cm	3	29 cm	36 cm
	4	27 cm	36 cm	5	28 cm	35 cm
	5	26 cm	35 cm	6	27 cm	34 cm
	6	25.5 cm	34 cm	1	26 cm	33 cm
	7	25 cm	33.5 cm	-	-	-
Saron Barung	1	25 cm	28 cm	1	26 cm	27.5 cm
	2	24 cm	27 cm	2	25 cm	26.5 cm
	3	23.5 cm	26 cm	3	24.5 cm	26 cm
	4	23 cm	25 cm	5	24 cm	25.5 cm
	5	22 cm	24. 5 cm	6	23 cm	24.5 cm
	6	21.5 cm	24 cm	1	22 cm	23.5 cm
	7	21 cm	23. 5 cm	-	-	-
Saron Penerus	1	21 cm	21. 5cm	1	22 cm	23 cm
	2	20.5 cm	21 cm	2	21.6 cm	22.5 cm
	3	20 cm	20.5 cm	3	21 cm	22 cm
	4	19.5 cm	20 cm	4	20 cm	21.5 cm
	5	19 cm	19.5 cm	5	19.5 cm	21 cm
	6	18.5 cm	19 cm	6	19 cm	20 cm
	7	18 cm	18.5 cm	-	-	-
Kendang Ageng		Length 70 cm, Diameter 25 cm and 45 cm		Length 73 cm, Diameter 40 cm and 34 cm		
Kethuk		Diameter 20 cm		23 cm		
Kenong		Diameter 20 cm		-		
Kempul		Diameter 40 cm		49 cm		
Gong		Diameter 70 cm		90 cm		

Modifications were also made to the shape of musical instruments. The reason is, just like the size of the gamelan, the shape of the box and ornaments or decorations of the shapes of plants (leaves) and animals (snakes) as well as the coloring of yellow, red, and black in conventional Javanese gamelan are not in accordance with the level of development of the child's soul. Shape modification is done by changing the shape of the box to the shape of a

vehicle, while the coloring is adjusted to the color of the original object.

The theme used as a reference for modifying the form is the theme of war. From the theme, the shape of tanks, fighter planes, ambulances, and floral motifs was chosen to modify it. The shape of the vehicle accommodates the desires or pleasures of male players, while floral decorations accommodate the pleasures of female players. These musical instruments are painted like the color of the original object so that children can recognize them easily. Color modification is carried out because color is an important element in the design of artworks, because with colors a work has a higher meaning and value and through color can create a pleasant atmosphere that affects the emotional emotions of the performer (Pile & Thrift, 1995).

Color can also affect a person's mood and thoughts. Red, orange, and yellow colors make for a warm and overflowing atmosphere, energetic, joyful, and carefree; while blue, indigo, and purple colors make a feeling of calm and soothing (Mahardhika & Budiono, 2012) For this reason, blue is used to paint the musical instrument and combined with dark green and red and white as its dominant color.

Figure 1. Pictures of Demung, Saron Barung, and Saron Penserus (Peking).

The material for this therapy is adjusted to the child's abilities and desires. Based on their abilities, the gending that is suitable for this therapy is the fluent form of gends, gending that is the easiest way to play it; While the type is the gendings that use vowels are the gending-gending that the children of this therapy participant prefer. In addition, gending without vowels is also taught, gending soran which is a smooth gending and gangsaran (gending whose way of playing is similar to the form of smoothness).

2.4. Teaching Gamelan Strategy

Teaching autistic children requires a strategy. One of them is to teach musical rhythm by associating it with colored blocks; Rhythm patterns are written using block notes, and to memorize them are used the child's favorite or favorite colors (e.g., red for rhythm pattern A, yellow for rhythm pattern B, and so on). During learning, it is interspersed with things that the child likes and learning must be done in a fun atmosphere. This strategy not only succeeds in teaching rhythm, but can also increase children's concentration (Arifin et al., 2021; Aulia et al., 2014).

