UNIVERSITÀ DEGLI STUDI DI PADOVA

Dipartimento di Psicologia dello Sviluppo e della Socializzazione

Corso di Laurea Magistrale in Psicologia Clinica dello Sviluppo

Tesi di Laurea Magistrale

Perinatal maternal anxiety and the quality of mother-child interactions in IUGR dyads

Relatrice

Prof.ssa Alessandra Simonelli

Correlatrice

Dott.ssa Chiara Sacchi

***Laureando**:* Ludovico Pareti

***Matricola**:* 2052347

Anno Accademico 2022/2023

TABLE OF CONTENTS

INTRODUCTION

Pregnancy is a delicate period in a woman's life, as she faces several changes, both physical, as her body prepares to accommodate the intrauterine development of the fetus, and psychological, related to the thought of the arrival of a child. The early postpartum months, however, also constitute a period in which maternal responsibilities to an individual initially totally dependent on her rise, and the possible challenges to be faced relative to building a healthy mother-child relationship increase. Therefore, the perinatal period constitutes a phase of life in which representations about oneself and the child change, a phase that may result in greater stress, which could have an impact on the mother's mental and physical well-being and mental health, possibly affecting the child's development. Besides, the quality of fetal development lays the foundation for later neurodevelopment and programs the risk of disease throughout life. Having an adverse pregnancy experience increases the risk of adverse perinatal and postnatal outcomes, and the mother's vulnerability with respect to her own well-being; however, the relationship between maternal mental health and fetal development is bidirectional, hence, it is possible that these two factors influence each other.

Therefore, both intrauterine developmental conditions and maternal mental health in the perinatal period influence the child's subsequent development in different domains.

Considering the above, this thesis aims to investigate the differences in prenatal and 4-month postpartum maternal anxiety between women who had a pregnancy with intrauterine growth retardation (IUGR), which is considered an adverse prenatal experience, and women with an uncomplicated physiological pregnancy, and proposes to study the differences in the interactive patterns of mothers and infants at 4 months postpartum between the IUGR and non-IUGR dyads. Finally, it was tested whether, within the sample of this study, IUGR condition and prenatal maternal anxiety, respectively, were able to predict the quality of mother-child interaction.

In the first chapter, the theoretical framework of the study is presented. First, IUGR is defined and conceptualized, and the prenatal mechanisms by which its subsequent development might be influenced are described, with the focus on the socio-emotional domain. Continuing, the main aspects of the construction of the mother-child relationship and of child development are described with reference to the quality of dyadic interactions, and the construct of emotional availability, an intrinsic aspect of interactive exchanges through which its quality can be assessed, is outlined. Additionally, the interactional context of IUGR dyads is outlined and maternal mental health is introduced as it is associated with both the

interactive (social-emotional and behavioral) development of the child and the IUGR condition. Finally, maternal perinatal anxiety and its possible consequences on the child's development and the interactive patterns of both dyad members are defined.

The second chapter describes our research, part of a longitudinal study implemented by the Department of Developmental Psychology and Socialization (DPSS) of the University of Padua in collaboration with the Department of Women's and Children's Health within the Obstetric-Gynecological Clinic of the University of Padua Hospital. This chapter represents a scientific paper in which the objectives, hypotheses, and research methods, thus the procedures and materials used in the study, are defined. Secondly, the results obtained are first described and then discussed, the strengths and limitations of this dissertation are explained, and, finally, conclusions and future research directions are presented.

CHAPTER 1. IUGR IN THE INTERACTIVE DIADIC CONTEXT AND ITS RELATIONSHIP WITH PERINATAL MATERNAL ANXIETY

1.1. INTRAUTERINE GROWTH RESTRICTION (IUGR)

Adverse experiences early in development, particularly during intrauterine life underlie multiple health outcomes and disease in adulthood (Barker, 2004). According to Barker's "Developmental Origins of Health and Disease" hypothesis (DOHaD; Barker, 2004) fetal programming (quality of fetal development) shapes individual differences in chronic disease risk across the life course. A series of epidemiological studies on infant mortality and in the adult population led the author to the formulation of the hypothesis that prenatal adversity, through permanent physiological and metabolic changes (i.e., altered fetal nutrition, increased glucocorticoid exposure, and alterations in genetic and epigenetic linkages), have a programming effect on childhood neurodevelopment (Barker, 2004).

The hypothesis (DOHaD) that neurodevelopment has a fetal origin emphasizes the importance of fetal growth and maternal well-being during pregnancy in individual differences regarding vulnerability with respect to mental health (Swanson & Wadhwa, 2008; Talge et al., 2007). From a greater understanding of the processes underlying the effects due to "fetal programming", Gluckman and Hanson hypothesize that the fetus, in response to changes in the intrauterine environment, makes immediate adaptations aimed at improving its survival condition. These fetal adaptations are usually reversible, but the moment intrauterine changes persist for a long time, the fetus is forced to adapt irreversibly, with effects that may be beneficial in the immediate term, but harmful in the long term, as is the case, for example, in IUGR pregnancies (Gluckman & Hanson, 2006).

1.1.1. Definition and conceptualization of IUGR

Intrauterine growth restriction (IUGR) is complex obstetric problem described as a fetal growth retardation resulting on ultrasound in an estimated fetal weight below the 10th percentile for gestational age (Alfirevic & Neilson, 1993), a pregnancy complication defined by the inability of the fetus to reach its biologically determined growth potential in utero, due to nutritional abnormalities (ACOG, 2019). IUGR is an important public health clinical problem, with a prevalence between 5% and 7% of pregnancies is the second leading cause of perinatal mortality and morbidity worldwide after prematurity (Murray et al., 2015) and the risk of stillbirth for IUGR fetuses is five to ten times greater than for Appropriate for

Gestational Age (AGA) fetuses (Gardosi, Clausson & Francis, 2009) resulting in approximately 50% of fetal deaths (Zamarian, Cruz & Nardozza, 2018), where an increased risk is directly related to the severity of growth restriction (Bernstein et al., 2000; Piper et al., 1996; Resnik, 2002; Seeds & Peng, 1998; Shankar et al., 2002). Moreover, approximately 10% of perinatal mortality is associated with Intrauterine Growth Restriction (Richardus et al., 2003). The inability of the fetus to reach its genetic potential during intrauterine growth is a risk factor for developmental outcomes (Baschat, 2011; Kok et al., 2007).

