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MUSIC AS A THERAPEUTIC RESOURCE IN CHILDREN WITH ASD TO ACHIEVE ENGAGEMENT AND SOCIAL COMMUNICATION

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ABSTRACT

Introduction: Already in the first description it was observed that children with autism had a great interest in music. It is also known that, in order for the child to better develop his linguistic skills, he must be engaged in the proposed activity. Objective: In view of this, this research aimed to analyze the functional profile of communication and the level of engagement of five children with autism in language therapy sessions associated with music and to compare such results with sessions without music. Methods: recordings of children diagnosed with autism were made and analyzed using the functional profile of communication protocol and the engagement verification scale. Results: the results showed an increase in the number of communicative acts and their more interactive functions, which appeared to be significantly higher in the sessions with music. In addition, there was a significant increase in the level of engagement and a decline in the level of disengagement in sessions with music. Conclusion: music in speech and language therapy sessions is a strategy to be considered to achieve better performance in social communication and engagement of children with autism.

Keywords: Autism. Therapy. Music.

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INTRODUCTION

Autism Spectrum Disorder is a neurodevelopmental disorder characterized by difficulties in communication, social interaction, restricted and repetitive patterns of behaviors, interests and activities, regardless of culture, race, ethnicity or socioeconomic group (KHAN *et. al,* 2012). Symptoms must be present early in the developmental period, even if not fully apparent or masked, and must cause significant clinical impairment in social, professional and personal functioning, and cannot be explained by intellectual disabilities or global developmental delay (APA, 2013). In addition, we can classify it as need for support, with level 1 having little need for support, level 2 having a moderate need for support, and level 3 having a substantial need for support (APA, 2013).

This disorder does not have a known etiology, but there are studies that indicate that there is no single cause, but rather an interaction of genetic and environmental factors (LORD *et. al*, 2018). As for environmental factors, some causes were associated with a greater or lesser degree of incidence, such as advanced maternal age (over 40 years) and paternal age (over 50 years) (IDRING, 2014), metabolic conditions, hypertension, hospitalization due to bacterial or viral infections, family history of autoimmune disease (LYALL, 2014), ingestion of anticonvulsant drugs such as valproic acid (CHRISTENSEN, 2013), preterm birth and low birth weight. It is important to note that environmental factors can increase or decrease the risk of ASD in genetically predisposed people.

Regarding prevalence, an increase in the number of cases is estimated, with the prevalence being 1/150 children in the 2000s and 1/44 in 2018. In the latest data made available in the United States by the Centers for Disease Control and Prevention (CDC) for the year 2020, 1 in 36 children were diagnosed, an increase of 22% compared to the previous study (INCLUSIVE PSYCHOLOGY, 2023). In Brazil, the Institute of Geography and Statistics (IBGE) estimates that there are two million autistic Brazilians, considered as 1% of the population (MINISTÉRIO PÚBLICO, 2023).

The alterations present in ASD conditions are variable, and may present difficulty in eye contact, non-response when called, difficulty in having shared attention (TOMASELLO, 1999/2003), reduced or absent symbolic play, impairment of executive functions evidencing a pattern of inflexibility and difficulty in inhibitory control, repetitive and restricted behavior, presence of echolalia and stereotypies, non-functional actions with objects (spinning and enfila), sensory alterations (KANNER, 2006), tendency to isolation, difficulty in initiating and maintaining a dialogue (ALVA, 2015), and difficulty in understanding. Regarding language

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development, there is a range of changes in verbal skills, especially about the universal impairment of pragmatic language, that is, deficits in social communication (BOTURA, 2021).