Learning to play gamelan in this study uses individual learning strategies and group learning or playing together. Individual learning is learning for each musical instrument that plays the main melody (Demung, Saron Barung, and Saron Penerus) and learning to play with all gamelan instruments. Individual learning is carried out by writing a melody on a pergatra or quarter-beat board, then children are invited to memorize it per gatra until it is finished.

Playing together practice is a joint exercise to open the gending, slow down or speed up the tempo, start singing, and end the gending. The practice began with the cooperation between the demung, barung sarons, and successor sarons players with the players of tap, kenong, kempul, and gong. The exercise uses sixteen repeated beats (half a second each). In each beat, two syllables are used as a result of modifying the pronunciation of the numbers 1 to 8. Beats are used to train the tempo of children's gending which in its implementation is accompanied by an accompanying teacher.

Table 4. Technique for Performing Instruments.

Count	*sa*	*tu*	*du*	*a*	*ti*	*ga*	*em*	*pat*	*li*	*ma*	*e*	*nam*	*tu*	*juh*	*la*	*pan*
Balungan		x		x		x		x		x		x		x		x
Sr. Penerus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kendang	p	p	p	p	p	b	p	p	p	b	p	p	p	b	p	p
Bonang Br	x		x		x		x		x		x		x		x	
Bonang Pr	x		x	x	x		x	x	x		x	x	x		x	x
Ketuk	x		x		x		x		x		x		x		x	
Kenong				x				x				x				x
Kempul						x				x				x		
Gong																x

The next exercise is to practice how to start the gending, slow down and accelerate the gending, and end the gending. The practice to start the gending is to practice the cooperation of Demung players with Kendang players; Demung players play the opening melody and drum players control the tempo, then followed by other players. The next exercise is processing (speeding up and slowing down the tempo of the drum) by the drummer and the practice is the most time-consuming, because autistic children who are used to being alone take a long time to listen to the drum cues when playing. After the exercise, the exercise was continued to strengthen the

gending.

Gamelan learning in this study is focused on interventions that emphasize the occurrence of social interaction (Boster et al., 2017). Social interaction is formed not only in the time of playing gemalan, but also in the preparation; For example, working together to carry the gamelan to be played.

Figure 2. Children Preparing Gamelan

2.5. Gending Presentation

The form of presentation of gending in this therapy is different from the conventional form of presentation. In the conventional presentation, the singer sits cross-legged, while in this therapy, the singer (each child) comes forward and sings in front of other players. This method is given to give children the opportunity to express themselves, encourage active students, make them happy, critical, creative, and devote attention to learning (Trinova, 2012) and to overcome children's boredom.

2.6. Types and Techniques of Data Collection

The collection of autism therapy data aims to explore and describe the patient's experience (Cruz & Tanti, 2017). The data consists of primary and supplementary data; Key data included social interaction skills, communication skills (non-verbal and verbal), initial behaviour, social-emotional reciprocity and side effects; while the data were in the form of social adaptation skills, quality of life at school, home and other environments, quality of family relationships, cognitive abilities (attention and concentration) and hyperacusis (Boster et al., 2017)

The data collection technique uses parent or teacher reports, and school records (Boster et al., 2017). This theory is used as the basis for determining the collection of data on the results of autistic therapy using this Javanese gamelan. Based on this, it was determined that the data collected included data on changes in student behavior related to playing gamelan, both at home, at school (when playing and studying), playing gamelan (at school and outside school). The data was collected using the following data collection techniques.

2.6.1. Brain Wave Recording

Brain wave recording uses EEG, which is the recording of brain activity for a period of 20-40 minutes using 18 electrodes attached to the body, especially the scalp. Electrodes are used to detect signals that are amplified to 1,000-100,000 times or 60-80 dB. The result is digital recordings transmitted on monitor screens as well as images on analog EEG paper rolls. Recording is carried out when the child hears and does not listen to the Javanese gending which is carried out at the Pramita Utama Laboratory in Yogyakarta. This data is used to determine the influence of Javanese gamelan therapy through brain waves, because brain waves can be used as a basis to find out a person's psyche.