The most widely used parameter for identifying IUGR fetuses is a fetal weight estimation (EFW) (Gordijn et al., 2016). A fetus with estimated weight or birth weight lowest 10th percentile (LBW; low birthweight) is defined as Small for Gestational Age (SGA) (Battaglia & Lubchenco, 1967). Although SGA fetuses are associated with poor perinatal outcomes, the IUGR condition is a different concept (Altman & Hytten, 1989; Ott, 1993; Soothill, Bobrow & Holmes, 1999), however several studies still adopt SGA definition in reference to IUGR. A new conceptualization of neonatal vulnerability has led to the definition of small vulnerable newborn (SVN), encapsulating LBW, SGA, and preterm birth under a unique term that can explain the increased risk of such individuals to neonatal death and adverse conditions in development and adulthood (Ashorn et al., 2023). This new, unified definition allows neonatal vulnerability to be studied in its entirety with the aim of planning increasingly accurate prevention interventions during pregnancy, with positive effects on maternal mental health and child development. IUGR infants, being also babies born SGA and, in some cases, preterm SGA, belong to SVNs.

There are several factors that, even in combination, can cause IUGR; the main categories are: genetic, fetal, maternal, and placental (Sharma et al., 2016).

1.1.2. Developmental programming and neurological and growth outcomes in IUGR

The developmental outcomes of the child born with Intrauterine Growth Restriction are the combination of genetic factors, for which the IUGR condition implies an adverse prenatal experience, and environmental factors (especially from birth: care, postnatal experiences, social factors) which, assuming a neuroconstructivist perspective (Karmiloff-Smith, 1994) whereby development follows a probabilistic (not deterministic) trajectory, favor the "happening or not happening" of certain processes, individually characterizing each child's development. According to the neuroconstructivist approach, in fact, development is not predetermined, but is the effect of a continuous bidirectional exchange between the

characteristics of the individual (internal world) and the environment, thus the different contexts in which finds itself (external world). Atypical development is an epigenetic process of adaptation based on change, aimed at the best possible expression of its own genetic potential.

The IUGR fetus, experiencing a risk intrauterine condition for survival, enacts a brain-sparing mechanism that could reflect the compensatory processes. Indeed, early brain hemodynamics through increased oxygen supply is directed to the frontal lobes, mainly to higher cognitive functions (Cohen, Baerts, & van Bel, 2015), however, given the prolonged shortage of energy resources, some developing neuronal processes might shift their preference toward brain connectivity, although this produces alterations in connections associated with important cognitive and behavioral aspects (Batalle et al., 2018). Therefore, fetal adaptations of IUGRs momentarily ensure survival but program long-term neurocognitive developmental outcomes. IUGR individuals, compared to AGA peers, are known to have a higher incidence of poorer developmental outcomes in the cognitive (Sacchi et al., 2020), social-emotional, and behavioral domains (Murray et al., 2015).

IUGR individuals have a higher risk than their AGA peers of having adverse outcomes both in the perinatal period and in the long term, and the risk is increased when such individuals are born prematurely (Pena, Teberg & Finello, 1988). In addition to the increased likelihood of neonatal mortality (mentioned earlier), the most common prenatal outcomes of IUGR mainly involve medical conditions related to complications of pregnancy (e.g., infections in utero), genetic alterations (i.e., chromosomal abnormalities), and metabolic abnormalities (Brodsky & Christou, 2004). During childhood, on the other hand, outcomes may be of different types, such as, for example, area pathway impairment (Pike et al., 2012; Rona et al., 1993), and probably depend mainly on individual differences and life context, in addition to differences in the etiology and definition of IUGR, age, possible perinatal complications, and a wide variety of postnatal environmental factors (Hay et al., 1997; Leitner et al., 2007; Sacchi et al., 2020). A favorable long-term prognosis is related to fetal tolerance of labor, mild growth restriction, delivery date, quality of neonatal care, and adequate head circumference growth (Berg, 1989; Crosby, 1991; Fang, 2005; Lin et al., 1991; Sharma et al., 2016). The worst outcomes are usually observed when growth restriction is early (Harvey et al., 1982; Parkinson et al., 1981), when umbilical arterial flow is altered (Vossbeck et al., 2001; Wienerroither et al., 2001), the IUGR condition is severe (Hawdon et al., 1990), and in individuals born preterm (Sung, Vohr & Oh, 1993). IUGR infants born preterm have a

higher incidence of short stature than IUGR infants born at term (Leger et al., 1997; Strauss & Diez, 1997), in any case, most IUGR infants exhibit increased growth velocity in the postnatal period followed by growth recovery by 3 years of age (Karlberg et al., 1996; Lee et al., 2003; Leger et al., 1997). Only a subgroup comprising about 10% of children born IUGR remains more vulnerable to growth problems because of poor nutritional reserves due to feeding difficulties (Lee et al., 2003; Steward, 2001).

Regarding the course of IUGR into adulthood, several epidemiological studies have shown that suboptimal growth in utero may predispose to specific diseases due to undernutrition during intrauterine life and in childhood, following the fetal programming hypothesis (Barker, 2003), such as hypertension (HTN), coronary artery disease (CAD), and type 2 diabetes (Barker & Osmond, 1986); the risk of adult disease resulting from fetal programming depends on the interaction between an individual's genetic make-up and nutritional, metabolic, and hormonal cues during fetal life and the early years of life, periods during which weight, height, and body mass index need to be especially monitored in order to avoid unfavorable long-term outcomes in individuals with Intrauterine Growth Restriction.

