



# Predictors of mother–child interaction quality and child attachment security in at-risk families

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Child healthy development is largely influenced by parent–child interaction and a secure parent–child attachment is predictively associated with positive outcomes in numerous domains of child development. However, the parent–child relationship can be affected by several psychosocial and socio-demographic risk factors that undermine its quality and in turn play a negative role in short and long term child psychological health. Prevention and intervention programs that support parenting skills in at-risk families can efficiently reduce the impact of risk factors on mother and child psychological health. This study examines predictors of mother–child interaction quality and child attachment security in a sample of first-time mothers with psychosocial and/or socio-demographic risk factors. Forty primiparous women satisfying specific risk criteria participated in a longitudinal study with their children from pregnancy until 18 month of child age. A multiple psychological and socioeconomic assessment was performed. The Emotional Availability Scales were used to measure the quality of emotional exchanges between mother and child at 12 months and the Attachment Q-Sort served as a measure of child attachment security at 18 months. Results highlight both the effect of specific single factors, considered at a continuous level, and the cumulative risk effect of different co-occurring factors, considered at binary level, on mother–child interaction quality and child attachment security. Implication for the selection of inclusion criteria of intervention programs that support parenting skills in at-risk families are discussed.

**Keywords:** attachment, emotional availability, psychosocial risk, parenting, psychosocial prevention

## INTRODUCTION

Child physical and psychological development is largely influenced by parent–child relationship (Bornstein, 2002). Through their caregiving, parents supply their children with the experiences and support they need for achieving their developmental milestones (Brinker et al., 1994). An extensive body of research on human parenting has provided evidence that quality of caregiving is essential in determining the level of children's social emotional as well as cognitive development (Bornstein and Tamis-LeMonda, 1989; Landry et al., 2006; Dexter et al., 2013). Specifically, sensitive and responsive parenting promotes a secure attachment relationship (De Wolff and van IJzendoorn, 1997; Nievar and Becker, 2008), which in turn is predictively associated with positive outcomes in numerous domains of child development (Bar-Haim et al., 2000; Vondra et al., 2001; Belsky and Pasco Fearon, 2002; Bernier and Meins, 2008; Dexter et al., 2013). However, the parent–child relationship can be affected by several psychosocial and socio-demographic risk factors that undermine its quality and in turn play a negative role in short and long term child psychological wellbeing (Sameroff, 1998, 2000; Choe et al., 2013). Classical research on the psychological development of children living in at risk families supports additive models according to which psychological problems are not the result of one specific risk factor but may be instead predicted by the combined presence of different factors (Greenberg et al., 1993; Lyons-Ruth et al., 1993; Hubbs-Tait et al., 1996). Also, established models of parenting (Belsky,

1984) postulate that the quality of the parent–child relationship is the integrated result of three sets of factors: parent characteristics, infant characteristics, and context which can influence parenting in a supportive or stressful way. Accordingly, many studies have investigated to which extent attachment security can be explained by theoretically relevant risk factors, such as low family socio-economic status (SES), maternal depression and other psychological symptoms, young maternal age, single parenting. However, most studies concentrated on one specific risk factor at the time, or several co-occurring factors that could not be disentangled. The aim of the present study was to examine the influence on dyadic emotional availability (EA; Biringen and Robinson, 1991; Biringen, 2000), as an index of mother–child interaction quality, and on child attachment security of different psychosocial and socio-demographic risk factors in at-risk families living in Northern Italy. Results in this direction may guide the selection of inclusion criteria for effective intervention programs that promote sensitive and responsive parenting in at-risk families.