Figure 3. Arkha EEG Examination

2.6.2. Observations

The observation was carried out by a team consisting of three people from the Faculty of Psychology, Gadjah Mada University, Yogyakarta, teachers, and researchers. Observation focuses on changes in children's interaction before and after receiving gamelan therapy whose aspects include initiation or the ability to start interacting with others, express their feelings clearly and defend their rights; self-disclosure or the ability to open up and tell others about personal matters; emotional support or the ability to provide emotional support to others and conflict management or the ability to overcome conflicts that occur between individuals (Pilarska, 2015)

Observation by teachers and researchers is carried out when children play gamelan or other activities at school. Observation when playing gamelan is carried out during rehearsals, during performances at school (school birthdays, celebration of World Autism Day,

etc.) and performances outside of school (broadcasts on television, invitations to perform to commemorate university anniversaries, performances at the Yogyakarta Arts Festival, and other performance invitations). The focus of observation was the same, namely changes in children's behavior after participating in Javanese gamelan playing therapy.

Figure 4. Photo of Gamelan Stage Autis

2.6.3. Interview

Interviews were conducted by researchers to parents, students and teachers. Interviews with parents focused on changing students' behavior at home before and after participating in gamelan practice; Meanwhile, the interview with the teacher focuses on changes in children's behavior before and after receiving gamelan therapy, both student behavior during learning and when playing or outside the classroom.

2.6.4. Questionnaire

A questionnaire was given to the parents of the students to get their responses to these therapy activities and data on changes in the child's behavior at home. The questionnaire questions include what do old oreants think of this therapy? What behavioral changes occur at home after following this therapy? Significant behavioral changes after the child has followed this therapy? Are students burdened? Does this activity need to be continued?

2.7. Data Analysis

The data analysis technique of this study uses analytical descriptive analysis techniques. This analysis technique focuses on the process and meaning of student behavior or the meaning of students' unique characters described in the context of therapy (Cruz & Tanti, 2017). The analysis consists of the analysis of the results of brain wave recordings and the analysis of behavioral changes; Brain wave analysis analyzes the results of brain wave recordings when listening to and not listening to gamelan to find out the position of brain waves when listening to gamelan and not listening to gamelan recordings. The analysis was carried out by neurologists from Dr. Sarjito Hospital, the largest hospital in Yogyakarta and Central Java. The goal is to test the effect of intervention in playing Javanese gamelan as an emotional, social, and psychological channel (Wardani, 2014) especially changes in the mental condition of students from a medical perspective.

The criteria are based on brainwave frequency positions. Gamma waves (20-40 Hz) indicate very high mental activity, such as intense focus, public performance, or acute stress, all occurring in a state of full consciousness. Beta waves (12-20 Hz) reflect an alert, wakeful state associated with daily activities and social interaction. Alpha waves (8-12 Hz) signify a relaxed state, typically accompanied by drowsiness or the onset of rest. Theta waves (4-8 Hz) correspond to light sleep or a deeply drowsy state. Delta waves (0.5-4 Hz) represent the deepest phase of rest, during which both body and mind undergo recovery and restoration.

The analysis of the meaning of student behavior change is the analysis of behavior change in the context of therapy. Four components of interpersonal interaction (initiation, expressing feelings, opening up, and managing conflict) are used to identify them and relate them to components considered in preparing therapy (physical movements, pleasurable therapy, and learning methods).

3. RESULTS

3.1. EEG Examination Results

The results of the EEG examination showed that there was a difference in brain activity when there was no intervention (not listening to the Javanese gending recording) and when listening to the Javanese gending recording, but the difference was not significant. It is suspected that during the examination, the child was uncomfortable, and the child was disturbed by the installation of 18 transmitters on his head, even though the child had previously been introduced to EEG devices and procedures. Actually, this problem can be overcome with anesthesia, but because the parents do not agree and the negative effect on their health, it is decided not to use it.