1.1.3. Social-emotional and behavioral development of IUGR individuals

The influence of fetal adaptations on development is conditioned by postnatal environmental factors; the quality of parental care and parent-child interactions are the variables that most affect child development (Belsky & Fearon, 2002; De Wolff & Van Ijzendoorn, 1997). In the study by Nichols, the developmental vulnerability of IUGR was analyzed in relation to the quality of maternal care. According to the authors, fetal ontogenetic adaptations in response to adverse conditions in intrauterine life predispose IUGR individuals to adapt to certain environmental challenges; moreover, maternal sensitivity in the context of care has positive effects on adulthood outcomes of IUGR individuals. This study demonstrates how IUGRs are not only vulnerable to adverse developmental outcomes and that individual differences among IUGR individuals and differences across domains of individual subject development can be explained from a combination of individual factors (vulnerability to the environment-child characteristics) and environmental factors (quality of care and interactions-environmental characteristics), which help determine the singular developmental pathway for each individual (Nichols, 2017).

In general, adverse prenatal experiences , such as the IUGR condition, reflect an increased vulnerability during development in extrauterine life to adverse environmental

characteristics. Such experiences could, in addition, reflect greater vulnerability to positive features of the extrauterine environment as well (Nichols et al., 2020), but this currently debated issue still lacks clear evidence and definite answers. Social-emotional development has its foundations in the caregiver-child relationship, which is characterized by daily dyadic interactions. The atypical characteristics of children belonging to a vulnerable developmental background (Porreca et al., 2018; Salo et al, 2009; Wan et al, 2013), as in the case of IUGR, may negatively affect the quality of parental care, consequently affecting the quality of dyadic exchanges (Kiff et al., 2011), within which parents may experience greater difficulties than parents of normotypical children. Parenting and parental care are the most impactful factors on a child's brain and behavioral development, and the quality of interactions with primary caregivers plays a critical role in healthy social-emotional development (Feldman, 2012; Tronick, 2007).

1.2. QUALITY OF DYADIC INTERACTIONS

1.2.1. Main aspects of dyadic relationships

The mother-child relationship is a bidirectional relationship characterized by dyadic interactions, in which the child is an active subject capable of learning and acting in the world, showing from the first weeks of life an innate predisposition to seek social stimuli and to share affections and experiences with the other (Lavelli, 2007; Meltzoff & Moore 1997; Trevarthen, 1998). The studies of Castiello et al. and Partanen and colleagues highlight how intersubjectivity, namely the sharing of subjective states by two or more people (Trevarthen & Aitken, 2001), and the sense of relationship arise before coming into the world in the womb, where the establishment of the relationship with the mother begins and the first knowledge of the world is made (Castiello et al., 2010; Partanen et al., 2013). According to "innate intersubjectivity" theories (Trevarthen, 1974, 1979, 1998; Trevarthen & Aitken, 2001; Tronick, 1989), children are born with a specific predisposition to receive and be aware of the mental states of others (Trevarthen & Aitken, 2001; Tronick, 1989), are motivated to communicate (Bushnell, 2001; Meltzoff, 2002; Meltzoff & Moore, 1997) and are able to signal a need through innate behaviors, designed to call the adult to provide them with the necessary care and sustenance (Schaffer, 1996). In addition to these socio-communicative skills, infants already have a self-regulatory capacity through which they are able to modulate their own affective and psychobiological states (Field, 1977; Spitz, 1965; Stern, 1974), enabling them to organize behavioral states as sleep and alertness and biopsychological

processes as attention, arousal, body temperature, hunger, moods and social engagement (Gianino & Tronick, 1988; Tronick, 2004, 2007). These self-regulatory abilities are initially immature and limited; it's the caregiver who has a crucial role, through his or her regulation, in supporting the development of child's self-regulatory and interactive regulation abilities (Beeghly & Tronick, 2011).

According to Tronick's Mutual Regulation Model (MRM), the infant and his or her caregiver are components of a broad dyadic regulatory system, in which members of the dyad influence each other in a continuous and circular manner through verbal and non-verbal communication (Tronick, 1989), in order to achieve reciprocity and the sharing of intentions and meanings, by affectively attuning to each other (Beebe & Stern, 1977; Brazelton et al, 1975; Gianino & Tronick, 1988). Therefore, within the care context, dyad is engaged in the regularization of basic processes (e.g., feeding and sleep-wake cycle), whose the cyclical nature allows exchanges centered on alternating shifts, similar to what happens in adult communication (Schaffer, 1996); it is between 7 and 15 weeks of life that "primary intersubjectivity" is fully developed, that's the capacity for active and conscious understanding of the other's communicative intentions (Trevarthen, 1979) and awareness of the sense of relationship (Trevarthen, 1993), which manifests itself through proto-conversation, dictated by exchanges of pauses, rhythms, facial expressions and sounds emitted. These exchanges occur in the mother-child relationship, but also in interactions between two infants (Trevarthen & Aitken, 2001). From acquisition of primary intersubjectivity, a form of cooperative and "triangular" intersubjectivity, termed "secondary intersubjectivity" develops from 9 months onwards, whereby the child is aware of the feelings and intentions shared in the relationship with the caregiver, with whom, during daily exchanges, attention is coordinated and shared towards an object, an event, or an action ("person-person-object relationship") (Trevarthen, 1993, 1998; Trevarthen & Hubley, 1978). Within these exchanges, in which infants may experience moments of intense emotional sharing (Beebe & Lachmann, 2002), the processes of self-regulation and interactive regulation are mutually integrated, simultaneous, and reciprocal, as each member of the dyad must regulate its own internal state by coordinating with the internal state of the other (Beebe & Lachmann, 2015). This process of co-regulation, namely a continuous mutual adaptation of the dyad, allows the infant to initiate, maintain, modify, terminate, or avoid interactions (Beebe et al., 2010) and fosters the consolidation of specific interactional patterns through the sharing of activities and emotional states (Fogel, 1993), contributing to the implicit acquisition of relational knowledge and ways of being together

with the other people (Tronick et al., 1979; Tronick, 2002). Moreover, in optimal situations, it can lead to increased complexity of thought in child's mental states (Tronick, 2005). Caregiver's sensitivity in modulating his or her own behavior towards the child, based on the child's willingness to interact, contributes to the establishment of the dyad's reciprocal regulation process (Beebe & Lachmann, 2002). However, in typical social interactions states of reciprocity alternate with moments of mismatch, where the lack of coordination may be due, for example, to misreading of other people's signals, to behavior considered wrong and to difference in partners intentions (Cohn & Tronick, 1988). In most cases (about 70%) states of mismatch last no more than two seconds, as people have the tendency to want to regain a state of reciprocity, which occurs through a communicative and affective repair. Typical interactions, therefore, are characterized by alternating moments of coordination and mismatch that are followed by repairs acted upon actively and simultaneously by dyad partners (Tronick & Beeghly, 2011; Tronick, 2007). Interactive repairs are central to regulation skills development, promoting the use of efficient coping strategies to cope with stress (Tronick, 1989; Tronick et al., 1978).

