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Title: The emotional availability in mother-child and father-child interactions in families with children with Autism Spectrum Disorder.

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Background. Emotional availability (EA) is a dyadic relationship construct that can be considered an index of emotional quality of parent-child interaction. Using this construct, some research showed that both parent and child components of EA reflect key aspects of the parent-child relationship, but there are few studies that investigated these aspects in families with children with Autism Spectrum Disorder (ASD). The present study addresses several specific issues about the emotional availability of parents of children diagnosed with Autism Spectrum Disorder (ASD). Method. We observed free-play interactions of 40 children with ASD (chronological age = 41.6 months, SD = 12; M mental age = 30.9 months, SD = 13.3) playing separately with their mothers and fathers one by one. We coded each parent-child dyad using the Emotional Availability Scales (EAS, Biringen et al. 2008). Results. Findings showed that mothers and fathers were equally emotionally available to their children. There were no differences between the two in parents' EA scales in association with child level of functioning and severity of the symptoms. In addition, children showed similarities in the mean level of Responsiveness and Involvement in mother-child and father-child interactions, but considering the cognitive functioning and the severity of the symptoms, there were differences in the child scales. Conclusions. The emotional quality of dyadic interaction is equally in mother-child interaction and father-child dyads in families of children with ASD. We discuss the clinical utility of the EA Scales for assessing relationship between parents and their children with ASD and we speculate the possible relevance of our findings on father-child relationship for future intervention studies involving fathers on par with mothers.

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Highlights

□ The study highlights the characteristics of emotional availability in mother-child and father-child interaction.

□ The study emphasizes the differences and similarities of the dyadic exchanges between mother and father.

□ Results indicated that children with ASD show similarities in social engagement with mothers and fathers

1. Introduction

The Autism Spectrum Disorders (ASD) are neurodevelopmental disorders characterized by difficulties in social interaction and communication, and by the presence of restricted and repetitive behaviors and interests. At present, ASD are among the most common developmental disorders, with a reported prevalence that has increased markedly during the past 3 decades. Indeed, estimates for the prevalence of ASD in the general population range from 1 in 100 to 1 in 68 children (Centers for Disease Control and Prevention, 2009, 2014; Baird, Simonoff, Pickles, et al. 2006). The core symptoms of children with ASD dramatically impact their mode of interaction with their significant others, including parents. Children with ASD are socially less involving (Dawson et al., 2004), they are less responsive and tend to decline, reject or ignore their parents' social initiatives more often than children with typical development (Adamson et al. 2001). In addition, these children show a clear difficulty in the ability to share attention on an object with their interaction partners (Kasari & Sigman, 1997; Wetherby et al. 2007; Bruisma et al. 2004) and are therefore more challenging for parents to engage in the joyful syntonic interactions that are essential for the growth and wellbeing of both children with typical and atypical development.

The vast majority of the studies on parental interaction with children with ASD focused on mothers, delineating strengths and weaknesses of maternal interaction style as well as the long-term benefits of positive mother-child relationship (Dolev et al. 2009; Kuhn, 2007; Siller & Sigman, 2002, 2008; Doussard - Roosevelt et al. 2003; van IJzendoorn et al. 2007; Spiker et al. 2002). In contrast, very little is known about the characteristics of father-child relationship in families with ASD and the affective quality of father-child interaction is still under-investigated, despite cultural and social changes in the western societies brought to an ample increase of fathers' involvement in childcare and notwithstanding the well documented contribution of fathers to the healthy development of their children (Pancsofar & Vernon-Feagans 2006; de Falco et al. 2008; Cabrera et al. 2014; Sethna et al. 2017; Rankin et al. 2019). With this in mind, our study aims to investigate father-child compared to mother-child interaction in families with children with ASD by focusing on dyadic emotional availability, as a multidimensional indicator of the quality of affective interaction.

1.1. Emotional availability

The emotional availability (EA, Emotional Availability) is a relational construct that refers to the quality of emotional exchanges between parent and child, and focuses on their reciprocal accessibility and their ability to understand and respond appropriately to each other's communicative signals (Biringen et al., 2000; Biringen & Robinson, 1991; Emde, 2000; Easterbrooks & Emde, 1985). The EA construct results from the integration of the attachment theory (Ainsworth et al., 1978), the theory of emotions (Emde, 1980) and the construct of

maternal sensitivity (Mahler et al. 1975). The innovative aspects of the approach proposed by Biringen and colleagues, as described in their first publication (1991), concern the multidimensionality of the partners' interaction style, the role of emotions as regulators of the interaction, and the strong dyadic nature of the construct. The latter aspect clearly reflects the acceptance of the empirical findings of the bidirectional nature of the parent-child interaction within which the child has a clearly active role (Venuti, 2007). EA operationalizes four aspects of the parent's behaviors (Sensitivity, Structuring, Non-intrusiveness, and Non-hostility) and two aspects of the child's behavior (Responsiveness and Involvement) in the Emotional Availability Scales (EAS, Biringen et al. 2008).

Although a growing body of studies using the EAS have investigated the EA in parent-child interactions with typically developing children and their mothers (for reviews, see Biringen, 2012; Biringen, Matheny, Bretherton, Renouf, & Sherman, 2000; Easterbrooks, Chaudhuri, & Gestsdottir, 2005; Bornstein, Suwalsky, Breakstone, 2013; Bornstein, Gini, Suwalsky, et al., 2006), only few studies have investigated EA of parents and children with special needs, and most of them have focused on the interaction with children with Down Syndrome (Venuti, de Falco, Giusti, & Bornstein, 2008; de Falco, Esposito, Venuti & Bornstein, 2008; Wiefel et al. 2005). Specifically, three studies have analysed EA in mother-child with ASD dyads and results are reported below (Gul, Hesna, et al. 2016; Dolev et al. 2009; van Ijzendoorn et al. 2007). The EAS authors provided guidelines for the application of the EA scales for children with disabilities, including children with ASD (Biringen, Fidler, Barrett & Kubicek, 2005). Among other aspects, these guidelines emphasize that the EA dimensions of the parents and children with ASD might be qualitatively separable in these dyads. The guidelines also help to specifically assess parental use of some "therapeutic techniques" to help the child with difficulties in social communication or other domains. The observation of early parent-child interactions can be useful in order to suggest to parents adequate strategies to support their both cognitive and social child development.

1.2 Mother-child relationship in ASD

Research on mother-child relationship in ASD, have especially focused on children's difficulties in engaging the mother in interactions with respect to children with typical development or with other developmental disabilities (DD) (Dissanayake & Crossley, 1997; Sigman et al. 1986; Bakermans - Kranenburg et al. 2000). On the other hand, despite their children's well documented social difficulties, mothers of children with ASD

were found to be as sensitive and responsive as mothers of children with typical development or other DD (Doussard - Roosevelt et al. 2003; van IJzendoorn et al. 2007). However, some research highlighted that mothers of children with ASD tend to be more directive (Spiker et al. 2002), displaying more controlling behaviors and physical attempts to catch their attention (Lemanek et al., 1993).

The way mothers adapt to their children with ASD special needs by achieving different levels of sensitive responsiveness is essential as it is in typical development. The positive association of maternal sensitivity with the quality of mother-child relationship and with child psychological development has been reported for parent-child with ASD dyads too. Specifically, maternal sensitivity has been linked to the development of a secure attachment of children with ASD (Capps et al., 1994), as well as to the development of their language and joint attention skills (Kuhn, 2007; Siller & Sigman, 2002, 2008).

In literature, only three studies have focused on the EA of mothers and children with ASD. Van IJzendoorn and colleagues (2007), using only the maternal sensitivity and the child involving scales of the EAS, found no differences in maternal sensitivity expressed by mothers of children with ASD compared to mothers of children with DD or typical development, whereas children with ASD showed weaker involving skills, meaning child abilities in involving the caregiver during the interaction and the modalities used (e.g. verbal involvement, body positioning, eye-contact looking). The authors also demonstrated that the association between maternal sensitivity and child attachment security was stronger for children with ASD than for children with typical development or with other DD. In a subsequent study, Dolev et al. (2009) evaluated the stability of the dyadic EA among different interactive situations (free play situation, structured play situation and social play episode) in 45 children with ASD and their mothers, using the EA Scales. Results highlighted that EA was highest in social play and lowest in free play. This is probably because in a social play situation, mothers were asked to play without toys and might have felt freer to follow the child lead and to have joyful exchanges without any demand. Although not directly comparing their participants to a control group, the authors reported lower levels and a larger variability in the EAS scores of mothers of children with ASD compared to normative data on typical population (Oppenheim et al., 2012). In the same study, a positive association of children's level of functioning with their responsiveness and involving skills as well as with maternal structuring and non-intrusiveness, but not sensitivity, was observed. On the other hand, maternal stress and negative feelings over the child were negatively associated with their EA (Dolev et al., 2009). Another recent study examined the effect of an infant's diagnosis of ASD, other psychiatric disorders or developmental delay on the mother-child EA. Results highlighted that although infants with ASD were less responsive and involving than children with other diagnosis, maternal EA of mothers of children was similar to that displayed by mothers of children with

developmental delay and somewhat higher compared to that of mothers of children with other psychiatric disorders (Gul, Hesna, et al. 2016).

1.3 Father-child relationship in ASD

Traditionally, studies on human parenting focused more extensively on mothers, the most common primary caregivers, than on fathers. However, as a result of cultural and social changes, we are witnessing an increase of paternal involvement in caregiving and, consistently, in a surge of studies on fathering (Badolato 1997; Dubeau and Moss 1998; Easterbrooks & Goldberg 1984; Lamb, & Billings, 1997; Lamb and Oppenheim 1989; Lewis & Takahashi, 2005; Martin 2002; Mendonça 2005; Paquette 2004; Parke 2002, 2004; Roggman et al., 2004; Tamis - LeMonda & Cabrera 2002; de Falco et al. 2008, 2009, Hallers-Haalboom, Elizabeth T., et al. 2014). Research over the past decades suggests that fathers have an important role on the development of their children, starting from before birth and continuing over their entire life course. The father involvement influences the children's development and well-being directly and indirectly (Cabrera, Fitzgerald, Bradley & Roggman, 2014). As an example, the supportiveness and responsiveness of fathers during play with their young children have been associated to children's later self-regulation and language skills (Anderson et al., 2013; Cabrera, Shannon et al., 2007; Cook et al., 2011; Kochanska, Aksan, Prisco, & Adams, 2008; Martin, Ryan, & Brooks-Gunn, 2007). Moreover, fathers may contribute in shaping children's development also indirectly by decreasing maternal stress and supporting positive maternal parenting (Coley & Schindler, 2008), by buffering the negative effects of maternal depression (Fletcher, 2009; Mezulis et al., 2004), as well as by providing financial support (Lamb et al., 1997).

The literature on fathering children with ASD is very sparse and mainly focuses on differences between the mother and father language style directed to their children with ASD. Specifically, fathers appear to have fewer requests, ask fewer questions, and label objects less often than mothers (Wolchik, 1983; Flippin & Crais, 2011). Konstantareas, Mandel, and Homatidis (1988) also observed similar specificities of paternal language style directed to children with ASD. Compared to mothers, fathers asked an equal percentage of questions but used a greater percentage of directives and a smaller percentage of prompts and statements than the mothers. Some differences between parents have also been observed in parent-child play interactions. For example, fathers of children with ASD have been reported to engage in less parallel play than mothers while being more directive and less consistently responsive to their child's initiatives (Elder, Valcante, Won, & Zylis, 2003).

1.4 Current study aims

To our knowledge, no studies have investigated dyadic EA in fathers and children with ASD. Moreover, father-child dyadic EA was only targeted by few published studies on children with typical development (Lovas, 2005, Hallers-Haalboom et al. 2016) and with Down syndrome respectively (de Falco et al., 2009). With regard to typically developing children (Lovas, 2005; Hallers-Haalboom et al. 2016), fathers seem to have lower levels of EA than mothers and less EA when interactive with boys than with girls. In contrast, de Falco and colleagues (2009) found fathers of children with Down Syndrome as emotionally available as mothers.

The present study aimed to expand the literature on parent-child interaction in ASD by comparing mother-child and father-child dyads for different dimensions of parent and child EA and for the associations among them. Moreover, we intended to investigate whether child cognitive level and symptom severity are associated with parental and/or child EA. We had the following hypotheses in relation with the described objectives. First, based on previous studies on father-child interaction in families with children with ASD or other developmental disabilities, we expected to find general similarities between mother- and father-child dyads in the affective quality of interaction (de Falco et al., 2009). Specifically, we expected no differences in the core affective subdimensions of parent and child EA although the controlling subdimensions of parent EA could be increased in fathers (Flippin & Crais, 2011; Elder, Valcante, Won, & Zylis, 2003). Second, we expected to find similar moderate-to-strong intercorrelations among mother-child and father-child dyadic EA dimension, although correlations between child and parent EA might be weaker than in normative samples, due to the specific social impairments displayed by children with ASD. Third, consistently with previous studies, we expected that both child cognitive level and symptom severity would be associated (positively and negatively respectively) with didactic but not affective dimensions of parents' EA (Dolev et al., 2009). Finally, in consideration of the nature of EA construct and of its measurement among children with special needs (Biringen, Fidler, Barrett & Kubicek, 2005), we expected child EA to be associated more strongly with symptom severity than with cognitive level.

2. Method

2.1 Participants

This study involved 80 parent-child dyads of 40 children with Autism Spectrum Disorder (M chronological age = 41.6 months, $SD = 12$; M mental age = 30.9 months, $SD = 13.3$; 2 females) with their mothers (M chronological age 37.2 years, $SD = 4.4$) and their fathers (M chronological age = 41.1 years, $SD = 4.2$). Table 1 provides participants' demographic information. All subjects were recruited at a clinical centre where families were followed for children diagnostic assessment or therapeutic intervention. The diagnosis of ASD was confirmed through clinical judgment by an independent clinician based on the DSM-5 criteria for Autism

Spectrum Disorders as well as through the Autism Diagnostic Observation Schedule -2 (ADOS-2, Lord et al., 2012).

Table 1 Demographic information

	Mental age	Chronological age	Mothers Age	Fathers age	Gmds General
	months	months	years	years	quotient
<i>M</i>	30.9	41.6	37.2	41.1	74.7
<i>SD</i>	13.3	12	4.4	4.2	15.1

2.2. Procedure

All procedures of our study were in accordance with the ethical standards of the Italian Association of Psychology and with the ethical standards of the Ethics Committee of the Faculty of Psychology and Cognitive Science of the University of Trento (Italy).

In order to determine child developmental level, the Griffith Mental Development Scale - Edition Revised (GMDS-ER, Luiz et al., 2006) was administered to all children. Children were classified as “children with cognitive level above 70” if they received a score equal or above 70 on the developmental test and as “children with cognitive level below 70”, if they received a score lower than 70. Twenty-six children (65 %) were classified as children with cognitive level above 70 and 14 children (35 %) were classified as children with cognitive level below 70. Considering the level of language development and the chronological age of the children, ADOS Module 1 and Module 2 were used to certify the presence of Autism Spectrum Disorder and to specify the severity level. Thirteen children (33 %) were found to have a mild form of ASD, 15 children (38 %) showed a moderate form of ASD, and the remaining 12 children (30 %) presented a severe form of autism.

Emotional Availability data were obtained from two consecutive video-recorded parent-child dyadic interaction sessions of 10 minutes each. During each session, one parent at a time was asked to play with the child individually in the way they would typically do at home. A standard, age-appropriate set of toys was provided and the sessions took place in a quiet room. Although some authors recommend an observation period of 20-30 minutes in order to have an accurate idea of interaction quality within the dyad (Biringen et al., 2005, 2008), other studies showed that a range between 5 and 10 minutes can be sufficient to reliably assess dyadic EA (Easterbrooks et al., 2000; Koren-Karie, 2002; de Falco et al., 2009). The order of mother-child and father-child play sessions was counterbalanced. All video-recordings of mothers and fathers interactions were double coded by two independent observers adequately trained.

2.3. Measures

2.3.1 The Emotional Availability Scales (EAS)

The Emotional Availability Scales (EAS, Biringen et al. 2008) 4th edition were applied to the videos of parent-child dyadic interaction. The EAS are observational scales that allow to score the Emotional Availability shared within the parent-child dyad, with specific focus on both emotion regulation and control

regulation of the two partners. The 4th edition includes six global EA dimensions, four for assessing caregiver's EA and two for assessing child's EA, and 7 sub-scales for each of the six global EA dimensions. The parent scales include Sensitivity, Structuring, Non-hostility, Non-intrusiveness; child dimensions are Responsiveness and Involvement. Each dimension is scored from 1 (lowest EA) to 7 (highest EA) on a Likert scale; midpoints were also used in the present study as they are highly recommended especially for children with disabilities (Biringen et al., 2005). The global scales score is obtained on the basis of 7 sub-scales which constitute points of attention for the evaluation of the correspondent global scale as described below. Each of the 7 sub-scales receives either a 1-to-3 or a 1-to-7 score and the scores sum can be used as a guide to support the *direct* score of the corresponding EA dimension. In the present study only the *direct* scores of the 6 EA global dimensions were taken into consideration. Adult Sensitivity refers to the ability to read and respond adequately to the child's signals and refers to the caregiver's ability to be emotionally connected to the child (Biringen, 2004; 2008). The scale is based on the following elements: positive affect expression; clarity of perceptions and appropriate responsiveness; awareness of timing; creativity and flexibility in interaction; acceptance; amount of interaction; resolution of conflict situations. Adult Structuring scale refers to parent's ability to facilitate, stimulate as well as organize the child's activities by providing appropriate cues and suggestions for exploration, without compromising their autonomy. The scale is based on: appropriate guidance and suggestions; success of structuring attempts; amount of structure; appropriate limit setting; appropriate regulation in case of pressure; balance between verbal vs. nonverbal structuring; assumption of a clear adult role. The scale of *Non-intrusiveness* refers to the ability of the parent to support the child's activities, being aware of the best time to fit in the interaction without being too challenging or directive. It is based on: the ability to follow the child's lead; the use of non-interruptive ports of entry into interaction; limited use of commands, directives; communicative use of adult talking; appropriateness of didactic teaching; avoidance of physical vs. verbal interferences; absence of hints in child behavior of the adult being intrusive. The scale of *Non-hostility* refers to the ability to interact with the child in pleasant, patient and harmonious ways. It is composed of: degree of negativity in face or voice; lack of mocking, ridiculing, or other disrespectful statements and/or behavior; absence of threats of separation; patience during challenging times; no frightening behavior; no excessive or hostile silence; absence of hostile themes. The *Child Responsiveness* refers to clear signs of pleasure in interaction with the adult and to the willingness to engage with the parent after suggestion. It is based on: positivity of affect and regulation of emotions and behavior; appropriate responsiveness; age-appropriate autonomy seeking and exploration; positive physical contact and positioning; lack of role reversal/over-responsiveness; lack

of avoidance; lack of excessive task oriented attitude. Finally, *Child Involvement* refers to child's ability to engage and involve the parent into interaction and it is judged based on: simple initiative; elaborative initiative; appropriate use of the adult for emotional and playful exchanges; lack of over-involvement; modulated eye-contact and looking; positive body positioning; verbal involvement. Considering adult's scales, optimal levels of EA (7) are characterized by the constant presence of genuine optimal quality of affect, optimal supportive frame and play interactions based on child's lead with no expressions of overt or covert hostility toward the child. Moderate levels (5-6) of adult's EA are given to an adult who is "good enough" but the affect is bland, the structuring is less spectacular with some signs of benign or well-intentioned interventions, adult's style is generally non-hostile but maybe not entirely. Apparent/inconsistent levels of EA (4) are characterized by adult inconsistency in behaviors, inconsistency in adult's ability to guide, sporadic parents interferences in children's activities and the presence of some signs of covert hostility (e.g. in the voice or face). Low levels (3/2.5) or very low levels (2-1) of EA are characterized by somewhat insensitivity or highly insensitive affect, the adult backs off and becomes unavailable or show no guidance, interruptions and interferences or clearly physical interferences, overtly or markedly hostile statement or action.

Considering child's scales, optimal levels of child EA (7) are characterized by optimal pleasure, eagerness and responsivity in interaction and right balance between autonomous play and drawing the adult into interaction. Moderate levels of child EA (5-6) is characterized by generally responsive but neutral quality with appropriate involving but less elaborate than ideal. Inconsistent levels of child EA (4) are characterized by negative affect used for maintaining connection and both positive and negative ways for involving the adult. Low levels (3/2.5) or very low levels (2-1) of EA are characterized by clear concerns about the child's emotional and behavioral responsiveness and involving behavior that might be atypical, dysregulated or very sparse.

Coding was carried out by two independent observers, who were actively certified at the time of coding, and trained on the EA Scales to reach satisfactory interrater reliability with EAS authors.

Interrater reliability on the 6 global scores, measured through Intraclass Correlation Coefficient ranged from .84 of Non Intrusiveness to .92 of Involvement.

2.3.2 Griffiths Mental Development Scales - Edition Revised

The Griffiths Mental Development Scale, Edition Revised (GMDS-ER, Luiz et al., 2006) was used to assess children's mental developmental. The GMDS-ER is among one of the most used tools for the evaluation of

child development from birth to 8 years old. The GMDS-ER evaluates different aspects of mental development in infants and children, providing scores relative to 6 subscales: *Locomotion; Personal-Social Behavior; Communication and Listening; Eye-Hand Coordination; Performance; and Practical Reasoning*. This scale provides a global quotient and a developmental age- allowing to detect developmental delays - as well as specific quotients and developmental ages for each of the 6 subscales. Only the global scores were used for the purposes of the present study.

2.3.3 Autism Diagnostic Observation Schedule - 2 (ADOS-2)

In the present study, we used the Autism Diagnostic Observation Schedule - 2 (ADOS-2, Lord et al., 2012) both to confirm participants' diagnosis and to obtain a measure of symptom severity. The instrument provides different modules according to child chronological age and expressive level of language. For the purposes of this study we used *Toddler Module* with children younger than 31 months, *Module 1* with children older than 31 months and with language abilities ranging from absence to simple sentences, and *Module 2* with children using sentences but not yet verbally fluent. Each module gives a final score that classifies the child into *mild, moderate* or *severe* form of symptoms.

The ADOS-2 is a semi-structured, standardized assessment, designed for individuals with suspected ASD. It is specific for ASD assessment and considered the "golden-standard" for ASD diagnosis. Further, it is internationally used and validated (Lord et al., 2000, 2012). ADOS-2 activities allow the examiner to observe the occurrence or non-occurrence of behaviors that have been identified as important to the diagnosis of autism and other neurodevelopmental disorders across developmental levels and chronological ages. Structured activities and materials, as well as less structured interactions, provide standardized contexts in which social, communicative and other behaviors relevant to the diagnosis of neurodevelopmental disorders are observed.

3.RESULTS

3.1 Analytic Plan

We first conducted preliminary analyses of the data. Then, we provided descriptive statistics of the data. The second section presents results of independent sample t-tests used to investigate differences in mothers and fathers' EA scales. The third section provides correlations among EA ratings separately for mother-child and father-child interactions using Fisher's z (Howell, 2001, p.278) to compare these correlations. The fourth section presents paired t-tests that were used to evaluate the difference between

child's scales in interaction with mothers' and fathers' scales. Finally, we present 3 mixed linear models with the principal parental scale (i.e., Sensitivity) and the child scales of Responsiveness and Involving respectively as dependent variables and with child chronological age, parent gender, cognitive functioning and severity of symptoms as factors.

3.2 Preliminary Analysis

Distributions of each EA scale was analysed for outliers and through *Levene's Test* to assess homogeneity of variance. Preliminary correlations were conducted to investigate associations of mother age and father age with EA scores. Neither mother nor father age correlated significantly with EA scores in our sample, and therefore were not considered further.

3.3 Descriptive Statistics

Table 2 presents descriptive statistics for each EA scales separately for mother–child and father–child dyads.

3.4 Maternal versus Paternal EA Ratings

T- tests for independent samples revealed no differences between mothers and fathers in adult EA scores of Sensitivity ($t(78)=-.25$; $p=NS$); Structuring ($t(78)=1.23$; $p=NS$); Non-Intrusiveness ($t(78)=.12$; $p=NS$) and Non-Hostility ($F(78)=.36$, $p=NS$).

Table 2. Descriptive Statistics for Emotional Availability Scales

EA Scales	Mothers		Fathers		t (78)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Adult Sensitivity	5.13	0.87	5.08	0.94	.25

Adult Structuring	4.81	0.89	4.56	0.92	1.23
Adult Non-Intrusiveness	5.21	0.99	5.19	0.89	.12
Adult Non-Hostility	6.01	0.81	5.95	0.75	.36
Child Responsiveness	3.73	0.95	3.65	0.86	.45
Child Involvement	3.30	0.92	3.29	0.74	.88

3.4 Correlations among EA Scales in Mother–Child versus Father–Child Dyads

Table 3 presents correlations among EA dimensions separately for mother–child and father–child dyads. We found significant positive associations between all pairs of scales in either mother–child or father–child dyads. We compared correlation coefficients among the EA Scales in mothers versus fathers using Fisher’s z (1921; see Howell, 2001, p. 278) and found no significant differences (z range from .05 to 1.49).

The mean of significant intercorrelations between all other pairs of scales for mother–child dyads was .53 and for father–child dyads was .55 (ranges = .7–.90 and .5–.90, respectively, $p < .05$). However, even if adult scales were strongly correlated to each other, the mean of inter-correlation decreased when we took into consideration child scales.

3.5 Child EA with Mothers and Fathers

Bivariate correlations highlighted the stability of Responsiveness and Involvement across interactions with the two parents. Paired- sample t-tests indicated no differences in mean levels of child Responsiveness and Involvement between mother–child and father–child interactions (Table 3).

Table 3. Correlations among EA Scales scores in Mother-Child and Father-Child dyads separately.

	Sensitivity	Structuring	Nonintrusiveness	Nonhostility	Responsiveness	Involvement
Sensitivity	-	.86***	.61***	.57***	.39**	.33*
Structuring	.81 ***	-	.53***	.51***	.56***	.43**
Nonintrusiveness	.72 ***	.67***	-	.77***	.36*	.38**
Nonhostility	.75 ***	.76***	.80***	-	.34*	.31*
Responsiveness	.16	.41**	.28*	.15	-	.86***
Involvement	.22	.36*	.30	.19	.92***	-

*The data below the diagonal refers to Mother-Child dyad and the data above the diagonal to Father-Child dyad

3.6 Relations between the Emotional Availability Scales and Child Factors

Mixed linear models were conducted to test moderation by child's symptom severity and cognitive level and their interaction to predict adult sensitivity and child EA scales. First of all, analyses showed that children's level of functioning was not associated neither to the parent EA scale (Sensitivity) nor to the child EA Scales (Responsivity and involvement). Then, we found that symptom severity was a discriminant factor for child responsiveness ($R^2 (2) = 22.08, p < 0.001$) and for child involvement ($R^2 (2) = 10.02, p < 0.05$)

The results indicated that children with a severe level of ASD showed lower levels of Responsiveness ($M = 3, SD = .7$) than children with moderate symptomatology ($M = 3.8, SD = .75$) and children with a mild level of ASD ($M = 4.1, SD = .85$). In addition, we found that children with a severe level of ASD exhibited lower levels of involvement ($M = 2.77, SD = .7$) than children with moderate symptomatology ($M = 3.57, SD = .83$) and children with a mild level of ASD ($M = 3.46, SD = .74$).

Table 4. Results of mixed linear model predicting EA Scales.

	Sensitivity		Responsiveness		Involvement	
Predictor	<i>R</i> ² (2)	<i>p</i>	<i>R</i> ² (2)	<i>p</i>	<i>R</i> ² (2)	<i>p</i>
Chronological age	6.82	<0.001	11.46	<0.001	10.71	<0.001
Cognitive Level	1.22	ns	0.19	ns	.35	ns
Symptom severity	0.08	ns	22.08	<0.001	10.02	<0.05

4. Discussion

The purpose of the present study was to investigate the affective quality of mother-child and father-child interaction in families of children with ASD. Specifically, we aimed at comparing the EA dimensions between the two parents as well as children's EA when interacting with their fathers and mothers. By focusing on a multidimensional approach to the understanding of affective interactions, we also aimed at analysing intercorrelations among parental and child aspects of EA. Moreover, we aimed at investigating the influence of child cognitive level and symptom severity on both parents and children's EA dimensions. To reach our aims we applied a set of standard multidimensional observation scales - the EAS (4th edition, Biringen et al. 2008), to dyadic semi-structured interaction sessions of children with ASD playing separately with their mothers and fathers. With respect to the general purpose of our study, we found substantial similarities between mother-child and father-child affective quality of dyadic interaction with both parents displaying adequate EA and children showing middle-low EA levels with both parents. Specifically, concerning the affective-salient parental EA dimensions, we found moderate levels of Sensitivity, indicating that both parents showed positive but bland verbal and nonverbal emotional tone, a "good enough" ability to understand the child's signals and respond to them in an appropriate, though not always optimal, way and they were able to maintain self-regulation in case of challenging situations. Moreover, Non-hostility was even higher, indicating that although the parents of children with ASD engage with children who have objective social and behavioral deficits, they do not show a refusing or impatient attitude (Dolev et al., 2009). This result is in line with other studies that have shown a similar trend in families with children with other disabilities as Down syndrome (de Falco et al., 2009). However, this interpretation needs caution, considering that the authors of the EAS argue

(Biringen, Damon et al. 2005) that parental hostility is infrequent in a context of free play, as the one that was analysed in the present study.

Considering the control regulation-salient dimensions of EA, both fathers and mothers showed a slightly less than moderate level of Structuring in our study. Thus, parents were not always able to structure and scaffold their children's play, and provide appropriate cues and limits, perhaps due to the objective challenge of finding the successful strategies for engaging the child in joint play activities, as the context of our observation required. On the other hand, parents show moderate levels of Non-intrusiveness, in fact they did not appear verbally or physically intrusive and were able to follow the child's lead, even if not optimally. This finding is apparently in contrast with previous research depicting parents, and mothers especially, of children with ASD and other DD as more controlling and directive than those of typically developing children (Spiker et al., 2002, Lemanek et al., 1993, Kasari et al., 1988). However, there is an open debate in literature about the valence of directiveness in parents of children with disabilities, calling for a distinction between a positive, i.e. scaffolding attitude, or negative, i.e. intrusive one. The EAS's focus on the two dimensions of Structuring and Non-Intrusiveness might have helped to address this question about parental directiveness. Moreover, the EAS authors in their guidelines for the application of the EA scales for children with disabilities (Biringen, Fidler, Barrett & Kubicek, 2005), specifically invite users to evaluate the appropriateness of the eventual parents' directiveness in consideration of the children's needs. These guidelines emphasize that the EA dimensions of the parents and children with ASD might be qualitatively separable in these dyads. With this, it is meant that when evaluating children with ASD the focus of the observer should be on the dyadic aspects without forgetting that children with ASD have objective difficulties in the social interaction area. Therefore, even when caregivers reach high levels on the adult dimensions, the child might not be responsive and in this case, parents might receive higher scores whereas children are rated low in responsiveness and involvement. Indeed, we found that parents and children's scales, both in mother-child and in father-child dyads, were not as strongly associated as in previous studies on TD children (Lum et al. 2005; Bornstein, Gini, Suwalsky, Putnick & Hayes, 2006; Bornstein, Gini & Leach et al., 2006).

Regarding child EA, children with ASD showed middle-low levels of Responsiveness and Involvement that were stable across interaction between the two parents. Children showed poor affective response to parental cues and limited eagerness to engage parents in their activities (Dolev et al, 2009; Dawson, 2004; Adamson et al., 2001; de Falco et al. 2009). These findings are consistent with the considerable difficulties children with ASD show in their social functioning, including joint attention deficits (Adamson et al., 2010;

Kasari & Sigman, 1997), diminished synchrony between gesture and language (de Marchena & Eigsti, 2010) and low levels of positive affect during social interactions (Dawson & Adams, 1984). On the other hand, children in our study did not show extremely low EA towards their parent, in confirmation of the preserved ability of these children to build strong and fulfilling attachment bonds with their primary caregivers, despite their above-mentioned socio-communication impairments. With respect to the comparison between mothers and fathers, as said, we didn't find any difference in any of the EA parental dimensions. In the literature about children with typical development, fathers are often described as less sensitive than mothers (Lamb, Fraud, and Hwang, 1982; Nakamura, Stewart, and Tatarka, 2000), but as more active and fun playmates (Hewlett, 1992; Lamb, 1977; 2004 Notaro & Volling, 1999; Parke, 1996; Bornstein & Venuti, 2013). The few studies comparing EA in mothers vs. fathers confirmed this general knowledge (Lovas, 2005; Hallers-Haalboom et al. 2016). In detail, both Lovas (2005) and Hallers-Haalboom and colleagues (2016), applying the EAS, reported that fathers had lower scores than mothers. In contrast, de Falco et al. (2009), applying the EAS to parent-child dyads in families of children with Down Syndrome, reported no differences between mother-child and father-child dyads, in accordance with our results. One possible explanation for the apparent contrasting results between the literature on typical and atypical development could be that in families with children with special needs, fathers perceiving the difficulties of their children become more involved and make a greater effort to respond to their needs and eventually reach the same level of emotional availability of their female counterparts.

Another goal of our study was to examine if child factors, i.e. cognitive level and severity of symptoms may account for the level of emotional availability manifested by the children themselves and their parents. In our sample, neither children's cognitive level nor the severity of the autistic symptoms were related to the level of both parents' sensitivity. This result is consistent with the appropriate level of emotional availability reached by parents in our study, which by definition implicates the ability to adapt to the child's needs being emotionally responsive besides the eventual difficulties displayed by the children. On the other hand, the level of child Responsiveness and Involvement were predicted by symptom severity and not by cognitive level. As expected, both Responsiveness and Involvement were lower in children with more severe autistic symptoms according to the diagnostic golden standard instrument. This finding confirms the specific impact of the ASD symptomatology on the quality of child affective interaction with their primary caregivers.

4.1. Conclusion and limitations

The clinical implications of these findings highlight the importance of analysing emotional availability of both mother-child and father-child dyads in families of children with ASD. In sum, we found that social and communicative deficits of children with ASD affected their ability to sustain social interactions with their parents but did not seem to strongly challenge the ability of both their parents to correctly read their children's cues and respond to them appropriately. However, even if both parents reached somewhat good levels of EA, strategies were not always ideal, especially in structuring activities with children. Accordingly, clinical experience shows that children's low responsiveness and involvement can easily elicit overly structuring and didactic interactions in parents. Despite this, it appears that in general parents are able to overcome the barriers imposed by children's social communicative difficulties. Moreover, fathers displayed similar levels of EA compared to mothers, differently from what reported by previous research on typical development. Thus, both fathers' and mothers' EA might constitute a positive foundation on which to build early parent-child interventions that help to improve the children's impairments in social interaction, allowing eventually to optimize the dyadic parent-child EA.

Our results take a first step in showing that the Emotional Availability Scales can be a useful tool for assessing relationships between parents and their children with ASD, discriminating, in general, the functioning of the dyads and, in particular, the contribution of each member to specific EA dimensions. Being able to assess higher levels of EA in clinical practice would mean uncovering an important strength to support interventions focused on other weak areas of child development. Indeed, there is empirical evidence that both mother-child and father-child EA can influence cognitive performance in children with ASD during joint play (Venuti et al., 2008; de Falco, Esposito, Venuti, & Bornstein, 2008, Flippin & Crais, 2011). Understanding the specific role of the father may have important service delivery implications for effectively involving all parents in play-based early interventions for children with ASD. Disclosing a detailed profile of parent-child EA would enable us to implement intervention programs focused on the parent-child interaction aimed to prevent secondary deficits that originate from or are comorbid with dysfunctional dyadic interactions. Several limitations in this study should be noted. First, as is common in studies on clinical populations, the sample was small and unbalanced in terms of child gender. Second, a direct comparison with an appropriately matched sample of TD children would have allowed to verify if our results are specific to families of children with ASD as it seems based on the existent literature. Furthermore, the inclusion of other variables, such as maternal and paternal levels of stress and anxiety, would enhance the study in terms of identifying which parental factors play an influential role in parent-child emotional availability. Finally, future studies on larger samples adopting a longitudinal approach to study the influence of paternal

and maternal EA on different aspects of child psychological development would bring evidence to the importance of targeting affective quality of interaction in early intervention for children with ASD and their parents.

Conflict of interest statement

All authors declare that they have no potential or competing conflicts of interest.

Informed consent

Informed consent was obtained from all parents

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***Highlights (for review)**

Highlights

- ☐ The study highlights the characteristics of emotional availability in mother-child interaction and father-child interaction.
- ☐ The study emphasizes the differences and similarities of the dyadic exchange between mother and father.
- ☐ Results indicated that children with ASD show similarities in social engagement with mothers and fathers
- ☐ The findings highlights the importance to involving fathers during intervention.