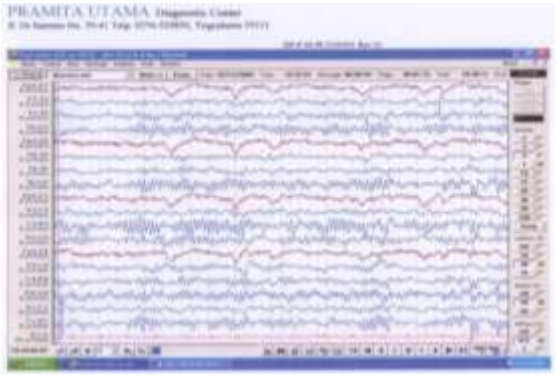

Figure 5. Results of the Brain Wave Examination of Vicaris Arka No Intervention.

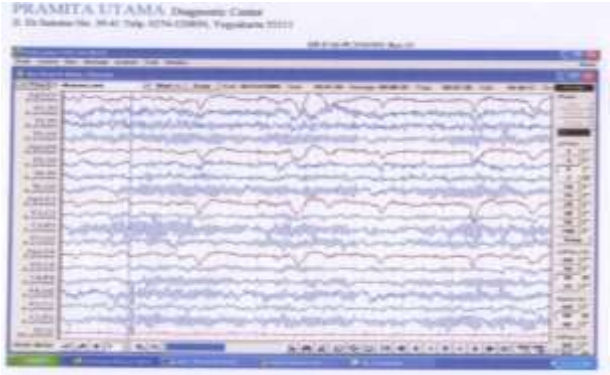

Figure 6. Results of the Brain Wave Examination of Vicaris Arka With Intervention.

Table 5. Result of Student Brain Wave Analysis.

No	Name	No Intervention	Intervention	Impact
1.	RLR Henriko	Alpha 8-9 Hz	Delta - alpha	Affected
2.	Cindy W	Alpha 8-9 Hz	Alpha 10-11Hz	Affected
3.	Vicaris Arkha H	Alpha 9-11 Hz	Alpha 7-9 Hz	Affected
4.	Raihan Tsany A	Theta-alpha 5-10 Hz	Theta-alpha 4-8 Hz	Affected
5.	Riva K	Theta-alpha 6-9 Hz	Theta-alpha 8-10 Hz	Affected
6.	Nanda S	Alpha 7-8 Hz	Alpha 7-8 Hz	Fixed
7.	Andreas Sony CAP	Alpha 8-9 Hz	Deltha - alpha	Affected
8.	Aksa Mutiandaru P	Alpha - beta	Alpha - beta	Fixed

3.2. The Development of Social Interaction

3.2.1. Initiation

Gamelan instruments whose shapes and ornaments are adjusted to the development of the child's soul encourage children to take the initiative to interact. The shape of the gamelan, which resembles an airplane or a combat vehicle, attracts children, making them an object of communication. When the gamelan is brought to school and placed in a room, the children approach, look, and ask the writer what it is? The author replied: It's a gamelan for younger siblings. The next day, they invited their friends to see the gamelan again. Arka called his friends by telling them, "Let's go there, there's a tank" (meaning let's go there and see a new gamelan in the shape of a tank). Not only that, but Arka also asked his father to buy a demung, the musical instrument he played. This surprised Arkha's father, because since childhood, the child had never asked his parents to buy anything, and this was the first request.

In addition to the shape and ornament of gamelan, gamelan playing activities also encourage children to interact or communicate (Irawati, 2020). The results of interviews with the people who deliver (father, mother, brother, uncle) all say that the children who take this gamelan therapy always ask anyone at home to take them to the gamelan practice when the training schedule arrives. Even Henriko's father was surprised when he was sleeping, his son, Henriko, woke him up and asked him to deliver gamelan practice. This incident was the first time a child told his father on his own initiative, because since childhood, Henriko had never told his father to sleep for any purpose.

