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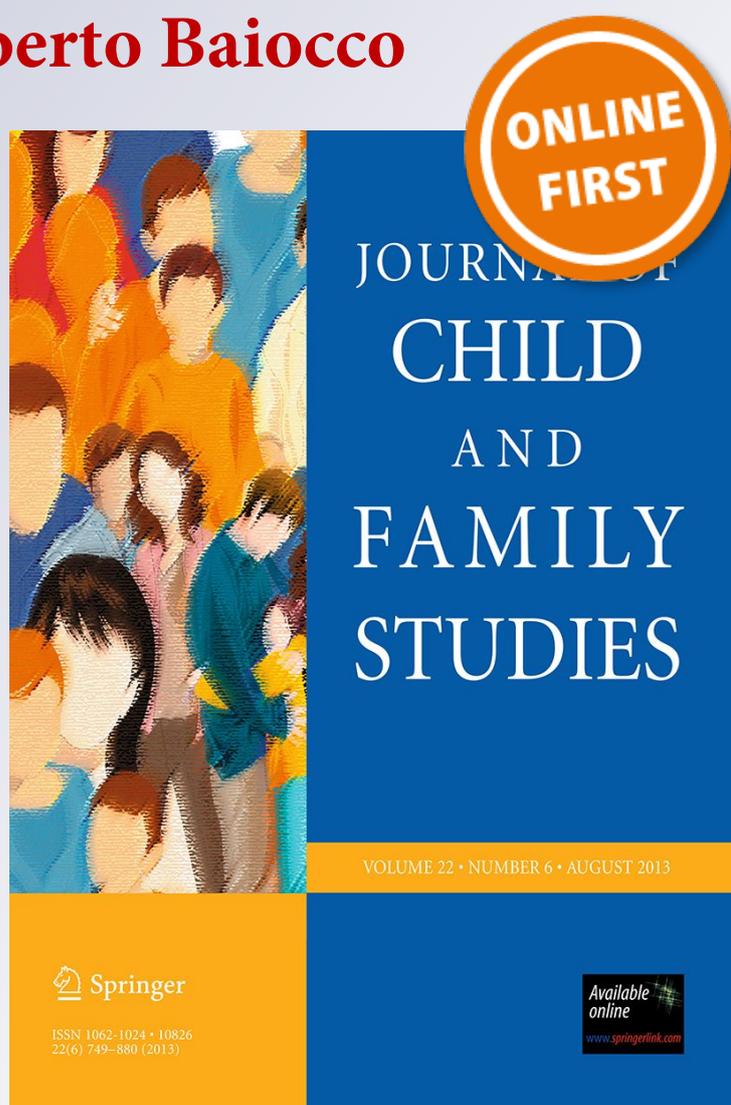
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Sibling Relationships and Family Functioning in Siblings of Early Adolescents, Adolescents and Young Adults with Autism Spectrum Disorder

Fiorenzo Laghi¹ · Antonia Lonigro¹ · Susanna Pallini² · Ambra Bechini¹ · Alexandra Gradilone¹ · Graziana Marziano¹ · Roberto Baiocco¹

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Abstract The purpose of the study was to investigate how family functioning (defined as the ability that family members hold to manage stressful events, and intimate and social relationships), the degree to which family members feel happy and fulfilled with each other (called family satisfaction), and the demographical characteristics of siblings (age and gender) impacted on sibling relationships. The Circumplex Model of Marital and Family Systems and Behavioral Systems constituted the theoretical frameworks that guided our study. Eighty-six typically developing adolescents and young adults having a sister or a brother with autism spectrum disorder were enrolled. Results indicated that the youngest age group (early adolescents) reported to engage more frequently in negative behaviors with their siblings with ASD than the two older age groups (middle adolescents and young adults). No significant differences were found among the three age groups regarding behaviors derived from attachment, caregiving and affiliative systems. Family satisfaction and age significantly predicted behaviors during sibling interactions. Suggestions on prevention and intervention programs were discussed in order to prevent parentification among typically developing siblings and decrease episodes of quarrels and overt conflicts between brothers and sisters with and without ASD.

Keywords Autism spectrum disorder · Sibling relationships · Family satisfaction · Family functioning

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Introduction

Autism spectrum disorder (ASD) is a complex developmental and neurological disorder that includes a wide range of symptoms, skills and levels of disability, encompassing verbal and non-verbal communication, social interaction, and repertoire of behaviors and interests (American Psychiatric Association 2013). Although a shared core of symptoms characterizes ASD, the level of severity and the need of support vary from person to person. Symptoms can range from mild to severe forms and often change over time. Some adults with ASD may function independently; however, ASD remains a lifelong disorder (Laghi et al. 2016a, b). This aspect and the huge increase in the rate of diagnosed ASD in the last years (Boyle et al. 2011; Rutter 2005) have led researchers and practitioners to think about which factors may allow people with ASD to improve the quality of their life.

Recent research has focused on sibling relationship because it is the longest bond for people, thus constituting an important source of support and help throughout the lifespan for people with ASD, too (Cicirelli 1995; Stoneman 2001). Studies on this field, which aim at verifying indirect and direct implications of sibling relationships on individual development and social abilities for individuals with ASD (McHale et al. 2016), are recent enough and are derived from a corpus of investigations regarding children with developmental disorders and chronic illness (Rossiter and Sharpe 2001; Stoneman 2005).

Adopting a lifespan developmental perspective and reviewing the past literature on siblings of individuals with ASD, Orsmond and Seltzer (2007a) argued that during childhood and adolescence, siblings with and without ASD spend a great amount of time together and engage in several activities (e.g., pretend or tumble play). Overall, typically

developing (TD) siblings positively describe their relationships with brothers or sisters with ASD and refer a great sense of admiration for their disabled siblings because of challenges that they have to cope with every day (Petalas et al. 2009). However, feelings of embarrassment are also commonly reported by TD siblings (Mascha and Boucher 2006). More than 50 per cent of TD children and adolescents show difficulties to explain their siblings' disabilities to their friends, even if they would like to do this. Conversely, only a limited number of TD siblings have any difficulties speaking and sharing with peers the health condition of their brothers or sisters with ASD (Bägenholm and Gillberg 1991). Moreover, non-disabled daughters and sons often perceive that all family time, resources and attention are often focused more on their siblings with ASD rather than on them. Rivers and Stoneman (2008) argued that TD siblings' perception of different parenting, favoring children with ASD, has a negative impact on the quality of sibling relationships.

As it happens for parents, TD siblings often express concern about future condition of their disabled brothers or sisters. Moreover, non-disabled siblings seldom feel anger and frustration due to physical aggression by their siblings with ASD. Although these aspects are reasonable, it must be said that Orsmond and Seltzer (2007a) recommend caution in the generalization of findings described in their analytic review because data on children and adolescents were grouped together. With respect to adulthood, Orsmond and Seltzer (2007a, b) concluded that greater similarities among siblings with and without ASD in their education level and functional abilities might give rise to sibling closeness.

When the perspective of adolescents with ASD is considered, research has found evidence for siblinghood that in part overlaps the description made by TD siblings. Adolescents with ASD refer to positive as well as negative aspects regarding relationships with their non-disabled sisters or brothers. Admiration, support and warmth coexist with conflict and hostility (Petalas et al. 2015). Moreover, adolescents with ASD express their desire to join activities and spend time with their siblings. As a whole, the literature on sibling relationships confirm that people with ASD show interest towards social relationships, but they do not often hold abilities that allow them to efficaciously interact with other people (Daniel and Billingsley 2010).