## ATTACHMENT SECURITY AND EMOTIONAL AVAILABILITY

Secure attachment has been shown to positively influence child social emotional as well as cognitive adaptation beyond infancy (Bar-Haim et al., 2000; Vondra et al., 2001; Dexter et al., 2013). Secure mother–child attachment is the result of adequate maternal sensitivity, as postulated by Ainsworth et al. (1978) and

demonstrated by a strong body of literature (NICHD Early Child Care Research Network, 1997, 2006). However, especially in high risk populations, the strength of this association may be modest and sensitivity may just partially explain child attachment security (Ward and Carlson, 1995; Seifer et al., 1996). Indeed, different risk factors can affect maternal sensitivity and child attachment security in many ways, complicating their associations. When studying the impact of risk factors on mother–child relationship, it may be appropriate to focus on more complex constructs within the theoretical attachment framework that expands that of maternal sensitivity. In this perspective, EA is a crucial construct (Biringen and Robinson, 1991; Aviezer et al., 1999; Bretherton, 2000; EA; Biringen and Robinson, 1991; Biringen, 2000) is a relationship construct based on attachment theory (Ainsworth et al., 1978) integrated with Emde's (1980) emotions perspective. It refers to the quality of emotional exchanges between parents and their children, focusing on the two partners' accessibility to each other and their ability to read and respond appropriately to one another's communications (Biringen and Robinson, 1991). Studies of EA suggest that the construct not only plays a role in the prediction of attachment (Easterbrooks and Biringen, 2000, 2005) but also show significant and meaningful associations with many discrete affective indices of parent–child interaction (Robinson et al., 1993; Zimmerman and McDonald, 1995; Kogan and Carter, 1996), and can be considered a global index of the overall quality of the parent–child affective relationship (Biringen, 2000).

#### PSYCHOSOCIAL RISK FACTORS FOR PARENT–CHILD RELATIONSHIP

Among the most investigated factors thought to have a detrimental effect on parent–child relationship and child healthy development are low SES of the family and maternal psychopathology. SES influences physical and psychological health as well as the chances of social and cultural achievements during the all life span (Ensminger and Fothergill, 2003). Children born and raised in low SES families have higher chances of perinatal negative outcomes and fewer chances of receiving the appropriate physical cares and cognitive stimulation they need for their healthy development (Yoshikawa et al., 2012). Low parental SES has been predictively associated with lower children IQ and school achievements (Bradley and Corwyn, 2002; Gottfried et al., 2003; Clearfield and Niman, 2012). The effect of low SES on child development is partially mediated by reduced parenting quality (McLoyd and Wilson, 1991; Fish, 2001). Parenting quality is thought to be affected by the increased instability and stresses connected to low income and poor education conditions (Bronfenbrenner, 1979; Aber et al., 2000; Bradley and Corwyn, 2002; Lemelin et al., 2006; Seow, 2012). Low SES mothers are reported to show lower levels of synchronic and responsive behavior when interacting with their children (Tamis-LeMonda et al., 2001; Ammaniti et al., 2002; Steele et al., 2002; van Bakel and Riksen-Walraven, 2002; Aviezer et al., 2003; Evans et al., 2005; Tarabulsy et al., 2005; Shin et al., 2006) as well as more inconsistent, punitive, and coercive parenting (McLoyd and Wilson, 1991). Lower levels of attachment security and a higher rate of disorganized attachment have been clearly documented in studies on low SES and low income families (Lyons-Ruth

et al., 1991; NICHD Early Child Care Research Network, 1997; van IJzendoorn et al., 1999). However, some level of inconsistency exists in this body of research and meta-analytic studies demonstrated comparable levels of attachment security between low SES and middle class children when isolated cases of neglect and maltreatment were excluded (Spieker and Booth, 1988).

A plethora of research has documented negative associations between maternal psychopathology and child psychological well-being (Downey and Coyne, 1990; Cummings and Davies, 1994; Seifer and Dickstein, 2000; Burstein et al., 2012). This field of research has been dominated by studies on maternal depression showing its detrimental effect on mother–child relationship and child healthy development (Downey and Coyne, 1990; Campbell et al., 1992, 1995; Beck, 1995; Murray et al., 1999; Edhborg et al., 2001; Nagata et al., 2004; Toth et al., 2009; McCabe, 2014). Maternal depression has been empirically linked to lower levels of attachment security (Lyons-Ruth et al., 1990; Lyons-Ruth et al., 1990; Murray, 1992; Teti et al., 1995; Goodman and Gotlib, 1999, 2002; Lyons-Martins and Gaffan, 2000) and diminished maternal sensitivity connected to the nature of depressive symptoms has been accounted to mediate this association (Ammaniti et al., 2007). However, the strength of this association has been found to be modest and maternal depression alone may not result in inadequate parenting quality or attachment insecurity for some children (van IJzendoorn et al., 1999; Atkinson et al., 2000; Toth et al., 2009).