3.2.2. Expressing Feelings

Gamelan is also used by children who participate in therapy to express their feelings. For example, Mutiandaru (Ndaru), a gong player, is very happy and cheerful when he can hit the gong correctly. The opposite thing, pouting, is done when it is his turn to sing, one of his teachers invites another friend to leave him alone. As a result, according to her mother, she has become less interested in practicing gamelan since it happened. Ndaru is a child who doesn't talk much, so to convey what he feels in his heart, he is more expressive through actions. Sometimes he conveys his desires and feelings accompanied by shouts, whining, and crying. The language used by Ndaru is not well organized, and the pronunciation is not clear.

Expressing feelings when playing gamelan was also conveyed by Cindy. It happened when the friends hit the wrong one, and immediately Cindy told them to stop with the words "stop-stop" while giving a signal by waving her hand. The author feels like an incident that occurred in the gamelan practice of children who are not autistic.

3.2.3. Opening Up

Self-opening is carried out by children when

playing gamelan. The incident occurred between Henriko and Arkha while discussing gamelan in practice. Visually, the incident is like the incident of a non-autistic child having a discussion, Arkha while raising one of her knees and putting one of her arms on it, while telling a story, and Henriko listening to it.

Figure 7. Children's Interaction in the Classroom

3.2.4. Managing Conflicts

The influence of gamelan practice also affects the management of children's conflicts. Arka, according to his parents, before participating in gamelan training, if he was angry, he always expressed his anger with a sullen face and was in front of his parents. After he took part in gamelan training, when he was angry with his parents he went to his room and looked for Javanese gamelan broadcasts on the radio while drinking tea.

3.3. Other Impacts

3.3.1. Improve Concentration

Increased concentration occurs both during the performance and in the classroom. During the performance, all participants of this therapy never developed bad habits. They sat quietly and concentrated, waiting for the cue given to play together. Even when they watched the broadcast on Jogja Television for an hour and a half, they still sat and concentrated on listening to the interactive dialogue that took place. What the accompanying teacher was worried about (the child could not concentrate during the broadcast) did not happen, and they admired it.

Increased concentration also occurs in the classroom. According to Anis, one of the accompanying teachers, his protégé, named Cindy, after participating in gamelan therapy, can forget about his bad activities; forget the habit of muttering when studying in class. In addition, his concentration time also increased from five to seven minutes. The increase in concentration was also experienced by the therapy participants, and the average increase was 2 minutes.

3.3.2. Children Are More Cheerful

Autism therapy using gamelan received a positive response from students' parents and had a positive effect on changes in their children's behavior. The results of the questionnaire showed that the parents agreed with this therapy program, the child was not burdened, and there were no negative effects, even though they wanted extra hours because they felt the positive impact. The change is that children are more cheerful than before, more fond of Javanese culture and puppet broadcasts, more open, and even some are disappointed when they can't take part in gamelan practice.

This activity also has a positive impact on the environment. Therapy activities using which in its implementation always involve other students also have a positive impact. They, other students, use the therapy activity as a medium to express their feelings, for example, jumping up and down when the gamelan sounds, dancing to the tempo of the drums, applauding to the tempo of the drums, singing to the rhythm of their friends, and so on.

The sound of gamelan makes the school environment comfortable. This was felt by the accompanying teachers when they accompanied their foster children. One of the teachers said that the sound of gamelan makes the school environment comfortable. This was felt by the accompanying teachers when they accompanied their foster children. One of the teachers once said, "If you listen to the game, you forget about it." That is, when you hear gamelan, you forget the debt. The meaning is that listening to the sound of gamelan makes the mind calm so that it forgets other tasks, including debts. Then he said, "If you listen to the game, you forget about it." That is, when you hear gamelan, you forget the debt. The meaning is that listening to the sound of gamelan makes the mind calm so that it forgets other tasks, including debts.