Pragmatic language is characterized by the social use of language and encompasses the verbal and non-verbal aspects of language (PRUTTING, KIRCHNER, 1987), social and environmental (FERNANDES, 1996), in addition to being associated with cognitive, emotional and social development (ADAMS *et. al*, 2005). Thus, pragmatics is based on communicative intention, using communicative functions and the use of language to realize this intention in an exchange between interlocutors within a social context. Depending on this situational context and the interlocutor, there are variations in the formal and communicative aspects. (PERKINS, 2005)

In view of this, it is pertinent to reflect on the objective of the intervention of children's speech therapy in cases of ASD, considering that this is the professional trained to develop human communication (MISQUIATTI *et al.*, 2018). In a playful language therapy based on the principles of the pragmatic approach, the focus of the treatment is to address the receptive and expressive skills of language, shared attention, symbolic play and engagement (PARSONS *et. al,* 2017).

The literature states that the structured therapeutic environment does not seem to significantly influence the development of communicative (MISQUIATTI, 2006) and sociocognitive skills of children with ASD in language therapy (MISQUIATTI *et. al*, 2014). With this in mind, it is important to consider that studies show that for a better development of language skills, the child must be engaged in the proposed activity (FELDMAN, 2019). Engagement refers to the degree of attention, curiosity, interest, and involvement that the child shows when they are learning or being taught, which extends to the level of motivation they have in learning and progressing. Generally speaking, the concept of "engagement" is based on the belief that learning improves when children are curious, interested, or inspired, and that learning tends to decline when they are bored, discontented, or "disengaged" (ENGAGEMENT, 2016).

Therefore, during the intervention, we should aim to expand these skills with strategies and resources that are in the interest of the subject. Kanner in 1943 noticed that children with autism showed a great interest in music. However, before using it as a therapeutic resource, it is important to understand its use, why it may or may not work, and how it can be expanded (SHARDA *et. al,* 2019). Music is composed of rhythm, sound,

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melody and harmony, contributing to cognitive, linguistic, psychomotor and socio-affective development, in addition to improving concentration, motor coordination, socialization and memory (CHIARELLI, BARRETO, 2005), making the activities proposed in therapy more pleasurable, motivating and attractive for children.

Music therapy is a therapy technique that uses music as the main therapeutic resource through the application of methods and techniques (ONZI, GOMES, 2015), aiming at the development of aspects of social interaction and communication (HECKLER, BAUMER, 2021). It uses musical experiences and the relationships that develop through them to allow people to relate to others, communicate and share their feelings. In this way, music therapy addresses some of the main difficulties of people with ASD (GERETSEGGER *et al*., 2014). Some studies claim that the use of music promotes the reduction of aggressive crises (BRANDALISE, 2001), improves social interaction, communication, expression of feelings, regulation and language development (FREIRE *et. al,* 2018).

Therefore, this study aimed to compare the functional profile of communication and the level of engagement of children diagnosed with Autism Spectrum Disorder who attended language therapy associated with music as a strategic resource and to compare such results with sessions without the use of music.

METHODOLOGY

This research project was approved by the Research Ethics Committee under the number CAAE: 10009619.0.0000.5406 of the Faculty of Philosophy and Sciences – CEP/FFC/UNESP and all participants signed the free and informed consent form in accordance with the resolution of the National Health Council CNS 196/96.

Five children of both genders, aged between two and five years old (chart 1), attended at the Specialized Rehabilitation Center of the São Paulo State University (UNESP) in the city of Marília-SP, which is a school clinic, diagnosed with Autism Spectrum Disorder, participated in this research. The children were in the therapeutic process in the area of child language, with activities supervised by researchers from the Laboratory of Child Language Studies.

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Chart 1 - Characterization of the participants.

Subject	Age	Sex	Diagnosis	Support Level	Therapy time
S1	4:6m	Male	TEA	Level 3	3 years
S2	2:6m	Female	TEA	Level 2	6 months
S3	3:2m	Female	TEA	Level 2	6 months
S4	2:7m	Male	TEA	Level 2	2 years
S5	5:9m	Male	TEA	Level 3	3 years

All were submitted to the application of two instruments, namely the Communication Functional Profile Protocol (FERNANDES, 2002) and the Engagement Verification Scale (KOSSYVAKI, CURRAN, 2020).