#### SOCIO-DEMOGRAPHIC RISK FACTORS FOR PARENT–CHILD RELATIONSHIP

Other conditions that have been investigated as potential risk factors in the parenting literature are two socio-demographic factors, namely young maternal age, and, to a lower extent, single parenting. However, both factors are thought to affect parent–child relationship mainly when occurring together with psychosocial risk conditions, as those described above, which indeed are especially frequent among young and single mothers (Rosenkrantz Aronson and Huston, 2004; Letourneau et al., 2004; Svoboda et al., 2012).

Adverse health and psychological outcomes have been associated with adolescent pregnancy and parenting (Long, 2009) including gestational hypertension, preterm labor and delivery (Sieger and Renk, 2007), and children's cognitive and language delayed development (Keown et al., 2001; Rafferty et al., 2011). Being themselves in a process of "separation-individuation" and in a period of emotional and social changes during the transition to adulthood, adolescent mothers may find it difficult to face the challenges of parenthood. There is a strong body of research showing that compared to older mothers, adolescent mothers display less desirable childrearing attitudes, lower sensitivity and diminished EA (Pomerleau et al., 2003; Easterbrooks et al., 2005; Bornstein and Putnick, 2007). Accordingly, researchers found that children of adolescent mothers are less likely to develop a secure attachment and more likely to develop behavioral problems (Madigan et al., 2006; Moran et al., 2008).

Raising a child without the help of a partner exposes the mothers to more challenges, stress and fatigue, leading to higher chances

of psychological problems (Broussard et al., 2012). Children raised only by the mother show poorer outcomes in several areas of development. Research in this domain has demonstrated lower levels of social emotional adaptation, social competence, cognitive scores, school achievements as well as higher rates of anxiety disorders and deviant behaviors in children raised in single-mother compared to two-parents families (Carlson and Corcoran, 2001; Weinraub et al., 2002; Tremblay and Japel, 2003; Fergusson et al., 2007; Scharte and Bolte, 2011; Shaw et al., 2012). Studies on attachment relationship between single mothers and their children showed inconsistent results ranging from increased (Golombok et al., 1997) to slightly decreased children's attachment security (Rosenkrantz Aronson and Huston, 2004).

All the mentioned risk factors may negatively affect mother-child relationship quality and children's attachment security eventually affecting child healthy development. However, the predictive value of each risk factor appears to be moderated by the co-occurrence of other risk factors in a complex additive model. Nevertheless most of the studies within this body of literature took into account one risk factor at the time. Moreover, some inconsistency in the results might be related to the tendency to operationalize risk factors only in a dichotomic way by comparing families with and without a specific risk condition, disregarding factors' intensity that can be instead accounted by considering risk factors at a continuous level (McCabe, 2014). Starting from the above considerations, the present study aimed to assess the influence of psychosocial and socio-demographic risk factors on mother-child EA and on children's attachment security in a sample of at-risk families living in Northern Italy. In an attempt to identify the specific effect on mother-child relationship of each risk factor as well as the cumulative effect of their co-occurrence, low family SES, maternal psychopathology, maternal young age, and single parenting, were analyzed both as dichotomic and as continuous variables in a longitudinal design. We specifically hypothesized to find modest negative associations between continuous measures of risk factors and the EA and attachment measures. Also, we didn't expect differences in EA and attachment security measures between groups of dyads with or without single risk factors. Finally, we expected that EA and attachment security measures would be higher in dyads presenting socio-demographic factors alone compared to dyads presenting psychosocial risk factors alone or a combination of both. Results of this explorative study would be crucial for the identification of the families at higher risk for low relationship quality and attachment security who might profit of prevention intervention that promote emotionally available mother-child relationship and in turn reduce the risk of poor developmental outcomes.