4. DISCUSSION

Based on the discussion of the results of the research above, the success of the gamelan learning model for autism therapy is determined by the use of physical movements, the activities are fun, using music, and the learning method is easy. The therapy model has been successful in improving participants' interpersonal relationships, improving their ability to concentrate, eliminating bad habits, and making their environment more vibrant. The explanation is as follows.

4.1. Music

The influence of gamelan on the behavior of autistic children has been confirmed by waves, although the effect has not been significant. Another piece of data that shows that sound can be accepted by autistic children is the results of a questionnaire that was circulated, stating that therapy participants were more cheerful after participating in therapy, children wanted to always follow therapy activities, and other children (spectators) also responded to the sound in their own way.

The musical elements of Javanese Karawitan (the sound of each instrument and its vocals, the rhythm of each instrument, and the drum's tempo) were used by therapy participants as a medium for interaction between children and their friends (Irawati, 2019). For example, during practice, Cindy saw her friends playing together at an inappropriate tempo, which resulted in unpleasant noise. Cindy warned by saying "stop... stop" while stretching out his arms and swinging his hands to reinforce the stop command.

Vocals are also used by therapy participants to interact musically with their friends (Afrida, 2021; Irawati, 2016). These include verbal cues to initiate a piece, signals to begin playing together, and singing (nembang) accompanied by gamelan. Each of these forms of interaction reflects the collective effort of the players to synchronize their instruments within a unified musical piece. In this way, the musical elements embedded in Javanese gamelan pieces function as a structured medium for social and musical interaction among participants.

4.2. Physical Movement

The physical movement in this therapy is that the child is given the opportunity to come forward in front of his friends to sing a song he likes. Before singing, they were required to invite their friends to use the words "Ayo konco-konco saiki nembang baris rampak" and answered by their friends "ayo". Then the child who came forward to sing gave a one-two-three cue and started. This opportunity is loved by children. When this opportunity was first given, they immediately stood up all scrambling to get the first turn. This is done when the author sees children feeling bored with the practice of beating in a sitting position; To overcome this problem, vocalists who were originally teachers or other children were replaced with those who played musical instruments. This offer received a good response from the child and was always awaited in every practice.

They sing in their own style. Some sing while shaking their hips to the tempo of the gamelan, some sing while holding a microphone, some sing while walking to the right and left, some sing while in style so that it becomes the attention of the audience when performing at the Yogyakarta Arts Festival, and others. The physical movements that are used in singing while dancing received a good welcome from the children.

However, the influence of nembang or singing on the addition of children's vocabulary has not been seen. The time of the study, especially for each child who advances nembang, is carried out two months before the end of the study is the reason why it has not yet appeared.

4.3. Fun Therapy Activities

The success of therapy using gamelan is also because the therapy model considers the child's pleasure. Efforts to create fun therapy are carried out by modifying the shape and ornament of the gamelan and its coloring, choosing songs with a low level of difficulty, using easy learning methods, and modifying the presentation technique. The modification of the shape, ornament, and coloring received a good response from children. They treat the modified gamelan not as a musical instrument, but as a toy. They call the gamelan tanks, fighter planes, and the like.

The selection of songs or gending in the form of a smooth form that has a joyful character, is arranged simply, and modifies the singing technique into singing while standing, is suitable for the therapy of autistic children at the Bina Anggita Special School for Autism, Yogyakarta. The selection of songs is liked by children, the arrangement techniques, and the teaching methods that are easy for accompanying teachers to like. This makes the implementation of therapy run smoothly and successfully. These activities are liked by children, and this is shown by their willingness to always be present in practice through various ways, and even ways that have not been done.

4.4. How to Learn Easily

Individual and group learning methods that use counting are effective methods of learning musical instruments in this therapy. Individual learning of instruments that play melodies using counts trains therapy participants to interact musically with their peers and concentrate. The results of the observation obtained data that the players of beats, kenong, kempul, and gongs who always practiced counting in each of their plays accidentally concentrated on their tasks.

Beyond its function as a musical activity, the findings of this study indicate that Javanese gamelan-based therapy also serves as a medium for developing social interaction, emotional regulation, and social engagement in children with Autism Spectrum Disorder (ASD). Group gamelan playing encourages children to respond to rhythmic cues, adjust playing tempo, and build coordination with peers. This condition is consistent with research stating that music intervention can improve social communication, joint attention, and reciprocal interaction in children with ASD because music provides structured and repetitive interaction patterns (Geretsegger et al., 2014, 2022). Research by Marquez-Garcia et al. (2022) also explains that music therapy contributes positively to the socio-emotional development of children with ASD, although its level of effectiveness is influenced by intervention design, therapy duration, and participant characteristics.

The rhythmic and repetitive character of Javanese gamelan is also presumed to provide a sensory regulation effect for children with ASD. Children with ASD generally experience difficulties in sensory processing, attention, and behavioral regulation. Therefore, the stable and repetitive rhythm patterns in gamelan can help improve children's focus and engagement throughout the therapy process. This finding is consistent with research by Sharda et al. (2018) which states that rhythmic musical stimulation can help improve attention, behavioral control, and emotional regulation in children with ASD. Activities such as counting beats, waiting for turns to play an instrument, and maintaining tempo consistency indirectly train the concentration and self-control of therapy participants.

Beyond its therapeutic aspects, the use of gamelan in this study highlights the importance of a culturally responsive therapy approach in special education. Most music therapy research for children with ASD remains dominated by Western music approaches, whereas this study demonstrates that local traditional music also holds great potential as an intervention medium. The use of gamelan allows children to interact with cultural elements that are closer to their social environment, thereby enhancing comfort, engagement, and learning motivation. Souto-Manning (2013) affirms that the integration of local culture in learning and therapy can increase meaningful engagement among students with special needs. Accordingly, this study contributes to the development of indigenous music therapy in the context of education and therapy for children with ASD in Indonesia.

The finding that nembang activities have not yet yielded significant improvement in children's vocabulary development also indicates that language ability requires a longer and more intensive intervention process. This is consistent with Vaiouli and Andreou (2018), who note that music therapy produces faster impacts on social engagement and emotional regulation than on verbal language development. Thus, gamelan therapy in this study appears to be more effective as a medium for enhancing social participation, emotional engagement, and concentration than as a primary language development intervention.

Furthermore, the physical activity performed while singing and moving to the gamelan rhythm can be understood as a form of embodied learning that simultaneously involves motor, sensory, and emotional coordination. The embodied musical interaction approach is believed to help children with ASD understand social patterns through repeated bodily experiences and movement (Koch et al., 2007). Therefore, the combination of musical elements, physical movement, and group interaction in gamelan therapy constitutes one of the key factors supporting the success of the therapy activities in this study.

5. CONCLUSION

Based on the discussion of the results of the research and the discussion, the following conclusions can be drawn. The success of autism therapy using Javanese gamelan is determined by a therapy model that utilizes elements as a therapeutic medium, the musical instruments are modified (the shape, size and coloring of the gamelan are adjusted to the level of development of the child's psyche); applying the learning method is easy to play the musical instrument, and the form of activity is liked by children. The effects of these therapies include changes in social interaction behavior (starting to interact with friends, expressing feelings, opening up, and managing conflicts), increasing the duration of concentration, and eliminating undesirable activities), and increasing the duration of concentration. The effect of therapy is not only on the therapy participants, but also on the accompanying teachers and the audience; Relieving the fatigue of the teacher and the audience also enjoyed the presentation of the gending-gending. Learning to play gamelan in therapy focuses on the interaction between players. The characteristics of the learning are the number of instruments used, the selection of gending or songs, and the selection of gending and the arrangement are based on the consideration of the ability and pleasure of the therapy participants.

Learning focuses on the interaction between players, while the quality of the song arrangement has not been the main concern.

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