The objective of the Protocol of Functional Profile of Communication (FERNANDES, 2002) is to enable the analysis of the functional aspects of communication, or even the investigation of the uses of language. The minimum unit of analysis is the communicative act, although the analysis also contemplates the non-linguistic aspects of communication and all the communicative means used (FERNANDES, 2002). The analysis of communicative acts begins when the adult-child, child-adult, or child-object interaction is initiated and ends when the child's focus of attention changes or there is a change of turn. Communicative acts are divided into verbal (VE), which involve at least 75% of language phonemes, vocal (VO) encompassing all other emissions, and gestural (G), which involve body and face movements, which are the communicative means. Finally, the last analysis is the communicative functions, divided into more interactive and less interactive functions (WETHERBY AND PRUTTING, 1984; FERNANDES, 2002)

The Engagement Verification Scale (KOSSYVAKI, CURRAN, 2020) allows characterizing the presence or absence of engagement. It is classified as whether the child is engaged when he is "on task" interacting with the researcher (shows, verbally or non-verbally, awareness, curiosity, investigation, discovery, anticipation and perseverance) and disengaged when the child seems "out of task" (for example, self-stimulating behaviors, looking at space or on the wall, wandering to the teaching staff, exploring other objects, as transitional objects).

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PROCEDURES

For data collection, five sessions were held "with music" and five "without music" that were filmed during 50 minutes of therapy. The recording sessions were carried out over a period of three months of individual language therapy based on the assumptions of the pragmatic theory, which involves the functional and social use of language, considering linguistic and non-linguistic elements for communication, communication initiative, as well as the context and the participation of different interlocutors. The proposed therapeutic situation allowed the therapist to gradually lead the child to his role as an interlocutor, favoring the communicative intention, the use of language in different situations and social contexts and, according to conventional procedures of language use, the exchange of turns, the maintenance and change of conversational topic and the possibility of informing, requesting and narrating an event, seeking the greatest possible symmetry between the interlocutors (MISQUIATTI *et al.*, 2014).

As materials, miniature animals (such as cow, duck, dog, cat, chicken, pig, chick and horse) were used that were related to the themes of the songs used, namely: "Seu Lobato", "Cinco ducklings", "Fazendinha" and "Pintinho amarelinho".

For the analysis of the video recordings, the most symmetrical 15 minutes of interaction of each footage were used, according to what is recommended by the protocols used, which are the Functional Profile of Communication (FERNANDES, 2002) and the Engagement Verification Scale (KOSSYVAKI, CURRAN, 2020). It is worth mentioning that the recording sessions were held in 10 moments, five with music and five without music interspersed. To measure the stage of the functional profile of communication, a quantitative analysis of these moments was performed and the number of communicative acts and the characterization of the more or less interactive functions were counted, in addition to verifying whether the child was engaged or not in the activity with the engagement protocol.

The analysis of the results was performed by the IBM SPSS (Statistical Package for Social Sciences) program, considering the functional profile of communication and engagement of patients diagnosed with Autism Spectrum Disorder who were in language therapy at both times, with and without music. To analyze the results, the Wilconxon Signaled Rank Test was used, adopting a significance level of 5% (0.050).

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RESULTS

From the application of the protocols for the analysis of the recordings obtained during the ten therapy sessions, five with and five without the use of music, it was possible to trace the communicative profile of the participants, as well as the presence or absence of engagement during the proposed activities.

Referring to the Functional Profile of Communication (FERNANDES, 2002), the results presented the mean number of communicative acts per minute (Table 1) and the comparison of the mean and statistical significance of communicative acts per minute in sessions with and without music (Table 2), using the Wilcoxon Signaled Rank Test to pair these data.

Table 1 – Average number of Communicative Acts per minute

Subject	Media with music	Average without music
S1	3,5	3,2
S2	4,4	3,1
S3	3,8	3,6
S4	2,9	2,7
S5	4,5	4,1

Table 2 - Comparison of the mean and statistical significance of communicative acts per minute in sessions with and without music

Variable Pair	Average	Standard deviation	Meaning (p)
Communicative acts with music	3,82	0,66	0,042
Communicative acts without music	3,34	0,53	

The analysis allowed us to verify that all the subjects evaluated had a higher average number of communicative acts per minute in sessions with music when compared to sessions without music. In addition, it was noted that there was a statistically significant difference in the comparison between these variables.

Still referring to the Functional Profile of Communication (FERNANDES, 2002), table 3 is contemplating the percentages of the five sessions with music and the five sessions

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without music statistically compared with the occurrences of the most interactive and least interactive functions.

Table 3 – Percentage of the most interactive and least interactive functions in the sessions with and without music.

Subject/ Functions	1 C/M	2 C/M	3 C/M	4 C/M	5 C/M	Average C/M	1 S/M	2 S/M	3 S/M	4 S/M	5 S/M	S/M Média
S1 – More interactive	21	24	23	22	40	26	8	28	18	31	34	23
S1 – Less Interactive	30	23	22	35	25	27	24	18	23	36	24	25
S2 – More Interactive	34	27	27	42	44	34	29	10	15	24	23	20
S2 – Less Interactive	13	30	23	38	21	25	32	16	18	31	21	23
S3 – More Interactive	36	41	19	28	57	36	17	21	16	40	30	24
S3 – Less Interactive	26	18	15	21	27	21	23	43	21	40	47	34
S4 – Most Interactive	11	18	30	27	21	21	18	11	22	12	22	17
S4 – Less Interactive	15	21	25	23	27	22	16	30	24	28	27	25
S5 – More Interactive	38	32	37	31	53	38	28	14	19	38	40	27
S5 – Less Interactive	31	29	18	29	42	29	31	18	26	37	58	34

C/M= with music S/M= without music

Regarding the final average, it is possible to verify that the subjects presented more interactive functions in the sessions with music when compared to the sessions without music. When we observed the less interactive functions, we can conclude that most subjects had a higher number of less interactive functions in sessions without music compared to sessions with music. However, observing individually, only subjects 1 and 2 presented less interactive functions in greater quantity in the sessions with music.

Finally, table 4 analyzed the differences in interactivity between the sessions, and as a result, the calculation showed that there was statistical significance between the use of more interactive functions when compared to sessions with and without music. However, there was no significant difference between the use of the less interactive functions,

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although the greater value of the less interactive functions in sessions without music is notable

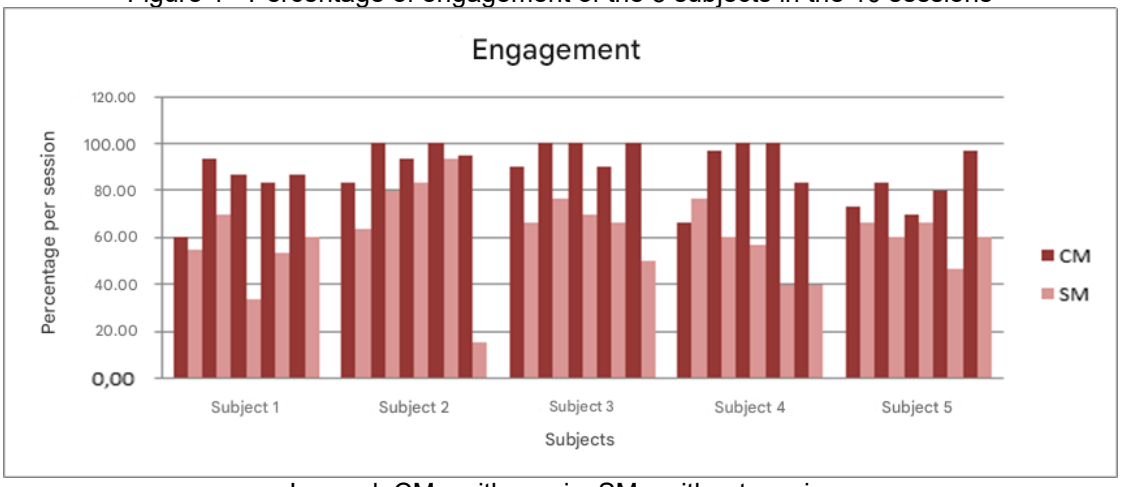
Table 4 – Analysis of the difference in the interactivity of communication between the sessions with and without music

Functions	Standard deviation	Meaning (p)
MOST INTERACTIVE- C/M	7,21	0,043
MORE INTERACTIVE – S/M	3,83	
LESS INTERACTIVE - C/ M	3,35	0,223
LESS INTERACTIVE - S/M	5,36	

As for the Engagement Verification Scale (KOSSYVAKI, CURRAN, 2020), data regarding the level of engagement and disengagement were quantified, both in sessions with music and in sessions without music.

In figure 1 it is possible to visualize the levels of engagement in each session with and without music

Figure 1 - Percentage of engagement of the 5 subjects in the 10 sessions



Legend: CM - with music, SM - without music.

From Figure 1, it is possible to analyze that the five subjects had a higher percentage of engagement in most sessions with music when compared to sessions without music, which was confirmed by the statistical significance shown in Table 5. Only subject four had a lower percentage of engagement in the first session with music when compared to the first session without music.

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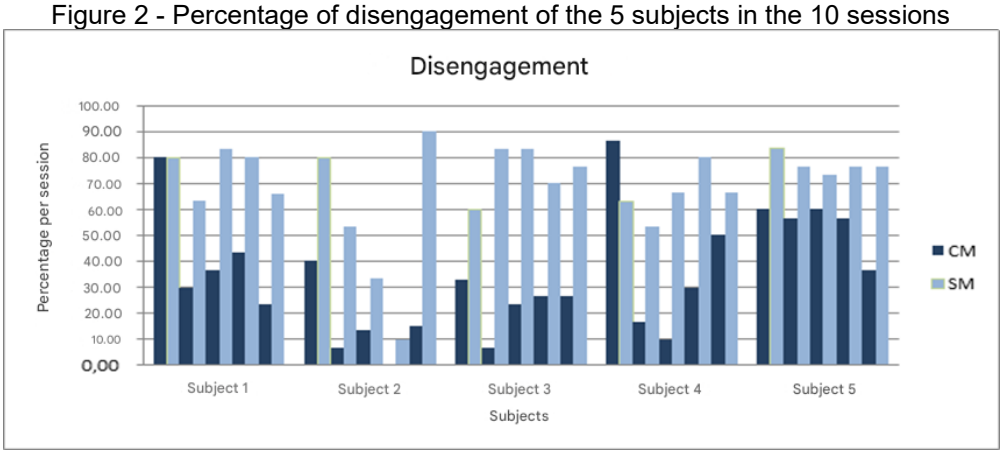
Table 5: Engagement analysis of sessions with and without music

Commitment	Average	Standard deviation	Meaning
With music	88,20	7,09	0,042
No music	59,69	5,77	

Figure 2 shows the levels of disengagement in each session with and without music.

Figure 2 - Percentage of disengagement of the 5 subjects in the 10 sessions



Legend: CM - with music, SM - without music.

According to Figure 2, it is possible to see that the level of disengagement of all subjects in sessions without music is higher than in sessions with music, which was reaffirmed by the analysis of statistical significance shown in Table 6. Only subject four showed greater disengagement in the first session with music when compared to the first session without music.

Table 6: Disengagement analysis of sessions with and without music

Disengagement	Average	Standard deviation	Meaning
With music	33,80	15,69	0,043
No music	68,40	9,61	

DISCUSSION

This study allowed us to achieve the intended objective of comparing the functional profile of communication and the level of engagement of children diagnosed with ASD who attended language therapy associated with music as a strategic resource.

Regarding the functional profile of communication, the evaluation encompassed communicative acts and communicative functions. With regard to the number of communicative acts per minute, the difference between the comparisons of sessions with

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and without music was statistically significant. These results make it possible to infer that music can be a strategy that favors the communicative intention of children with ASD (BHARATHI, 2019; GASSNER, 2022). Studies affirm that music can help children with ASD to improve their skills in areas that involve the core of the diagnosis, such as: social interaction, verbal communication, initiative, socio-emotional reciprocity (GERETSEGGER *et al.*, 2014; BHARATHI, 2019; MOSSLER *et al.*, 2020; GASSNER *et al.,* 2022; HECKLER, BAUMER, 2021), and reduction of aggressive crises (BRANDALISE, 2001), in addition to the possibility of being an important strategy in speech and language therapy sessions (VAIOULI, ANDREOU, 2017). Such findings corroborate the statements of the present study that there is a strong relationship between music and the development of communicative skills of children with ASD who attend speech therapy (MAYER-BENAROUS, 2021).

When it comes to communicative functions, they are divided into more interactive and less interactive. It is pertinent to inform that the most interactive functions refer to Object Request (PO), Action Request (PA), Social Routine Request (PS), Consent Request (PC), Information Request (PI), Exhibition (E), Nomination (N), Exclamatory (EX) Comment (C), Protest Expression (EP), Recognition of the Other (RO), Protest (PR), Shared Game (JC) and Narrative (NA); and the least interactive refer to Exploratory (XP), Reactive (RE), Performative (PE), Game (J), Non-Focused (NF) and Self-Regulatory (AR). Wetherby and Prutting (1984) stated that one of the significant differences between the language development of children diagnosed with ASD and neurotypical children refers to the fact that in the former, there was a predominance of non-functional communication, while in children with typical development there was a small number of less interactive functions associated with the functional use of communication.

Thus, it is known that when compared to children with typical development, children with ASD have a limited communicative profile, differentiated both qualitatively and quantitatively (WETHERBY, PRUTTING, 1984) and that one of the therapeutic objectives of speech-language pathology refers to the long-term production of better communicative results (KOEGEL, 2000). In the present study, it was possible to observe that in the sessions with music, the most interactive functions increased exponentially, demonstrated with statistically significant results, and the less interactive functions decreased, although this fact is not statistically significant. In view of this, we can discuss the hypothesis that music contributed to the better communicative functional performance of participants with

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ASD and that both the quantitative (number of communicative acts) and qualitative (interactive profile) analyses revealed expressive data when compared in the sessions with and without the use of music.

Corroborating this statement, a review study that analyzed 14 scientific studies pointed out that among these, the three intervention proposals that involved the best results in the shortest intervention time for the levels of developmental performance, cognition, and behavior corresponded to therapies with the use of music (MAW, HAGA, 2018).

Finally, the data regarding the level of engagement showed that participants were more engaged and with shorter disengagement intervals during sessions with music (MOSSLER *et al*., 2020). In the literature, there are no studies that verify the relationship between language therapy with the use of music and the level of engagement of children with ASD, although statements are found that students with ASD are more susceptible to show engagement when adults use music as a strategy (WIMPORY *et al.,* 2007). Thus, it is possible to infer that music contributed to increase the level of engagement of children with ASD during language therapy sessions and that this factor may be related to the better communicative performance demonstrated by these children.

The literature states that music is an important predictor in the development of social and communicative skills in children with ASD (MOSSLER *et al*, 2020), in addition to contributing to cognitive, linguistic, psychomotor and socio-affective development (CHIARELLI, BARRETO, 2005), although there are still no neuroscientific confirmations about its benefits in therapeutic sessions. Thus, this study aimed to contribute with information about the benefits that music can cause from five case studies, which demonstrated a strong relationship between the aspects studied

CONCLUSION

Music as a resource for children's speech-language therapy contributed to greater communicative intention and greater frequency of use of more interactive functions, in addition to greater engagement of children with autism. It is therefore proposed that this may be a strategy to be used in speech-language pathology intervention sessions, especially if the stipulated objectives refer to the variables studied in this research. Therefore, the importance of further studies related to this theme is emphasized, in view of

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the limited sample evaluated, as well as a detailed verification of the long-term benefits obtained with this intervention.

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