## MATERIALS AND METHODS

### PARTICIPANTS

This study involved 40 first-time mothers with specific psychosocial and/or socio-demographic risk factors and their healthy full term children living in three different areas (A, B, and C) of Northern Italy. At the time of recruitment mothers had a mean age of 27.32 years ( $SD = 6.56$ ) and they were in the third trimester of pregnancy. Measures for the present study were collected when

children were aged 3, 6, 12, and 18 months (with a 2-weeks flexibility interval). Participants were part of a broader intervention study on at-risk families in either the intervention or the control group (group assignment was controlled as appropriate in the analyses for the purposes of the present study, see "Materials and Methods" section). Participation in the project was proposed by midwives, OB/GYN doctors and psychologists of the local public health centers who received specific information about the project and the inclusion criteria. After consensus was obtained, mothers were visited by a trained psychologist to verify through clinical interview and psychological assessment that at least one of the following inclusion criteria was satisfied: (1) age under 22 years; (2) single mother; (3) low family SES [family income under 13,125,90 euros (poverty threshold according to ISTAT for 2011); less than 10 years of education]; (4) high indexes of psychopathological symptoms assessed through standardized questionnaires [Global Severity Index, GSI  $>1$  at the Symptoms Checklist 90-R, (SCL 90-R; Derogatis, 1994) and/or Edinburg Postnatal Depression Scale (EPDS; Cox et al., 1987) score  $>9$ ] or being actually followed by the local public mental health services. Twenty-three mothers (57,5%) satisfied criteria for only one of the risk factors: 15 for psychopathological symptoms (37,5%), 3 for single parenting (7,5%), 3 for low family SES (7,5%), and 2 for young age (5,0%). In the remaining sample, 14 mothers (35,0%) satisfied criteria for two risk factors, and 3 (7,5%) for 3 risk factors. Eighty-seven percent of the contacted mothers accepted to participate in the study and drop out was 12%. Participants gave written informed consent for their participation in the study. The study protocol was approved by the local ethical committee.

### PROCEDURE

The protocol of the broader longitudinal study in which the participants were involved included several home visits of a trained psychologist for test administration, mother-child interaction observation and video recording. Measures of maternal risk factors used for the present study were collected during home visits at pregnancy and at child age three and six. Measures of mother-child relationship quality and child attachment security were taken during home visits at ages 12 and 18 months, respectively.

### Measures of psychosocial and socio-demographic risk factors

Maternal risk factors were considered both at a dichotomic and at a continuous level. (A) Dichotomic classifications of the mothers for low family SES, maternal psychopathology, young age and single parenting are described in the *Participants* section where the inclusion criteria are defined. (B) As continuous measures of psychosocial risk factors the following questionnaire scores were considered: the Four-Factor Index of Social Status (Hollingshead, unpublished manuscript) as a measure of family SES; the GSI of the SCL 90-R (Derogatis, 1994) and the EPDS (Cox et al., 1987) score as measures of maternal psychopathological symptoms.

### Emotional availability measure

Emotional availability in a subsample of 25 mother-child dyads was evaluated from 15-min of free-play at home interaction video-recorded continuously by a female filmmaker. A standard set

of age-appropriate toys was used and mothers were instructed to play with their children in their usual way, disregarding the observer presence. Observations were coded using the emotional availability scales (EAS): Infancy to Early Childhood Version (EAS 4th Edn; Biringen, 2008). These Scales consist of six dimensions concerned with emotional regulation in the parent–child dyad. Four dimensions address the EA of the parent in relation to the child (sensitivity, structuring, non-intrusiveness, and non-hostility), and two address the EA of the child in relation to the parent (responsiveness and involving). All scales range from 1 (highly emotional unavailable) to 7 (highly emotional available) points and scores are given based on seven subcategories. The Sensitivity scale assesses the parent's appropriate affectivity, acceptance, flexibility, clarity of perceptions, affect regulation, and variety and creativity in play displayed toward the child. Structuring assesses the degree to which the parent provides rules, regulations, and a supportive framework for interaction while appropriately scaffolding child play, exploration, or routine. Non-intrusiveness refers to the ability to be available for the child without being over-directive, over-stimulating, or overprotective. Non-hostility assesses the degree of hostility both in covert and overt forms. Responsiveness focuses on the child's interest in exploring on his or her own and in responding to the mother's bids (i.e., the balance between connection and autonomy) as well as on the extent of the child's enjoyment of the interaction. Involving of mother assesses the child's ability and willingness to engage the mother in interaction. The flexible nature of the Scales, which can be used with children from infancy to early childhood, and the choice of an ecological context of free-play with a standard toy set for pre-school children allowed us to use the same observational situation for all participants. Coding was carried out by two independent coders who were first trained on the EAS to obtain satisfactory interrater reliability with the codings the author of the EAS 4th edition and then between themselves. Interrater reliability [Biringen, 2005 was assessed using average absolute agreement intraclass correlation coefficients (ICC); McGraw and Wong, 1996] on 15% of the interactions coded, and ICCs ranged from 0.81 to 0.93.

### **Attachment security measure**

Child attachment security was measured using the Italian version of the Attachment Q-Sort (AQS; Waters, 1987; Cassibba and D'Odorico, 2009) applied at 18 months of child age by a trained observer after 2–4 home visits lasting ca 1,5 h each. AQS is a Q-Sort method to evaluate child security in relation to the quality of child secure-base behavior (Vaughn and Waters, 1990). The Italian version includes 90 items describing child behavior that the observer has to sort into nine piles according to similarity with the infant's behavior (Vaughn and Waters, 1990; Cassibba et al., 2000). By comparing this sorting with a composite description of the "hypothetically most secure infant" provided by experts in the field of attachment theory, a score for attachment security is obtained (Cassibba et al., 2000) that is thought to reflect the degree of similarity of the target child to the prototypical securely attached child (Teti and Ablard, 1989; Bretherton et al., 1989; Howes and Hamilton, 1992).

## **RESULTS**

### **PRELIMINARY ANALYSIS AND ANALYTIC PLAN**

Distributions of the dependent variables were examined for normalcy which was confirmed for all EAS and for AQS scores. As the EAS and the AQS are measures of theoretically associated constructs, bivariate correlation analysis was performed between AQS score and EAS scores in order to verify that these measures were in fact empirically associated in this study. Results, highlighting positive association between the AQS and two scales of the EAS: mother non-intrusiveness [ $r(36) = 0.38, p < 0.05$ ], and child responsiveness [ $r(36) = 0.40, p < 0.05$ ], constitute relevant confirmation of the validity of the instruments used to measure the dependent variables.

Bivariate correlation analyses were performed to check associations of AQS and EAS scores with the risk factors measured as continuous variables. Then, risk factors were considered in binary fashion and for each of them (young maternal age, single parenting, maternal psychopathology, family SES), separate ANCOVAs were performed with AQS and EAS scores as dependent variables, and each risk factor (present or absent) as between factor. Finally, the risk factors were aggregated into a three-level between factor (socio-demographic only, psychosocial only, both) which served as independent variable in further separate ANCOVAs with AQS and EAS scores as dependent variables. Participants were part of a broader intervention study either in the target or control group; as a precaution, group assignment was included as covariate in all the analyses of variance described above.

### **DESCRIPTIVE STATISTICS**

**Table 1** show the means and standard deviations of AQS and EAS scores for dyads with and without each risk factor and in the whole sample. **Table 2** shows descriptive statistics of AQS and EAS scores for dyads with socio-demographic risk factors alone, psychosocial risk factors alone, and with both kind of risk factors.

### **CORRELATIONAL ANALYSIS**

Results showed a positive correlation of mother's sensitivity [ $r(36) = 0.47, p < 0.01$ ], structuring [ $r(36) = 0.55, p < 0.001$ ], and non-hostility [ $r(36) = 0.38, p < 0.05$ ] with family SES. Correlation between family SES and AQS scores was within the moderate range but did not reach significance [ $r(40) = 0.33, p = 0.09$ ]. AQS and EAS scores were not significantly associated with measures of maternal psychopathology, i.e., SCL 90-R GSI and EPDS scores (**Table 3**).

### **GROUP COMPARISONS**

No significant differences were found in AQS and EAS scores of dyads differentiated according to the presence/absence of each of the risk factors as defined for the inclusion criteria. However, dyads presenting a low family SES had lower scores of maternal structuring and non-intrusiveness scores [ $F(1,34) = 3.13, p < 0.062$  and  $F(1,34) = 2.98, p < 0.07$ , respectively], compared to dyads who did not meet the criteria for this risk factor, but the results did not reach statistical significance.

**Table 1 | Attachment Q-Sort and Emotional Availability Scales.**

	Total Sample (N = 40)		Young maternal age				Single parenting				Psychopathological symptoms				Low family SES			
			Presence (N = 12)		Absence (N = 28)		Presence (N = 13)		Absence (N = 27)		Presence (N = 23)		Absence (N = 17)		Presence (N = 12)		Absence (N = 28)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Attachment Q-Sort	0.27	0.38	0.36	0.26	0.26	0.39	0.35	0.42	0.26	0.33	0.25	0.33	0.34	0.39	0.15	0.41	0.35	0.33
Sensitivity	5.10	0.97	5.00	0.87	5.29	0.98	5.44	0.98	5.10	0.93	5.29	0.97	5.05	0.91	5.06	1.07	5.26	0.89
Structuring	4.82	1.15	4.61	1.41	5.18	0.89	5.25	0.71	4.90	1.21	5.15	0.93	4.77	1.31	4.61	1.34	5.18	0.93
Non-intrusiveness	5.17	0.80	5.22	0.51	5.34	1.00	5.13	0.92	5.38	0.86	5.50	0.88	5.00	0.78	5.11	0.93	5.39	0.84
Non-hostility	5.69	0.89	5.56	0.85	5.82	1.03	5.94	1.12	5.65	0.92	5.76	1.00	5.68	0.96	5.83	1.03	5.68	0.96
Responsiveness	5.15	0.93	5.28	0.62	5.26	1.14	5.25	0.93	5.28	1.03	5.35	1.07	5.14	.87	5.17	0.94	5.32	1.03
Involving	4.88	1.20	4.89	0.74	5.11	1.24	5.00	1.23	5.05	1.08	5.18	1.19	4.82	0.96	5.06	1.18	5.03	1.09

Scores in all dyads and for each risk factor: young age, single parenting, psychopathological symptoms, and low family SES.

A significant difference was found between dyads with different type of risk factors (socio-demographic only, psychosocial only, both),  $F(2,37) = 3.26, p < 0.05, \eta^2 = 0.31$ . *Post hoc* test showed that attachment security was higher in dyads with demographic risk factor only compared to dyads with both demographic and socio-psychological fragilities, whereas attachment security of children in dyads presenting only psychosocial risk factor did not differ significantly from the other two groups. ( $p < 0.02$ , Bonferroni Correction for multiple comparisons; **Table 2**).

## DISCUSSION

Among several influential variables, parents can be considered the “final common pathway” for children development, growth and adaptation (Bornstein, 2002). Specifically, the quality of mother–child interaction and attachment are key determinants of child social emotional adaptation and cognitive development (Bowlby, 1969; Ainsworth et al., 1978; Belsky and Pasco Fearon, 2002; Bernier and Meins, 2008). Different risk factors can affect mother–child relationship resulting in negative children outcomes as demonstrated by a strong body of research (Sameroff, 1998; Choe et al., 2013). Psychosocial risk factors, such as low family SES and maternal psychopathology, and socio-demographic risk factors, such as very young maternal age and single parenting, are among the most theoretically relevant and empirically investigated risk conditions. Although results of this line of research are substantially coherent in identifying the detrimental effect of each factor, they also point out to a complex cumulative model of risk according to which a single factor may not be influential itself whereas its predictive value might be moderated by the association with other risk conditions or by its degree of intensity (Belsky, 1984; Greenberg et al., 1993; Lyons-Ruth et al., 1993; Hubbs-Tait et al., 1996). Several intervention programs have been developed for at-risk families and some have shown positive effect on mother–child relationship quality (Bakermans-Kranenburg et al., 2003) reducing the impact of risk factors on mother and child psychological health (Kohlhoff and Barnett, 2013). Starting from the above considerations, this study aimed at investigating the effect of psychosocial and socio-demographic risk factors on mother–child EA, measured with the EAS at 12 months of child age and child attachment security, measured with the AQS at 18 months of child age, in at risk dyads living in Northern Italy. Specifically, we focused on low family SES, maternal psychopathology, young maternal age and single parenting considered both at a continuous (where appropriate) and at a dichotomic level in order to investigate the contribution of each factor as well as the potential additive effect of more factors on mother–child relationship measures. We had a set of specific hypotheses: we expected 1) that intensity of each risk condition would show modest negative association with mother–child EA and child attachment security. Also, we hypothesized 2) to find no differences in our dependent variables between dyads differentiated according to the presence/absence of each of the risk factor, but we expected 3) socio-demographic risk factors to show a smaller effect on EA and child attachment security than psychosocial risk factors or the combination of the two type of fragility. Preliminary analyses of the selected measures validity verified positive association between some maternal and child EA scales and AQS score.

With respect to our first hypothesis, we found that in our sample the level of family SES was significantly positively associated with different dimensions of maternal EA, namely sensitivity, structuring and non-hostility. Mothers with a higher socioeconomic level recognize and respond more appropriately to child signals, structure the interaction in a way that better foster child play and exploration and are more able to limit their display of negative emotions during interaction. The positive association between SES and the quality of mother interactive behavior measured in similar and different ways has been observed in previous studies (Rosen et al., 2003; Aviezer et al., 2003; Evans et al., 2005; Tarabulsky et al., 2005) and attributed to higher cognitive, emotional, material, and social resources that characterize high compared to low SES families. The association between family SES and child attachment security at 18 months did not reach significance but the coefficient was in the moderate range and the small  $n$  of our sample may have reduced the power of our analyses. Such association has been reported in previous studies (Lyons-Ruth et al., 1991; NICHD Early Child Care Research Network, 1997; van IJzendoorn et al., 1999) with some notable exceptions (Spieker and Booth, 1988). We also found maternal age to be positively associated with mother EA and specifically to mother structuring and non-hostility, in line with previous studies demonstrating that compared to older mothers, younger mothers show more limited knowledge about childrearing and child development, lower confidence in their parenting skills (Bornstein and Putnick, 2007) and a less emotionally available interactive style (Pomerleau et al., 2003; Gazzotti et al., 2010). Instead, no association was found between maternal age and child attachment security. Surprisingly, our measures of maternal psychopathology, i.e., SCL-90-R and EPDS (at 3 and 6 months of age respectively), showed no associations with either mother–child EA and child attachment security. Yet, psychopathological symptoms of the mother, and depression in particular, have been repeatedly reported to predict negative outcomes terms of maternal sensitivity and child attachment security though highlighting only moderate association (van IJzendoorn et al., 1999; Atkinson et al., 2000). Our findings might be explained by the small inter-subject variability in questionnaire scores of a sample including only mothers at risk for socio-demographic and/or psychosocial risk factors.