1.2.1.1. Emotional availability

Together with the ability to tune in and share the emotional states experienced within mother-child interactions (Stern, 1985), maternal emotional availability (EA, Biringen, 2000) is a fundamental aspect of dyadic affective communication, especially during the first year of life (Riva Crugnola, 2007). The term "emotional availability" was first used, with different meanings, by Mahler, Pine and Bergman to describe the mother's supportive presence during child's exploration of the environment (Mahler, Pine & Bergman, 1975) and later by Emde, in reference to adult's “receptive presence” (also in the patient-therapist relationship) understood as physical presence, emotional signaling and reception, awareness of the other's signals and acceptance of positive and negative emotions (Emde, 1980, 2000).

Emotional availability, a cyclical and relationship-specific construct, is the dyad's capacity for emotional sharing, through experiencing and sharing emotional states within a healthy and mutually satisfying relationship (Biringen & Easterbrooks, 2012). The construct, embedded within a dyadic-relational perspective with respect to interactions and observable through the Emotional Availability Scales (EAS, Biringen, 2000, 2008) highlights how the adult's behavior in turn depends on and influences child's behavior within that specific relationship; emotional availability is not a stable individual trait, but a variable one within

relationships (Biringen & Easterbrooks, 2012). Emotional availability could be considered as the "good repair capacity" of the relationship with the child after a conflict (Biringen, 2009) and as the "connective tissue of healthy social-emotional development" (Easterbrooks & Biringen, 2000).

It is possible to assess dyadic emotional availability (through EAS scales) in different contexts (naturalistic, laboratory, medical) and in various situations, such as free play, semi-structured situations (Biringen, Damon et al, 2005; Biringen, Fidler et al, 2005; Biringen, Skillern et al., 2005; Dolev et al., 2009) or more structured and more stressful situations (Easterbrooks et al., 2012; Kogan & Carter, 1996). In addition, assessment can be performed longitudinally through multiple observations over time to permit investigation of, for example, the interactional development of a specific population of individuals over a specific time frame, observing changes even at close range. Observation of dyadic exchanges can also be useful in clinical practice as an adjunct to assessment and aid in treatment (e.g., therapeutic parenting) (Biringen et al, 2014; Biringen & Easterbrooks, 2012).

Through the construct of emotional availability, which encapsulates the characteristics of interaction, it is therefore possible to assess the quality of adult-child exchanges, which is expressed in the typical interactive patterns enacted by dyad members daily (Biringen, 2009). The observation of an interactive moment of at least 15-20 minutes (Biringen, 2008) reflects the dyad's habitual modalities of interaction; these modalities are indicative of the two members' way of being in relationship (Biringen, 2009).

1.2.2. Child development in the interactive context

The quality of the parent-child relationship, particularly the first meaningful caregiver-child relationship (usually mother-child), characterized by daily interactions, has a strong impact on the psychological and physical child development (Bornstein, 2002). Several studies have highlighted the value of caregiving quality, expressed through the care and support needed to reach developmental milestones (Brinker et al., 1994), in socio-emotional (Cowan et al., 2005) and cognitive development (Bornstein & Tamis-LeMonda, 1989; Landry et al, 2006; Dexter et al., 2013) and in the promotion of secure attachment bonding (De Wolff & van IJzendoorn, 1997; Nievar & Becker, 2008), which in turn is associated with positive outcomes in several developmental areas (Bar-Haim et al., 2000; Vondra et al., 2001; Belsky & Pasco Fearon, 2002; Bernier & Meins, 2008; Dexter et al., 2013).

More specifically regarding social-emotional development, within the mother-child relationship, first social context in which newborns learn to be in relationships, the quality of exchanges influences the child's ability to emotionally and behaviorally self-regulate (Leerkes, Blankson, & O'Brien, 2009); children's ability to regulate their emotions is associated with lower levels of anxiety, depression, and aggression (e.g., Suveg & Zeman, 2004) and optimal relationships with peers (Contreras et al. , 2000). Overall, a higher quality of the mother-child relationship implies a lower risk of internalizing and externalizing problems and more prosocial child's behaviors (Fearon et al., 2010; Pallini et al., 2014; Van Der Bruggen et al., 2008) and often, in relationships where there is a good dyadic interactive quality, self-esteem and perceived competence, essential components of the sense of self are promoted (Grolnick et al., 2007). In addition, dyadic measures of mother-child interactions are predictive of the child's social-emotional functioning (Aksan et al., 2006; Feldman, 2003; Kochanska et al., 2005).

Regarding the construct of emotional availability within caregiver-child relationships (particularly for the mother-child dyad), numerous studies have shown that is predictive of a wide range of child developmental outcomes (Saunders et al., 2015): it's significantly correlated with child attachment in terms of bond security (Easterbrooks & Biringen, 2000) and is associated with children's emotional and behavioral regulation (Martins et al., 2012), specifically: high levels of EA are related to greater emotional control under stressful conditions (Little & Carter, 2005) and high levels of adult sensitivity predict better regulation in very inhibited children in stressful social situations (Kertes et al., 2009). Associations have also been found between emotional availability and sleep state regulation both on the maternal side, which is positively associated with sleep quality between birth and 24 months (Teti et al., 2010), and on the child's EA side, whereby high levels of responsiveness and involvement during interactions predict more nighttime awakenings (Scher, 2001).

In addition, dyadic emotional availability has influence on language and social development. In self-perception, greater infant EA (especially in child responsiveness scores) is associated with early recognition of self in the mirror, indicative of an infant's emerging sense of self (Harel et al., 2002), while maternal EA (particularly high non-hostility) is positively associated with social-cognitive development at 7 months, interpretation of others' behaviors as goal-oriented (Licata et al, 2014) and, taking into account only the dimensions of adult sensitivity and structuring, EA is associated with greater child obedience toward caregiver demands (Ainsworth et al., 1978; Lehman et al., 2002). Maternal sensitivity and structuring

measured at 3 years are predictive of pretend play and social skills during kindergarten (Howes & Hong, 2008). Instead, maternal emotional availability at 15 months predicts language, cognitive, social engagement, and empathy development towards the mother at 2 years (age-appropriate skills) and maternal EA at 2 years is predictive of empathy towards adult figures external to the relationship at 4 years (Moreno et al., 2008). Finally, caregiver-child emotional availability predicts internalizing and externalizing behavior's problems in pre-school age (Kang, 2005) and higher it is, more socially competent the child will be and the fewer problems related to the transition to kindergarten; specifically, adult sensitivity and structuring and child responsiveness and involvement assessed at pre-school predicted low levels of victimization and/or aggression and fewer internalizing and externalizing symptoms (Biringen et al., 2005).

1.2.3. The interactive context of IUGR dyads

It has been observed that IUGR infants, particularly those born prematurely (also in comparison with preterm AGA infants) (Feldman, 2007), have greater difficulty orienting themselves to their social and non-social environment and have a tendency to look at others less frequently than their peers (Watt, 1990) and also, within social interactions, show signals that are difficult to interpret (ambiguous to parents), for example: they smile less and look less at each other's faces, they tune in to each other more hardly, they are less rhythmic and more passive (Feldman & Eidelman, 2006), they use environmental stimuli less and they cry more hostilely (Figueras et al., 2009), showing frequent state changes (Feldman, 2007), as well as exhibiting higher levels of negative affectivity (Watt, 1987, 1989; Watt & Strongman, 1985b). In general, IUGR children show behavioral impairments, particularly at the level of attentional skills, organization of their internal states, and social interactional modes (Cruz-Martinez et al, 2009), and IUGR children born preterm also score significantly lower on the neurobehavioral assessment, more specifically on the attentional-interactive system (Tolsa et al., 2004) and showing more autistic traits (Sacchi et al., 2021); they also obtain scores that reflect poor adaptive skills (Padilla et al., 2011). In the study by Mello and collaborators, SGA children, thus including IUGR subjects, were observed and described as more avoidant and irritable, less helpful, and less responsive to the environment; their interactive patterns were atypical in relation to the control group (Mello et al., 2014). It has been observed that the interactive and social-emotional difficulties that characterize IUGR dyads persist for the

first 2 years of life, in which children show delays in language skills (Savchev et al., 2013) and social interaction skills (El Ayoubi et al., 2016).

Literature regarding the social skills of IUGR individuals at later ages is still quite poor, and the results obtained from studies are contradictory among themselves. Similar to the interactions of premature infants (greater focus when both IUGR and prematurity conditions are present), the atypicality of communicative signals of IUGR infants may activate compensatory behaviors in parents (Miles & Holditch- Davis, 1995; Montirosso et al., 2017), aimed at being adaptive in the context of child care, but which may result in intrusive behaviors that are not attuned/coordinated with their child's signals (Howe et al, 2016); mothers of IUGR children show higher levels of intrusiveness, compared to mothers of AGA children, during interactions with their child (Feldman & Eidelman, 2006; Gorman et al., 2001; Van Beek et al., 1994; Watt, 1986), and such high levels of maternal intrusiveness can be impactful on child development (Feldman & Eidelman, 2006). Although data on the father-child relationship are not numerous enough, it is very likely that the effects of the IUGR child's vulnerability on fatherhood are similar to those observed on the mother and therefore spill over to the entire family system in triadic interactions (Feldman, 2007). In addition, significantly less reciprocal engagement in play has been observed in caregivers of IUGR children (Halpern et al., 2001).

Therefore, if on the IUGR child's side, their brain and behavioral vulnerabilities can negatively impact parenting and the building of a healthy parent-child bond, on the adult side, parenting support and dyadic interactive quality can potentially mitigate the negative effects due to the child's poor social skills (Baker et al., 2007). The extrauterine environment in which the infant develops, when appropriate, has mediating effects on the developmental outcomes of the IUGR subject (Feldman & Eidelman, 2006), however, the influence of the IUGR's biological vulnerability on the family system may increase parental intrusiveness within dyadic (and triadic) interactions, which in turn may increase the child's negative affect, which in turn in a circular fashion may further increase parental intrusiveness (reciprocal negative affect) (Feldman, 2007). In any case, the IUGR condition, due to both parental representations (mentalization, reflective function) and the child's reduced and ambiguous communication skills, negatively influences early dyadic interactional characteristics and therefore the quality of mother-child emotional exchanges in the first year of life (Sacchi et al., 2018; Tarabulsy et al., 1996).

In the longitudinal study by Sacchi and colleagues (Sacchi et al., 2018), in which IUGR dyads were evaluated in comparison with non-IUGR dyads regarding the quality of interactions and social-emotional and cognitive development at three different stages (4, 9 and 12 months postpartum), less maternal structuring was observed at 4 months, which is reflected in less attuned and synchronized stimulation of mothers of IUGR infants, resulting in impoverished interactive exchanges, characterized by frequent, uncoordinated and ineffective maternal attempts to contacts to their child. Lower responsiveness of IUGR children was observed at 9 months, while significant differences in cognitive and motor performance between the two groups of children emerged at 12 months. The study highlighted that the basis for social development might take place in the first few months of life, therefore, effective interventions should occur before the expression of real behavioral interactive disadvantage, and that prenatal adversity (such as IUGR) plays a massive role in shaping the developmental trajectory, with cascading developmental effects involving constant transactions between brain, behavior, and environment.

Another factor that can influence development, especially in the social-emotional domain by impacting the quality of mother-child interactions, is maternal mental health, which can, in addition, contribute to, but also be influenced by, IUGR.

1.2.3.1. Maternal mental health in pregnancy (risk or protective factor for IUGR and quality of dyadic interaction)

The most common maternal mental disorders, such as anxiety, depression and stress are considered major complications of pregnancy and when they persist in the postnatal period can be an obstacle to the healthy development of the mother-child relationship (Martins & Gaffan, 2000).

Fetal growth (Federenko & Wadhwa, 2004) and the quality of postnatal parenting practices (De Carli et al., 2019) may be affected by maternal mental health in pregnancy, especially by states of stress and anxiety. Most studies on maternal mental health consider exposures to stress, anxiety, and depression as isolated factors in order to individually observe their effects and associations with other factors; however, it is important to keep in mind that these factors are co-occurring with each other and may be one predisposing factor for the other in a series of events, for example, a stressful situation may generate anxiety or be accompanied by anxiety symptoms, which may increase the risk of depression (Lewis, Austin & Galbally, 2016). Numerous studies have found associations between anxiety and prenatal depression

and birth size and postnatal growth rates (Field, 2011): maternal anxiety in pregnancy is significantly associated with a 76% increased risk of low birth weight (Ding et al., 2014), while prenatal depression is associated with an increased risk of preterm birth (+39%), low birth weight (+49%) and intrauterine growth restriction (+45%) (Grote et al., 2010). Most research that has investigated links between maternal health (as measured by self-report questionnaires or structured diagnostic interviews) and fetal growth has reported significant associations (Conde et al., 2010; Diego et al., 2006; Diego et al., 2009; El Marroun et al., 2012; Field et al., 2008; Henrichs et al., 2010; Hompes et al. 2012; Uguz et al, 2011), although the findings on the specific growth parameters affected are different from each other and largely to be investigated more specifically (Lewis et al., 2016); there are several evidences suggesting that symptoms or disorders related to stress, anxiety and depression (maternal mental health) during pregnancy are consistently associated with the IUGR condition (Lewis et al., 2016). In addition, information about IUGR and its characteristics (e.g., fetal growth abnormalities) may have an impact on attitudes about caring for one's child (Geva et al., 2006), being a source of stress and anxiety for parents, particularly for the mother, who during pregnancy experiences a situation that is inherently exposed to more physical and mental stress. Particularly, women with early IUGR pregnancies, with onset by 32 weeks' gestation, have a 3.5 times higher risk of experiencing anxiety and depressive symptoms than women with late IUGR pregnancies, as early onset of IUGR is generally related to its more severe form (Tsakiridis et al., 2019).

Therefore, the mechanisms underlying the relationship between maternal mental health and IUGR are unclear, and current research has yet to find a definitive answer to the question. Poor mental health in pregnancy and thus the psychological distress experienced, however, usually result in stress-associated metabolic and functional alterations, such as increased cortisol in the hypothalamic-pituitary-adrenal axis (HPA), adrenocorticotropic hormone (ACTH) and adrenaline (Seth et al., 2016), and autonomic alterations that may affect lifestyle, such as changes in sleep-wake cycle and nutrition (Lewis et al., 2015). Such changes can affect the functioning of the placenta, the dysfunction of which is the main cause of IUGR (Sharma et al., 2016), resulting in poor fetal nutrition (Lewis et al., 2015), whereby compensatory adaptations suitable for survival discussed in the first paragraphs of the chapter are enacted by the fetus.

1.3. MATERNAL ANXIETY

Mental health problems often emerge or worsen during the pregnancy period (Wenzel, 2011) and the most common clinical symptoms are anxiety and depression (Hamid et al., 2008; Martini et al., 2015; Ngai & Ngu, 2015; Parfitt & Ayers, 2014; Rees et al., 2019; Ryan et al., 2017; Skouteris et al., 2009).

1.3.1. Anxiety construct definition

Anxiety is a cross-sectional construct that has been conceptualized over time in many different ways, also given the influence of the cultural environment in terms of both the nature of anxiety-exposing situations and how the experience of anxiety is perceived, processed and understood (Endler, 1997). Lewis originally defined anxiety as "an emotional state, with the subjectively experienced quality of fear as a closely related emotion", in which the experience is negative and disproportionate to the perceived threat and is future-oriented (Lewis, 1970).

1.3.2. Prenatal maternal anxiety and risk conditions (focus on IUGR)

About 16% of women in pregnancy experience high levels of anxiety (Ross & McLean, 2006; Rubertsson et al., 2014), compared to 7% of general population, while around 11% of women experience generalized anxiety (GAD) in the prepartum period (Grigoriadis et al., 2011; Phillips et al., 2009), and 12.5% of women with a high-risk pregnancy have an anxiety disorder (Thiagayson et al., 2013). Fetal well-being, maternal illness, mortality, and social and economic support are the main causes of maternal concerns during pregnancy (Furtado et al., 2018), which, if they persist over a protracted period, can become pervasive and functionally impair several areas of woman's life (Wenzel, 2011); in addition, maternal anxiety in pregnancy, as well as depression, is a strong predictor of problems in children's self-regulation and social-emotional well-being (Barker et al., 2011; Korja et al., 2017; O'Donnell & Meaney, 2017). However, experiencing low levels of anxiety in pregnancy is described as a normal experience while waiting for childbirth, which can be helpful in preparing for parenthood (Harpel, 2008).

The comorbidity between anxiety and depressive disorders in the pre-partum period varies between 30% and 58% (Field et al., 2010), so studies examining the prevalence of anxiety disorders or anxious states in pregnant women in isolation are limited.

A study in which self-report questionnaires were used reported that 20% of women acknowledged the onset of anxiety during the pregnancy period, 14.3% reported experiencing

anxious states at the time of delivery, and 51.4% immediately after labor (Phillips et al., 2009). Most women with prenatal anxiety have pregnancy-related concerns (PrA) specifically associated with maternal and/or infant outcomes (Bayrampour et al., 2016), unlike concerns associated with GAD (Huizink et al., 2004). One of the main differences between PrA and GAD in pregnancy is increased anxiety levels in the third trimester of gestation, with worries due to fear of childbirth, maternal physical appearance and having a problematic child (Huizink et al., 2004) and concerns related to parenting and financial costs (Bayrampour et al. 2016). PrA has been conceptualized by Bayrampour and colleagues into three primary attributes, namely affective responses, cognitions, and somatic symptoms with three behavioral consequences: negative attitudes, excessive seeking of reassurance and avoidance behaviors (Bayrampour et al., 2016).

The factors most associated with prenatal maternal anxiety are high-risk pregnancy (such as, for example, IUGR) and labor; however, there are several risk factors, environmental, social, physical, biological, and psychological in nature, that may contribute to a woman's increased state of anxiety between prepartum and postpartum (Mudra et al., 2020; Van de Loo et al., 2018). Among these factors, the most predictive ones are socioeconomic status, including income, employment status and education level (Kim et al., Martini et al., 2016), social support received, especially willingness for support from the partner (Orr, 2004) and stressors and problems related to daily life and domestic and work responsibilities (Feligreras-Alcalà et al., 2020; Yu et al., 2020). In addition, high levels of anxiety in pregnancy indicate an increased risk of elevated anxiety and depressive symptoms in postpartum (Tamaki et al., 1997).

Concerning social support, including emotional, informational, and practical (e.g., financially) support, the literature has highlighted its significant role in stressful life events (Dambi et al., 2018; Sharif et al., 2021) such as pregnancy, of which it is a strong predictor in terms of health (Naveed et al., 2018). Specifically, perceived social support received is associated with prenatal maternal anxiety (Sharif et al., 2021), thus affecting maternal mental well-being, but also the fetus and potentially other family members (Aktan, 2012). Lack of perceived social support may lead the woman to mental health problems (Aktan, 2012; Denis et al., 2015; Sharif et al., 2021). The social support that can have the greatest impact on a pregnant woman's well-being is that of her partner, especially in terms of his involvement in childcare and domestic responsibilities (Feldman, 2000; Simpson et al., 2003). Paternal involvement has positive effects on reducing the mother's distress: at the dyadic level,

reflecting in the mother-child relational reciprocity, and at the triadic level regarding the construction of a harmonious and cohesive family context from the very first months of child's life (Feldman, 2007). Experiencing high-risk pregnancies (as in the case of IUGR), which account for 15-20% of total pregnancies (Coco et al., 2014), can induce more stress on the woman, increasing her state of anxiety and cyclically also the risk of the pregnancy (Abrar et al., 2020). The incidence of anxiety in women with high-risk pregnancies is 5.2 times higher than in low-risk pregnancies (Fairbrother et al., 2017). In the 20-100% of women with an obstetric complication (not necessarily considered "high risk"), with the need for social and/or obstetric or surgical intervention, there is an increased level of anxiety (Fischbein et al, 2019); critical to maternal mental health and reducing anxiety levels and symptoms is prenatal education about childbirth and possible maternal complications due to the high-risk condition they are in, as well as effective communication with medical staff (Cankaya & Simsek 2021; Fenwick et al., 2018). Maternal anxiety during pregnancy places fetal development at increased risk and is associated with reduced fetal growth (Conde et al., 2010), particularly reduced fetal head growth (Lewis et al., 2016) and low birthweight (Ding et al., 2014). IUGR condition and prenatal maternal anxiety are positively associated as one possible risk factors for each other (Glynn et al., 2008; Goldenberg et al., 1991; Hedegaard et al., 1993; Lewis et al., 2016; Sabri & Nabel, 2015; Tsakiridis et al., 2019; Uguz et al., 2011). In fact, anxiety in pregnancy may increase maternal stress levels with repercussions on fetal growth, contributing to cause IUGR through the mechanisms explained above; on the other hand, the diagnosis of IUGR, the way its communication occurred, and the possible medical interventions received may increase maternal anxiety levels, as these mothers may feel a sense of inadequacy related to providing the fetus with an intrauterine environment that may not be conducive to its growth, knowing that they are in a condition of prenatal risk for which they need more attention from medical personnel (Geva et al., 2006).

1.3.3. Maternal anxiety on parenting and child development

In the postpartum period, 8-12% of new mothers experience subclinical levels of anxiety, a figure comparable to the incidence rates of prenatal anxiety (Goodman et al., 2014), although the incidence rate in the postpartum period is thought to be underestimated (Fairbrother et al., 2016). A stable trend has been observed between anxiety in the prenatal period and postpartum anxiety (Dipietro et al. 2008; Grant et al., 2008; Tamaki et al., 1997), although a fair group of women with moderate/high prenatal anxiety levels show, even, an increase in

the weeks after delivery (Britton, 2008). During the postpartum period, in fact, as responsibilities and demands increase, worries may also increase, and several factors, such as maternal health and child welfare, poor social support, difficulty in breastfeeding, and economic difficulties may contribute to increased anxiety and stress and the onset of anxiety and anxiety disorders even in mothers who had optimal levels during pregnancy (Nakić et al., 2018). It is usual for anxiety to be comorbid with depression during this period, but this doesn't mean that all anxious mothers are also depressed (Matthey et al., 2003; Miller et al., 2006; Wenzel et al., 2005). Maternal mental health, as demonstrated by a substantial number of studies, is critical to optimal child health (Ryan et al., 2017). Maternal PrA and maternal postpartum anxiety (Murray & Cooper, 1997) have a negative influence on child developmental outcomes (Martini et al, 2020), as the effects of anxiety on maternal behavior can translate into disinterest, disengagement, insensitivity, and even severity, reflecting parenting that can be expressed in different, but usually (not always, as an anxious mother may have a trustworthy parenting style) non-positive ways for the child, such as an authoritarian, permissive, or disengaged style (Huizink et al., 2017).

High levels of anxiety and overt anxiety disorders of pregnant and postpartum women, in addition to being highly prevalent, are increasing in recent years (McKee et al., 2020), and maternal anxiety disorders during pregnancy are associated with cognitive deficits of the child, independent of extrauterine environmental stress (Lin et al, 2017) and may contribute to the onset of social-emotional problems (Madigan et al., 2018) and difficult temperament, for example high negative affectivity and emotionality and poor attention regulation skills (Baibazarova et al., 2013; Clavarino et al., 2010; McMahon et al., 2013; Van Batenburg-Eddes et al., 2013). In addition, increased behavioral problems (Van den Bergh et al., 2005) and reduced executive working memory functioning (Loomans et al., 2011; Pearson et al., 2016) have been observed in children of women with PrA. Regarding social-emotional development, it has been found that children born to women with high levels of prenatal anxiety are more likely to develop retardation and even more so when the mother has, instead, high levels of postpartum anxiety; the risk is increased for children of mothers with both prenatal and postnatal anxiety (Polte et al., 2019).

Summarizing, maternal anxiety is associated with adverse child development outcomes (Comaskey et al., 2017), it impairs the child's adjustment (Weinberg & Tronick, 1998), affecting the child's cognitive, social-emotional, and self-regulatory abilities (Goodman & Gotlib, 1999). Particularly, maternal perinatal anxiety and anxiety during pregnancy is linked

to adverse birth outcomes, predicting early alterations in the neurocognitive, social-emotional, and behavioral domains, the magnitude of which is estimated to be around 10-15% (Glover, 2014), is associated with a child's difficult temperament (Austin et al., 2005; Davis et al., 2007; Dunkel Schetter & Tanner, 2012; Henrichs et al., 2009; Hernández-Martínez et al., 2008; Huizink et al., 2014; O'Connor et al., 2014; Van den Bergh, 1990), and may increase the risk of mental health issues of the child in adolescence and young adulthood (Graignic-Philippe et al., 2014; Mulder et al., 2002; Van den Bergh, 2011); it has also been observed that children of mothers with high trait anxiety are more predisposed to suboptimal nervous system development and are more vulnerable to developing motor problems (Kikkert et al., 2010).

Regarding social-emotional development in early childhood, prenatal maternal anxiety is associated with deficits in emotional regulation (Bolten et al., 2013), excessive crying (Van der Wal et al., 2007) and sleep disturbances (Gérardin et al., 2010). Furthermore, high levels of anxiety, both pre and postnatal, can result in inappropriate caregiving behaviors for the infant (Drake & Ginsburg, 2011; Fallon et al., 2018). Maternal prenatal (Baibazarova et al., 2013; Hakanen et al., 2019; Korja & McMahon, 2021; Parfitt & Ayers, 2014) and postnatal (Martini et al., 2015; Nicol-Harper et al, 2007) anxiety, in fact, influences the quality of dyadic interactions and potentially affects the quality of parenting and the construction of the mother-child relationship (Weinberg & Tronick, 1998), therefore the attachment bond between the two partners (Dawson et al., 2000; Barnett & Parker, 1986; Martini et al., 2015; Tietz et al., 2014). In late childhood (around 5/6 years of age), instead, high prenatal anxiety are associated with higher negative emotionality in the child (Pluess et al., 2010), higher intensity reactions to stress (Lin et al., 2017), lower incidence of prosocial behaviors, and higher behavioral problems (Loomans et al., 2011); such individuals, at around 8 years of age, have also been observed to have poorer working memory than their peers (Pearson et al., 2016).

1.3.3.1. Maternal anxiety and its influence in the quality of interaction

Several research have examined the influence of maternal anxiety in dyadic mother-child interactions, observing its effects on dyad members' behavior (Blissett et al., 2007, Feldman et al., 1997, Field et al., 2005, Nicol-Harper et al., 2007; Wijnroks, 1999). The defective or excessive response behaviors of anxious mothers toward their children may reflect the difficulty of these mothers in regulating their own and their child's emotions (Kaitz & Maytal,

2005); a common feature of anxiety disorders is precisely poor emotional regulation skills (Rodebaugh & Heimberg, 2008). In fact, maternal anxiety predicts an inadequate mother-child emotional regulation style and is reflected in greater negative states of both mother and child (Riva Crugnola et al., 2016), whose interactions are described as less reciprocal and cooperative and in which dyads show little joint activity, characterized by a tense atmosphere, for which there are more feelings of distress and little emotional expressiveness (Zietlow et al., 2019). As the severity and chronicity of maternal anxiety levels increase, the risk of negative consequences and social impairment in mother-child interaction grows (Feldman et al., 2009; Piccinini et al., 2014).

It is known that feelings of maternal anxiety and stress can negatively affect the attention given to child and the evaluation regarding the child's need for protection (Davies, 2010) and that anxiety is linked to lower maternal sensitivity regard to the child's suffering (Clavarino et al., 2010). What has emerged most in mother-child interactions is that mothers with high levels of anxiety have shown more iperarousal (Kaitz et al., 2010), less responsiveness and effectiveness in involvement (Nicole-Harper et al., 2007; Murray et al., 2007; Woodruff Borden et al., 2002), lower emotional tone regarding affection, warmth, and positive feelings (Tietz, Zietlow, & Reck, 2014), and less granting of autonomy (Nicole-Harper et al., 2007; Turner et al., 2003; Whaley et al., 1999). In the case of overt anxiety disorders, it has been observed that during dyadic interactions with children under one year of age, mothers are less sensitive (Warren et al., 2003) and more intrusive (Feldman et al., 2009; Pelizzon Dib et al., 2019); in fact, generalized anxiety during the 3rd trimester of pregnancy predicts high levels of intrusiveness in EAS scores (Hakanen et al., 2019).

Regarding, on the other hand, children of anxious mothers, there is not much evidence regarding the most common behavioral deficits during dyadic interactions. What has emerged to a greater extent is that such children appear to be less communicative and less emotional within social exchanges with the adult (Murray et al., 2007; