

Nature as a preferential habitat in growth and socialisation processes in autism.

A structured intervention

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Abstract

Dysfunctionality in socialisation is undoubtedly the most crucial characteristic of autism. For a long time, social functioning and its improvement have been considered among the most important interventions in the literature. Individuals with autism are responsive to therapist-mediated and/or peer-mediated interventions that increase their social engagement. The present study examines the impact of outdoor integrated activities, such as music therapy, equine-assisted therapy, and art therapy, in autistic individuals (n=14). The analysis was carried out on the application of a questionnaire assessing three social skill domains: Joint Attention (JA), Imitation (IMI), and Turn-Taking (T-T) mediated by the therapists and by peers. The development and acquisition of these social behaviours were examined in a structured outdoor context (ASO). Data were collected by two independent observers using the White's Scale questionnaire. The results revealed that the proposed interventions facilitated and led to an increase in social-behavioural experience.

Keywords: autism; music therapy; equine-assisted therapy, art therapy, social behaviour*

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* Received on October 30, 2023. Accepted on December 16, 2023. Published on December 30, 2023. DOI: 10.23756/sp.v11i2.1462. ISSN 2282-7757; eISSN 2282-7765. ©Fazzini et al. This paper is published under the CC-BY licence agreement.

1. Introduction

Autism spectrum disorder is pervasive and affects the development of social interaction, communication skills and imitation. Many epidemiological studies have reported prevalence and variables in the age group of 3 to 10 years. In Italy, it is estimated that one out of 77 children presents an autism spectrum disorder with a higher prevalence in boys (4:1). The primary deficit of the disorder is impaired social interaction. The Vineland II reports very low scores for children with autism spectrum disorder (Ministero della Salute 2023).

The same subjects have profound difficulties in maintaining and initiating social interaction of a communicative nature due to an experiential lack as well as impaired socio-emotional aspects (Bauminger, N., 2002). These children present gross and fine coordination disorders and often dysplasia (Abu-Dahab, S. M., 2013). Motor disability is a co-morbidity that affects the functionality of communication and socialisation skills (Simpson, R. L., Myles, B. S., Sasso, G. M., & Kamps, D. M. 1997). Fundamental in this context are activities with horses and music therapy, which improve coordination and movement and are incisive in acquiring social dynamics.

Social dysfunctions are, in fact, the defining characteristics of the most severe handicap in autism (P. Ventola, C.A. Saulnier, E. Steinberg, K. Chawarska, A. Klin Early, 2014). One of the most important tools within interventions is social improvement; empirical studies published in the literature have been designed for this purpose. The interventions present various biases in the groups, mainly of uniformity such as age, severity, target behaviour (from initiation to response to maintenance), type of social partner or intervention strategy. Many of the interventions in the literature represent a behavioural method that allows and requires a singularly comprehensive definition of the behaviour to be acquired and, thus, of the antecedent and consequent behaviour to structure an efficient intervention strategy. While efforts were initially directed towards effectiveness and proposition within a clinical context, the field has shifted towards an ecology of relationships and interactions that place subjects within natural contexts. Simpson et al. (Simpson, R. L, 1997) emphasise that learning, if not based on positive contextualisation, may not be efficient and, therefore, needs to use typical and natural reinforcers. Many approaches are based on incidental or peer-mediated learning that uses prompts and modelling by typical peers. To do this, however, teaching the typical peer to be a tutor in the recreational, school or socialisation task is always necessary (Alvin, J. and Warwick, A., 1992).

The present study aims to examine the impact of integrated activities, such as music therapy, equine-assisted therapy, and art therapy, outdoors in subjects with autism (n=14)

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on the development of three specific social skills: Joint Attention (JA), Imitation (IMI) and Turn-Taking (T-T). The development and acquisition of these social behaviours were examined in a structured outdoor context (ASO).

The participants stayed with the primary caregiver in a three-day residential at the Montefanum hostel in Torricella Sicura, Teramo, Italy. Various professionals were involved in the study.

Music therapists, trainees, educators, and professionals such as psychologists, neurological therapists and psychotherapists involved were subjected to semi-structured interviews regarding the activities of MT (music therapy), art therapy and animal-assisted therapy as well as the effects these activities had on the behaviour and socialisation of the user and the family.

2. Materials and Methods

This observational study developed in the context of the “Naturalmente Diversi” project. “Naturalmente Diversi” is a project wanted by an outdoor intervention in a 3-day residential structure with medical and paramedical activities (music therapy, art therapy and hippotherapy) to test the parameters of sociality at T0 (Baseline) and T1 (end on the three days). Two independent observers (NF and RS) completed White's scale to measure the residents' behaviour regarding peer relations and relations of residents with therapists. Regarding disagreement between independent observers, the lowest value was taken. The sample includes 14 autistic subjects divided into two groups according to age: Children (<15 years) vs. Not Children (≥15 years). The study was conducted at Terrazza Gran Sasso in the municipality of Torricella Sicura in the province of Teramo in the Abruzzo region in Italy. The outdoor setting lasts three days, during which residents can enjoy room and board, therapeutic/recreational time, comparisons, and group sharing. During the project, the subjects carried out music therapy activities (2 sessions), hippotherapy activities (2 sessions), art therapy activities (2 sessions) and outdoor activities such as walking or lighting fire or psychomotor activities. Before experimenting, there was a preliminary meeting between therapists and parents (or caregivers) to obtain the anamnestic helpful information for specific knowledge of medical-functional aspects of the patients, such as the ability to listen, comprehend, communicate, etc. A wrap-up

meeting was conducted at the end of the experience, where parents or caregivers indicated strengths and weaknesses or dispensed advice for optimising the experience.

2.1. Questionnaire: The White's scale

The White's scale (White, C. 2006) consists of a scale of 15-item to measure three different domains, each composed of 5 questions: Joint Attention (JA), Imitation (IMI) and Turn-Taking (T-T). Items are scored using a 5-point Likert scale (0 = Never, 1 = Rarely, 2 = If asked, 3 = Sometimes, 4 = Often), with higher scores indicating greater competence proved to be sufficiently sensitive in recording participants' progress in the development of the social skills of imitation, shared attention, and turn-taking. The processes identified are fundamental to developing a social play that underpins the same competence impaired in individuals with autism spectrum disorder. Descriptive statistics are reported as median and quartiles (q1; q3) for continuous variables, while categorical data were summarised as frequency and percentage. The Mann U Whitney test assessed differences in unpaired samples, and the Wilcoxon rank sum test for paired samples. All statistical tests were two-tailed, with a significance level set at $p \leq 0.05$. Analyses were performed using the R software environment for statistical computing and graphics (version 3.4.1; <http://www.r-project.org/>).

3. Results

Figure 1 shows the Age of each enrolled subject and the gender distribution. Of the over 14 subjects, 54% are males. The age distribution shows that those involved are at different stages of their lives, characterised by different social approaches. The minimum age is five, and the maximum is 23. Given the heterogeneity of the sample due to the different ages of the subjects, it was decided to divide children from adolescents. Table 1 shows the [first, third] quartile medians of White's scale dimensions for children and non-children, noting higher values for non-children; in particular, a statistically significant value ($p=0.032$) was found for the median value of the scales when assessing the two groups for peer relationships. Figure 2 and Figure 3 report the differences in time (T1 vs. T0) by age group between peers and therapists using the Mann-Whitney U-test for JA, IMI, T-T and mean. In both, we can establish any statistically significant association. Table 2 shows the median values of the ratings at baseline and after the activities to check whether there were improvements over time in both peer and therapist relationships. It

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appears that among peers, all domains improved statistically significantly (JA:p=0.007, IMI:p=0.002, T-T:p=0.001, Average:p=0.035).

In relationships with therapists, a statistically significant improvement can be seen for the IMI dimension (p=0.044).

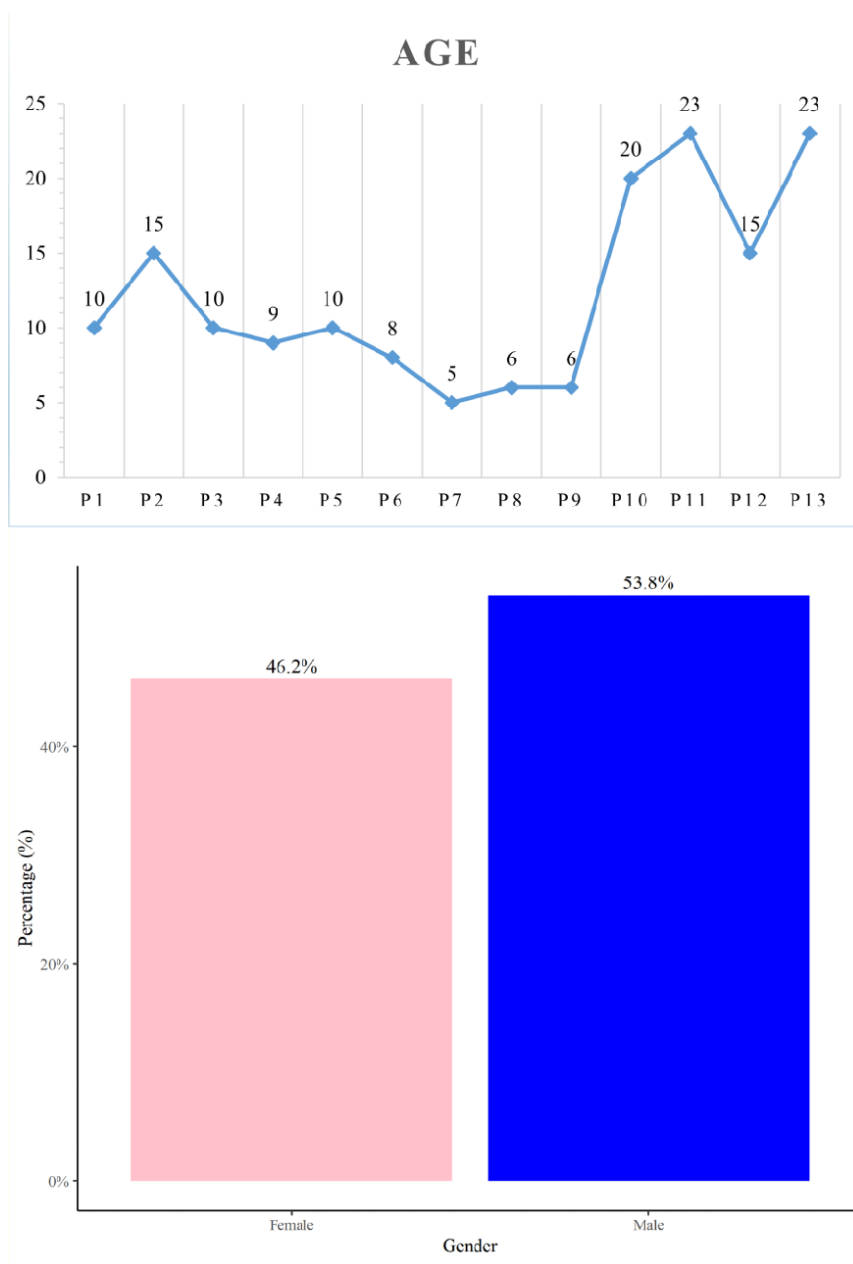


Figure 1. Age and gender distribution.

Dimensions at Baseline (T0)	Peer			Therapists		
	Child	Not-Child	p	Child	Not-Child	p
	n=8	n=5		n=8	n=5	
JA	5.00 [5.00;8.00]	15.0 [15.0;20.0]	0.010	8.00 [5.00;15.5]	16.0 [15.0;20.0]	0.132
IMI	5.00 [5.00;5.50]	15.0 [6.00;15.0]	0.063	6.00 [5.00;11.5]	15.0 [10.0;15.0]	0.156
T-T	5.00 [5.00;7.00]	8.00 [7.00;8.00]	0.082	6.00 [5.00;13.8]	13.0 [13.0;15.0]	0.183
Average	5.00 [2.08;5.42]	14.0 [7.00;14.3]	0.032	5.00 [2.44;8.50]	15.0 [8.00;16.0]	0.142

Table 1. The figure shows the basic descriptive statistics expressed in fact as the median [first; third] quartile for the questionnaire dimensions: Joint Attention (JA), Imitation (IMI), Turn-Taking (T-T) and mean value divided by age group (≤ 15 vs > 15) years and social interaction conditions (Peers and Therapists). The p-value (p) is derived from the Mann U Whitney test.