As expected, according to our second hypotheses, in our sample of at-risk mother–child dyads we did not find any effect of the single risk factors considered in a binary fashion, i.e., in terms of presence or absence, on either EA and attachment security, with the exception of the tendency of mothers with low SES to display lower structuring and non-intrusiveness which, however, did not reach significance. With respect to our third hypothesis, when we explored the effect of the type of risk factors by aggregating them into a three level variable, i.e., comparing dyads with socio-demographic risk factors only (young maternal age and/or single parenting), those with psychosocial risk factors only (low family SES and/or maternal psychopathology) and those who had both type of risk factors, results highlighted higher attachment security in children of mothers with socio-demographic risk factors only compared to those with both kinds of risk conditions, with attachment security level of children with psychosocial risk

**Table 2 | Descriptive and inferential statistics for Attachment Q-Sort and Emotional Availability Scales scores for type of risk factors.**

	Socio-demographic risk only (N = 10)		Psychosocial risk only (N = 19)		Both risk factors (N = 11)		F(2,37)	p
	M	SD	M	SD	M	SD		
Attachment Q-Sort	0.35	0.40	0.24	0.38	0.06	0.37	3.26	0.03
Sensitivity	5.42	0.86	5.21	0.89	5.00	1.13	1.46	0.25
Structuring	5.33	0.88	5.18	0.91	4.44	1.40	2.09	0.13
Non-intrusiveness	5.42	0.59	5.39	0.96	5.06	0.90	1.71	0.19
Non-hostility	5.92	0.97	5.75	0.92	5.56	1.15	1.30	0.30
Responsiveness	5.58	0.67	5.21	1.16	5.13	0.92	0.94	0.44
Involving	5.17	0.75	5.07	1.19	4.88	1.25	1.39	0.27

**Table 3 | Bivariate correlations of AQS and Emotional Availability Scales scores with family SES, maternal age, SCL 90-R (GSI), EPDS.**

	AQS	Sens.	Structure	Non-intr.	Non-host.	Resp.	Invol.
Age	-0.10	0.33	0.50**	0.25	0.35*	0.19	0.30
SES	0.33	0.47**	0.55**	0.30	0.38*	0.29	0.30
SCL 90-R	0.12	0.09	0.11	0.00	-0.08	-0.05	-0.22
EPDS	-0.13	-0.16	-0.25	-0.04	-0.08	-0.06	-0.05

Significance: \* $p < 0.05$ , \*\* $p < 0.01$ . Sens(itivity); Struct(uring); Non-intr(usiveness); Non-host(ility); Resp(onsiveness); Invol(ving).

factors only somehow in the middle. Although, AQS does not allow to classify secure vs. non-secure children, when looking at previous studies, it becomes evident that mean scores of children in dyads with socio-demographic risk only are surprisingly similar to those of the no-risk typical sample used in a study of AQS reliability and validity in the Italian population (Cassibba et al., 2000). Altogether these findings speak in favor of classical approaches to psychological development of children living in at-risk families according to which the predictive value of each factor is moderated by its intensity and by the co-occurrence of other specific risk conditions (Belsky, 1984; Greenberg et al., 1993; Lyons-Ruth et al., 1993). Also, these findings are consistent with theoretical models (Belsky, 1984) and psychometrics evidences (Markon et al., 2011) according to which considering risk variables in a binary, instead of continuous, fashion might lower the possibility to describe the risk conditions in a valid and complete way (McCabe, 2014).

A crucial limitation of the present study concerns the sample size and the small *ns* of the subgroups of dyads satisfying each selected risk criterion or a specific association of criteria; a wider sample would allow more sophisticated and informative analyses to identify the contributing role of each single risk factors as well as their reciprocal additive effects. Moreover, the inclusion of other theoretically relevant variables, such as child temperament and maternal attachment security would enrich the study in terms of deepening our understanding of the effects of the selected risk factors on mother-child relationship and attachment. Nevertheless, the results of this study may have some important implications for the selection of inclusion criteria for prevention programs

that promote emotionally available caregiving and secure attachment in at-risk families, at least within the target geographical area. In our sample, dyads with co-occurring socio-demographic and psychosocial risk factors show the lowest level of attachment security suggesting that they might be the most urgent targets for prevention intervention programs, whereas dyads with socio-demographic risk factors alone appear to be less in need of such intervention. Moreover, looking at risk factor intensity, we found that family SES and maternal age were positively associated with maternal EA, suggesting that mother-child dyads displaying low family SES or very young maternal age might deserve special attention for the risk of emotionally unavailable and undesirable interactive style.

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