Overall, sibling relationships are influenced by family context, and many researchers have focused on family functioning and its link with members' social behavior at home and outside the home. According to the Family System Theory (Minuchin 1985; Rosenbusch and Cseh 2012), family is a whole system in which all members are interdependent. Thus, each member influences and is influenced by other members. Moreover, family encompasses different subsystems such as marital, parental,

sibling and extended family. How family members manage the interactions within and between family subsystems and the exchanges with the outside world provides information on family functioning. The Circumplex Model, developed by Olson (1993) and later revised in order to bridge research, theory, and practice, focuses on cohesion, flexibility and communication, the three dimensions of marital and family system (Olson 2011). Cohesion refers to the emotional bonding that family members have toward one another. Thus, cohesion is an index on how family system and subsystems balance togetherness vs. separateness. Flexibility refers to the ability of family to adapt and change its aspects and rules in demand to stressful situations. Thus, flexibility focuses on how family members manage stability vs. change. Overall, families with balanced levels of cohesion (i.e., separated and connected) and flexibility (i.e., structured and flexible) function more adequately than those with unbalanced levels (i.e., disengaged and enmeshed for cohesion; chaotic and rigid for flexibility). Communication, the third dimension of the Olson's model, is a facilitating dimension because it allows family members to move on cohesion and flexibility levels to cope with life situations and appropriately respond to environmental requests (Baiocco et al. 2013).

A well-functioning family system provides support for family members, and it is associated with positive children, siblings and parents outcomes (Renzaho et al. 2013; Rivers and Stoneman 2003). Raising a daughter or son with ASD may be challenging for parents (Sikora et al. 2013). Evidence, confirmed by cross-culture studies (Gau et al. 2012; Manor-Binyamini 2011), has shown that families having a child with ASD report less affective family functioning, in terms of both flexibility and cohesion (Baker et al. 2011; Higgins et al. 2005). Furthermore, greater severity of behavior problems of children with ASD and parent mental psychopathology seem to negatively impact on family functioning (Jellett et al. 2015; Pruitt et al. 2016).

The Circumplex Model of Marital and Family Systems (Olson 2011) guided our study in order to analyze family functioning, whilst the Behavioral Systems (Furman and Buhrmester 2009) were used to investigate interactions among brothers and sisters with and without ASD. Attachment, Caregiver, and Affiliative systems were considered. The attachment system aims at maintaining some degree of proximity to an attachment figure in order to gain comfort and security (Bowlby 1969). Two different kinds of behavior characterize the attachment system: seeking the other out as a safe haven when upset or distressed, or using the other person as a secure base to engage in exploratory behaviors. Conceptualized as reciprocal to the attachment system, the caregiving system refers to behaviors finalized to provide comfort and security to the other person by either providing a safe haven or a secure base (George and

Solomon 2008). The affiliative system is based on humans' biological predisposition to interact with others for protection and co-operative food-sharing opportunities (e.g., companionships). Negative interaction is characterized by conflict, criticism and antagonism (Furman 1999).

The main aim of the current study was to verify how family functioning (defined as the ability that family members hold to manage stressful events, and intimate and social relationships), family satisfaction (or the degree to which family members feel happy and fulfilled with each other) and gender and age of siblings predicted the quality of relationships among sisters and brothers with and without ASD. Another purpose of this study was to verify whether different kinds of behaviors characterized sibling relationships in the three age groups. With respect to this aim, we evaluated the extent to which TD siblings' dyadic relationships with their brothers or sisters with ASD were characterized by behaviors commonly involved in the attachment, caregiving and affiliative behavioral systems. We hypothesized that the youngest age group would engage in more negative behavior than the older age groups. Affiliative, caregiving and attachment behaviors would more accurately describe sibling relationships at older age. With regard to the second aim, balanced levels of flexibility and cohesion, higher degrees of family satisfaction and siblings' older age were expected to positively affect siblings' behaviors entwined with affiliation, caregiving and attachment systems. Reverse pattern was hypothesized for negative sibling interactions.

Method

Participants

The sample included 86 TD siblings of early-adolescents, adolescents and young adults with ASD. Participants (49M and 37F) ranged in age from 12 to 26 years ($M = 16.74$, $SD = 3.78$). Fifty-two TD siblings were older, 30 were younger than their sibling with ASD, and 4 were twins. Two point 22 years ($SD = 1.15$) was the average absolute value of sibling age differences (range equaled 0–7 years). All of the TD siblings in the research were biological siblings to the children with ASD. Siblings with ASD (72M and 14F) ranged in age from 11 to 30 years ($M = 16.83$, $SD = 4.75$). Each sibling with ASD from the sibling pairs was independently diagnosed with autism spectrum disorder.