Dim.	Peer				Therapeutics			
	T0	T1	Δ	p	T0	T1	Δ	p
JA	8.00 [5.00;15.0]	18.0 [15.0;20.0]	5.00 [0.00;5.00]	0.007	14.0 [5.00;20.0]	18.0 [11.0;20.0]	5.00 [3.00;11.0]	0.201
IMI	5.00 [5.00;15.0]	16.0 [11.0;20.0]	5.00 [4.00;7.00]	0.002	9.00 [5.00;15.0]	15.0 [12.0;20.0]	6.00 [3.00;8.00]	0.044
T-T	7.00 [5.00;8.00]	17.0 [13.0;20.0]	5.00 [5.00;7.00]	0.001	12.0 [6.00;15.0]	18.0 [9.00;20.0]	4.00 [2.00;7.00]	0.063
Average	5.00 [3.11;7.00]	9.33 [6.33;19.0]	2.33 [1.89;5.00]	0.035	6.67 [4.56;15.0]	10.3 [6.56;17.3]	3.67 [2.33;4.67]	0.144

Table 2. Median [first; third] quartile for Joint Attention (JA), Imitation (IMI), Turn-Taking (T-T) and the average value of the three dimensions at baseline (T0) and at follow-up (T1) for the peer and therapist condition of social interaction. Δ = differences between T1 and T0. The p-value (p) is derived from the Wilcoxon rank sum test.

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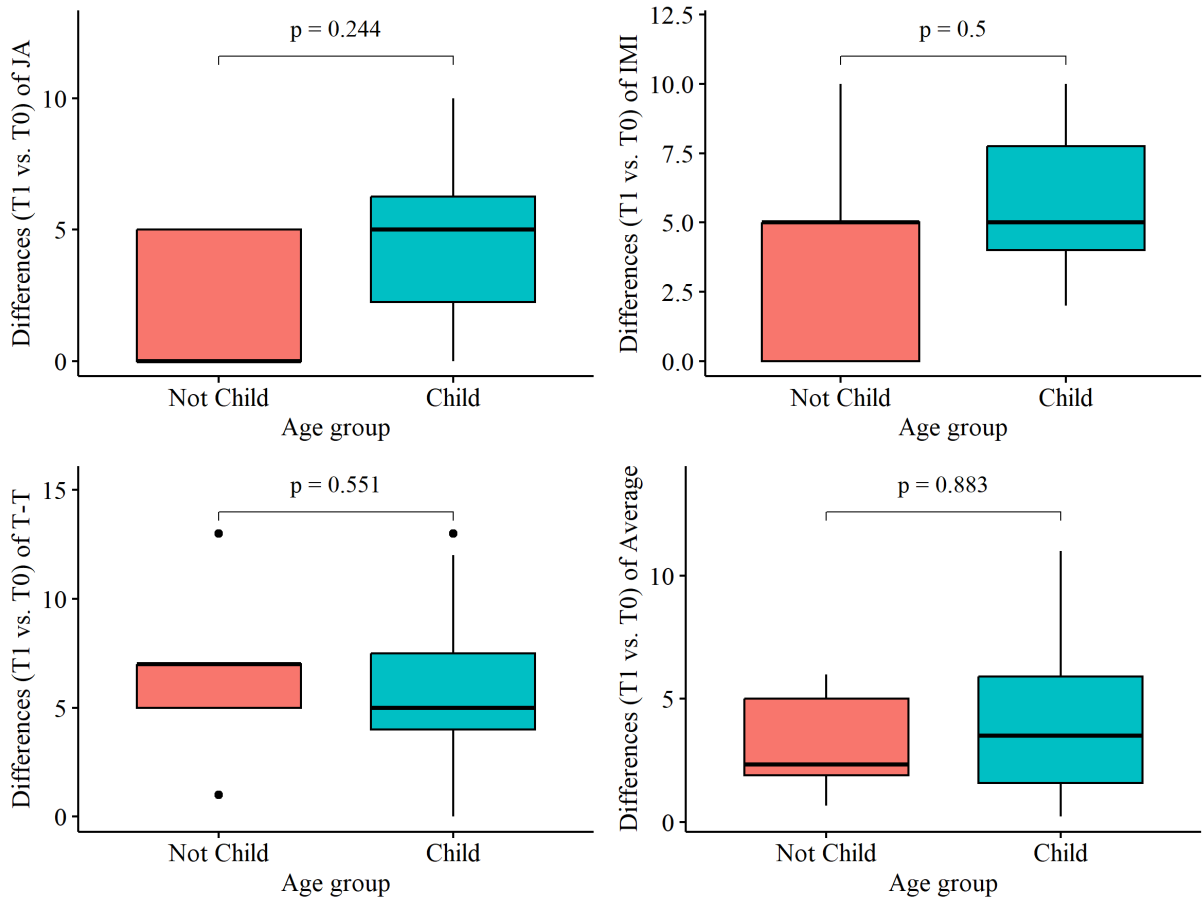


Figure 2. Boxplots for differences in time (T1 vs. T0) in Peer's U-test and Mann-Whitney for JA, IMI, T-T and middle group and age (children and non-children).

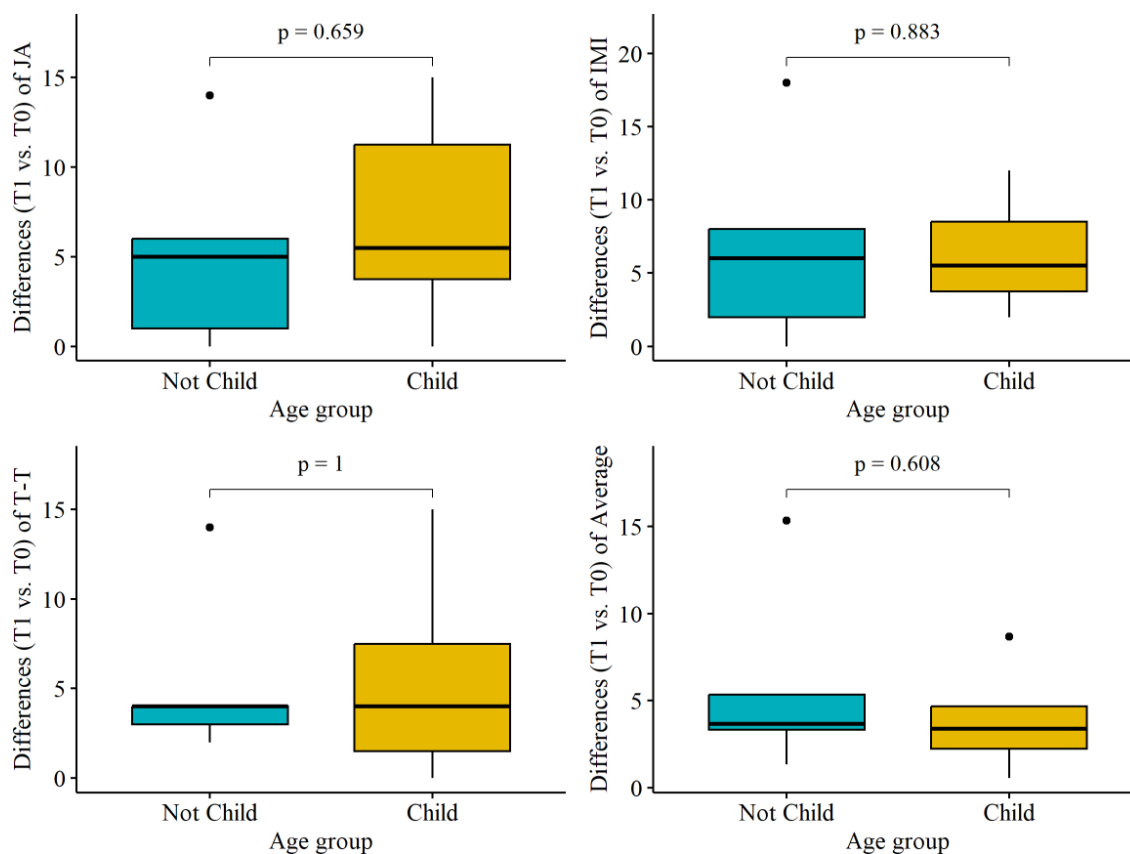


Figure 3. Boxplots for differences in time (T1 vs T0) in the Therapeutics and Mann-Whitney U tests for JA, IMI, T-T and Mean and age (children and non-children).

4. Discussion and Conclusions

The main objective of this study was to raise awareness of the possible benefits of structured outdoor work and music therapy in the autistic community to understand the effects of the same interventions on socialisation. Limitations are that the groups have different ages and severities, which can be confounding. (Polyak, A., 2015). According to LaGasse's study (LaGasse, A. B., 2014), these activities carried over into everyday life, perhaps school settings, and could be used to promote social and personal development. Our study was designed to examine the impact on social skills of music therapy, animal-assisted therapy, and art therapy in a stimulating and structured outdoor environment. Social behaviours examined in the music therapy room and outdoors included shared attention, imitation, and turn-taking. These types of abilities are impaired in children with

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autism. (Scaked, M. and Yirmiya, N., 2003). According to Ghasemtabar et al. (Ghasemtabar, S. N., 2015), MT is an effective method with deep and consistent effects on improving the social skills of children with autism. Furthermore, according to Ybarbo (Ybarbo, E. L., 2017), there are positive effects of hippotherapy on children and adolescents with autism in terms of social and communication skills. Regarding art therapy, it is known that it might be able to contribute to mitigating two main problem areas: social communicative problems and restricted and repetitive behaviour patterns (Martin, N., 2009). Our study shows that the White's scale Average results in an overall positive increase in the development of social behaviour. Indeed, all subjects with autism indicated a positive change in their levels of communication and social nature between peers and therapists. The results also showed how the development and acquisition of some outdoor skills were accelerated: a remarkable improvement was seen in just three days. Indeed, recent qualitative and quantitative studies have highlighted the positive effects of nature on children, including physical competence, stress reduction, attention restoration, and social support (Barton et al., 2015).

At the beginning of the study, the adolescents with ASD were reluctant to get involved. Still, then, especially during the music therapy sessions, some improvements were observed in areas such as acceptance of the therapist's change, eye contact, listening, self-expression, coordinated movement in the group, decision-making with others, and acceptance of others' differences. Moreover, the results revealed that peer-mediated strategies, such as modelling, proximity, or prompting, facilitated the development of social skills in children with autism. In conclusion, all subjects made highly rapid and consistent progress over the three days, with unexpected gains in the use of social skills. It was shown that with the increase in social-musical and animal communication, the development of outdoor social skills also increased, thus revealing a positive impact of the proposed activities on the social development of ASD subjects. However, the conclusions of this study must be understood in the context of its limitations, which include the minimal period and the small sample size. The study must be validated with a larger population than the one analysed in this study. It must also be mentioned that there is marked variability in the sample as all subjects with autism in the study were of different ages. The limited data collected cannot completely depict social skills in music

therapy and outdoor settings. It would be helpful to include other confounding factors in future studies.

Acknowledgements

Regional Councillor for Social Policies, Pietro Quaresimale, Bim of Teramo and the President of the Consortium, Marco di Nicola, Tercas Foundation, Tiziana Di Sante, Casella's Conservatory in L'Aquila, University of Teramo, Serena Lo Curzio music therapist, Caterina Varola music therapist, Marghareth Coda music therapist, Giada Pulcini music therapist, Beatrice Masi music therapist, Giulia D'Alatri music therapist, Nicola Di Nardo, Lucian Di Gennaro music therapist, Lucrezia Piermarini music therapist.

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