Procedure

We recruited participants in this study by distributing information sheet about the study to local autism organizations and centers that provided services to adolescents and

young adults with ASD. The eligibility requirements were to have a sibling with ASD, and to be the closest in age to his/her sister or brother with ASD. All of the TD siblings and early-adolescents, adolescents and young adults with ASD lived in the family home.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional and/or National Research Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Approval from the University Institutional Review Board was obtained before data were collected for the current study. The TD siblings were evaluated at a research laboratory at the Faculty of Medicine and Psychology by a team of clinical psychologists with the supervision of the first author, and took approximately 40 min to complete.

Application consisted of the participants fulfilling the questionnaires in a quiet research laboratory, after informed consent was acquired from both participants and their parents if they were under 18 year old. After administering the questionnaires, the participants were asked if they were interested in participating at a support group for sibling of adolescents or young adults with ASD.

Measures

Italian adaption of Network of Relationships Inventory: Behavioral Systems Version

The Italian adaption of Network of Relationships Inventory: Behavioral Systems Version (NRI-BSV; Furman and Buhrmester 2009) was used to assess sibling relationships. It is a 24-item questionnaire that assesses eight features of close relationships. Two scales evaluate attachment behaviors: (a) participant seeks safe haven (sample item, How much do you turn to your sister/brother for comfort and support when you are troubled about something?), and (b) participant seeks secure base (sample item, How much does your sister/brother show support for your activities?). Two corresponding scales assess caregiving behaviors: (a) participant provides safe haven (sample item, How much does your sister/brother turn to you when s/he is worried about something?), and (b) participant provides secure base (sample item, How much do you encourage your sister/brother to try new things that s/he would like to do but is nervous about?).

The companionship scale evaluates affiliative behaviors (sample item, How much do you and your sister/brother spend free time together?). Three components of negative interactions are assessed, encompassing conflict (sample item, How much do you and your sister/brother get upset with or mad at each other?); antagonism (sample item, How much do you and your sister/brother hassle or nag one

another?); and criticism (sample item, How much do you and your sister/brother criticize each other?). Participants rated how much each feature occurred in the relationship with sibling with ASD using 5-point Likert scales (1 = "Little or None", 2 = "Somewhat", 3 = "Very Much", 4 = "Extremely Much", 5 = "the Most"). Scale scores are derived by averaging the items. At the present, the NRI-BSV has also been repeatedly employed in both clinical and non-clinical studies; concerning the validity of the NRI-BSV subscales, supportive evidence has been obtained previously in the Italian context (for details, see Dellagiulia et al. 2011).

Family Adaptability and Cohesion Evaluation Scales

Family Adaptability and Cohesion Evaluation Scales (FACES IV; Olson 2011) is composed of 42 items on a Likert-type scale divided into six scales: two balanced scales (Cohesion and Flexibility) assessing central-moderate areas and four unbalanced scales (rigid, chaotic, enmeshed and disengaged) assessing the lower and the upper ends of Cohesion and Flexibility (Olson and Gorall 2006). While the two balanced scales, Balanced Cohesion (sample item, "Family members are supportive of each other during difficult times") and Balanced Flexibility (sample item, "My family is able to adjust to change when necessary"), are similar to previous scales, the four Unbalanced Scales, Enmeshed (sample item, "Family members feel guilty if they want to spend time away from the family"), Disengaged (sample item, "Family members seem to avoid contact with each other when at home"), Chaotic (sample item, "Our family feels hectic and disorganized"), and Rigid (sample item, "There are clear consequences when a family member does something wrong"), represent an original improvement (Olson 2011).

The two Balanced Scales assess normal functioning, while the other scales are related to problematic functioning. A further improvement brought on by the Balanced and Unbalanced ratio score is that it offers a method to assess the curvilinearity of Cohesion and Flexibility dimensions. These scales proved to be valid, reliable, and discriminatory among both problematic and no problematic families (Baiocco et al. 2013). Following the procedure used by Olson (2011), the *Cohesion Ratio* score is calculated by dividing the Balanced Cohesion score by the *average* of the two unbalanced scales (Disengaged and Enmeshed), and the *Flexibility Ratio* is calculated by dividing the Balanced Flexibility score by the *average* of the two unbalanced scales (Rigid and Chaotic). A *Circumplex Total Ratio*, that can be considered a summary of a family's balanced characteristics in a single score is calculated by dividing the *average* of the two balanced scales (Cohesion and

Flexibility) by the *average* of the four unbalanced scales (Rigid, Enmeshed, Chaotic and Rigid).

Family Communication Scale

Family Communication Scale (FCS) is based on the Parent-Adolescent Communication Scale (Barnes and Olson 1985), which is a 20-item scale developed to measure communication in families with an adolescent (sample item, Family members express their true feelings to each other). The FCS is a shorter measure containing 10 items evaluable on a Likert-type scale based on the longer 20-item version which can be used with a variety of family forms and families at various life cycle stages related to the Circumplex Model.

Family Satisfaction Scale

Family Satisfaction Scale (FSS; Olson et al. 1989) assesses the degree of satisfaction with aspects related to family cohesion and flexibility (sample item, The ability your family to share positive experiences). The current version of the Family Satisfaction Scale contains 10 items on a Likert-type scale and is based on the original 14 item scale. Based on a sample of 2465 family members, the 10 item family satisfaction scale has an alpha reliability of .92 and test re-test of .85.

Data Analyses

Because previous investigations has found TD gender-related differences on sibling relationships (Laghi et al. 2016a, b), univariate analyses were carried out to verify if it was also the case in the present study. MANOVAs were conducted to verify age differences on sibling relationship and family functioning dimensions. Partial eta-squared values were calculated as a measure of effect size, and results were interpreted using Cohen's (1988) guidelines for determining small (.01), medium (.06), and large (.14) effects.

Bivariate correlations, using the Pearson product-moment, among the key variables of the study were computed. Finally, hierarchical multiple regressions were used to examine the associations between family functioning and different indicators of sibling relationship. In each regression, we entered TD and ASD gender, the average sibling age and the absolute age difference in the first step, family functioning dimensions in the second step (*Circumplex Total Ratio*, Family Communication and Satisfaction). All statistical analyses were performed with SPSS 23 for Windows.

Results

For comparative purposes the sample was divided into three age groups: 24 TD early adolescent siblings (10M and 14F; Mage = 13.33; SD = .48; range: 12–14 years old) of early adolescents with ASD (20M and 4F; Mage = 12.13; SD = 1.39; range: 11–14 years old); 33 TD adolescent siblings (18M and 15F; Mage = 15.09; SD = 1.65; range: 15–18 years old) of adolescents with ASD (25M and 8F; Mage = 15.21; SD = 2.18; range: 15–18 years old); 29 TD young adult siblings (21M and 8F; Mage = 21.45; SD = 2.01; range: 19–26 years old) of young adults with ASD (27M and 2F; Mage = 22.55; SD = 2.37; range: 19–30 years old). No significant differences were found for TD gender, $\chi^2(2) = 5.19, p = .07$, nor for ASD gender, $\chi^2(2) = 3.41, p = .18$. Preliminary analyses revealed no univariate outliers. According to Curran et al. (1996), the skewness and kurtosis of NRI-BSV and FACES-IV dimensions were within the range proposed (values less than |2| for univariate skewness and kurtosis). Thus, these variables were used for the following analyses.

The analysis revealed main effect for age, $\lambda = 0.73, F(8160) = 3.32, \text{partial } \eta^2 = .14, p = .002$. Results from the univariate tests (ANOVA) and post-hoc comparisons (Tukey test; $p < .05$) revealed that the three groups differed on the subscale of negative interactions, $F(2,83) = 8.71, \text{partial } \eta^2 = .17, p < .001$, where TD siblings of early adolescents with ASD obtained higher scores than TD adolescent and young adult siblings that did not differ significantly.

For family functioning, MANOVA did not reveal main effect for age, $\lambda = 0.77, F(16,152) = 1.34, p = .18$ (Table 1).

As shown in Table 2, affiliative, attachment and caregiving behaviors were positively and significantly related to family functioning and satisfaction. Negative interactions were negatively related to family satisfaction.

We performed preliminary analyses to exclude the possibility of collinearity in the regression analyses (Table 3). The hierarchical multiple regression analysis conducted for affiliative behaviors showed that TD and ASD gender and age were not significant predictors in Step 1, $F(4,81) = 1.97; p = .11, R^2 = .09$. With the addition of family functioning, satisfaction and communication at step 2, the regression was significant and accounted for 23% of variance, $F(7,78) = 5.28; p < .001$. Only age differences significantly and negatively predicted affiliative behaviors. There was a marginal effect of Family Satisfaction ($p = .06$).

When the analysis was conducted for attachment behaviors, the hierarchical multiple regression at the Step 1 was not significant, explaining only 9% of variance, $F(4,81) = 2.20; p = .07$. Inspection of this step revealed that only sibling age average tended to be a significant negative

Table 1 Differences between age groups on the NRI-BSV and FACES-IV subscales

Dimensions	TD early adolescent siblings of early adolescents with ASD (N = 24)		TD adolescent siblings of adolescents with ASD (N = 33)		TD young adult siblings of young adults with ASD (N = 29)	
	M	SD	M	SD	M	SD
Affiliative behaviors	3.58	.85	3.19	.74	3.11	.88
Attachment behaviors	2.68	1.12	2.32	.78	2.08	.88
Caregiving behaviors	3.51	.97	3.42	.92	3.31	.92
Negative interactions	3.01 ^a	.74	2.59 ^b	.68	2.18 ^b	.75
Cohesion	4.02	.70	3.88	.60	4.04	.76
Flexibility	3.51	.73	3.57	.57	3.63	.75
Disengaged	2.24	.61	2.26	.59	2.24	.59
Enmeshed	2.10	.66	1.97	.51	1.89	.51
Rigid	2.78	.57	2.88	.54	2.81	.68
Chaotic	2.76	.65	2.42	.55	2.40	.64
Family communication	3.54	.65	3.49	.64	3.58	.73
Family satisfaction	3.11	.75	3.16	.60	3.51	.75

Note: Post-hoc Tukey test. Significant differences ($p < .05$) are indicated by different letters

predictor. When the Family Satisfaction dimension entered in Step 2, the prediction was increased, $R^2 = .32$ emerging as a significant positive predictor, $F(7,78) = 7.88; p < .001$.

For caregiving behaviors, the hierarchical multiple regression at the Step 1 was not significant, explaining only 5% of variance, $F(4,81) = 1.05; p = .39$. The Family Satisfaction dimension entered in Step 2 was found to add to the prediction, $R^2 = .20$ emerging as a significant positive predictor, $F(9,76) = 3.65; p < .005$. When the analysis was conducted for negative interactions, the hierarchical multiple regression at the Step 1 was significant, explaining 13% of variance, $F(4,81) = 3.15; p < .05$. Inspection of the first step revealed that only sibling age (average) tended to be a significant negative predictor. The Family Satisfaction dimension entered in Step 2 was found to add to the prediction, explaining only 7% of variance, $F(9,76) = 2.83; p < .05$, emerging as a significant negative predictor.

Discussion

One of the purpose of this study was to explore whether behavioral differences in sibling relationships occurred among the three age groups. As hypothesized, the youngest age group (i.e., early adolescents) reported to engage more frequently in negative behaviors with their siblings with ASD than the two older age groups (i.e., adolescents

Table 2 Pearson's product moment correlations for the variables measured in the study ($N = 86$), with means, standard deviations, and cronbach's alpha

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. TD age	–													
2. TD gender (0 = boys; 1 = girls)	–.18	–												
3. ASD age	.85**	–.17	–											
4. ASD gender (0 = boys; 1 = girls)	–.10	.25*	–.12	–										
5. Sibling age (average)	.95**	–.18	.97**	–.12	–									
6. Age difference (absolute value)	.17	–.04	.28**	.02	.24*	–								
7. TD age (0 = younger; 1 = older)	–.01	.04	–.48**	.09	–.28**	–.23*	–							
8. Affiliative behaviors	–.14	.20	–.23*	.07	–.20	–.19	.15	–						
9. Attachment behaviors	–.20	.20	–.20	–.09	–.21	–.06	.11	.633**	–					
10. Caregiving behaviors	–.05	.16	–.10	.03	–.08	–.16	.05	.64**	.58**	–				
11. Negative interactions	–.34**	–.07	–.29**	.06	–.33**	–.01	–.03	.01	–.02	–.09	–			
12. Circumplex total ratio	–.01	.04	–.04	–.14	–.03	.13	.08	.43**	.50**	.35**	–.08	–		
13. Family satisfaction	.27*	.06	.21	–.14	.25*	.13	.04	.38**	.51**	.40**	–.32**	.69**	–	
14. Family communication	.11	.11	.00	–.06	.05	.14	.17	.40**	.49**	.36**	–.18	.76**	.83**	–
Mean	–	–	–	–	–	–	–	3.28	2.34	3.41	2.57	3.62	3.26	3.53
SD	–	–	–	–	–	–	–	.83	.94	.93	.78	.68	.71	.67
Alpha	–	–	–	–	–	–	–	.88	.88	.88	.86	.78	.89	.85

* $p < .05$; two-tailed. ** $p < .01$

and young adults). During childhood and early adolescents, intimate daily contact between siblings is more recurrent than it happens over middle and late adolescence. If during childhood and early adolescence the social sphere includes family members, few friends and teachers, over the later years social relationships burgeon to include many more people outside the family context (La Greca and Harrison 2005). Thus, it is reasonable to think that the greater amount of time that siblings spend together in early adolescence than during adolescence and young adulthood may increase the likelihood that quarrels and overt conflicts may take place. At the same time, the possibility to share different moments of the day may constitute for brothers and sisters a way to train on attachment-related behaviors. However, the presence of repetitive, uninhibited, frightening or disruptive behaviors (Benderix and Sivberg 2007; Higgins et al. 2005), obsessive rituals (Mascha and Boucher 2006), and the lack or the impairment in the language acquisition (Kaminsky and Dewey 2001) may be very hard to manage for a young adolescent interacting with a sibling with ASD. Perhaps, the development of more advanced social-cognitive abilities that involves pre-frontal cortex and are acquired after elementary school years (Dumontheil 2016), such as the understanding of others' mental states (Lonigro et al. 2014, 2016), allow adolescents and young adults to cope with overwhelming situations, engaging in more functional and adaptive behaviors than early adolescents (Rossiter and Sharpe 2001; Zeman et al. 2006). Future research may support these findings.

Unlike our expectations, no significant differences were found among the three age groups regarding behaviors derived from attachment, caregiving and affiliative systems. This finding is in line with a retrospective study carried out by Tomeny et al. (2017). The authors spelled out the role played by TD adults in care for their siblings with ASD from childhood to adulthood. The key element that characterizes their past memories and their present life is a sense of duty due to the recognition of vulnerability of their disabled sisters or brothers and to alleviate parents' fatigue and stress. Our study support that the active involvement in care for siblings with ASD by TD siblings takes place early.

Another aim of the study was to identify which factors affected siblings relationships. Family satisfaction, whose operational definition includes cohesion, flexibility and communication (Olson et al. 1989), positively predicted both attachment and caregiving behaviors. By contrast, negative interactions, which encompass criticism, antagonism and conflict, were negatively predicted by family communication. As a whole, findings suggest that the degree of the extent to which family members feel satisfied and fulfilled with each other is appeared to be a crucial variable in the adoption of functional sibling behaviors. This issue extends substantial evidence found by past research, in which only marital satisfaction has been primarily investigated in families where a member with ASD lived. Research agree that parents of children with ASD have a slightly lower level of marital satisfaction that parents of children without disabilities (Lee 2009). When

Table 3 Hierarchical regression analyses for family functioning predicting sibling relationships

	Affiliative behaviors				Attachment behaviors				Caregiving behaviors				Negative interactions			
	B	SE B	β	R ²	B	SE B	β	R ²	B	SE B	β	R ²	B	SE B	β	R ²
Step 1				.09				.09				.05				.13
TD gender (0 = boys; 1 = girls)	.19	.17	.11		.26	.17	.14		.17	.19	.09		-.15	.15	-.11	
ASD gender (0 = boys; 1 = girls)	.23	.22	.10		-.18	.23	-.07		.17	.26	.07		.05	.19	.03	
Sibling age (average)	-.03	.02	-.17		-.07	.02	-.29**		-.02	.03	-.10		-.04	.02	-.26**	
Age difference (absolute value)	-.15	.07	-.21*		-.05	.07	-.06		-.16	.08	-.20		.04	.06	.07	
Step 2				.23				.32				.20				.07
Family functioning	.35	.18	.28		.26	.19	.19		.19	.22	.14		-.11	.16	-.09	
Family satisfaction	.29	.22	.25		.64	.23	.49**		.53	.26	.41**		.13	.16	.13	
Family communication	.01	.24	.01		-.08	.25	-.06		-.09	.28	-.06		-.40	.19	-.42**	
Total R				.57				.64				.50				.45
Total R ²				.32				.41				.25				.20

Note: The tabled values for Beta reflect Bs after Step 2

* $p < .05$; ** $p < .001$

daughters and sons with ASD became adolescents or adults, their parents have a higher risk of divorce than parents of non disabled children (Hartley et al. 2010a, b). Moreover, the severity of symptoms is negatively associated with parents' marital satisfaction (Baker et al. 2005; Hartley et al. 2010a, b, 2012).

With respect to family functioning, the *Circumplex Total Ratio*, that can be considered a summary of a family's balanced characteristics, is appeared to be related to attachment, affiliative and caregiving behaviors among siblings, although it was not a significant predictor in the regression analyses. In particular balanced levels of cohesion which tended towards a deep engagement among family members was positively associated with behaviors finalized to companionship and cooperation. Although unbalanced levels of cohesion and flexibility characterize more frequently families with a child with ASD than families having only TD children (Baker et al. 2011; Gau et al. 2012; Jellett et al. 2015; Higgins et al. 2005; Manor-Binyamini 2011), family satisfaction levels are more likely to have a more determinant role in family functioning when a member has a disability. In particular, a recent study (Pruitt et al. 2016) demonstrated that when balanced levels of family satisfaction are reported by family members, increased daily positive parenting interactions between mother and their children with ASD are observed. These interesting results suggest that family functioning is a fertile ground that needs to be further explored by research, considering both the overall family system and its subsystems.

Finally, findings from the present study revealed that siblings' age was positively associated with family satisfaction and negatively with negative interactions. The same relations were found when TD siblings' age was considered.

Conversely, for ASD siblings age was only negatively related to negative interactions. Past research carried out on TD children and adolescents has documented how relationships with parents, siblings, and friends are both similar to and different from one another in terms of behavior that typically mirror the different behavioral systems (Furman and Buhrmester 2009). Further research needs to support how age-related differences may impact on sibling relationships.

Limitations and Implications of the Study

Several limits need to be mentioned. The sample was relatively small, social desirability was not measures, and data were collected at a single time point and without considering the perspective of siblings with ASD. The cross sectional design of the research did not permit to investigate directionality in the relationships; we examined restricting the casual inferences that might be drawn from the results. To investigate the developmental processes such as those examined here, and to understand them correctly, we need longitudinal studies.

Interestingly, no differences among all three age groups were found regarding behaviors derived from attachment, affiliative and caregiving systems, suggesting that TD siblings very early provide support and care for their brothers and sisters with ASD. It is important to shed light on the nature of attention and care behaviors engaged by TD siblings towards their siblings with ASD. Recently, Tomeny et al. (2017) pointed out how TD siblings may be at increased risk for parentification, a phenomenon in which tasks typically reserved for parents or adults are completed by daughters and sons (Hooper et al. 2011).

Author Contributions F.L. and A.L. designed and executed the study and wrote the paper. S.P. and R.B. collaborated with the design and writing of the study. F.L. analyzed the data and wrote part of the results. A.B., A.G., and G.M. collaborated with the recruitment of participants and with data scoring. F.L., S.P., A.L., and R.B. collaborated in the writing and editing of the final manuscript.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

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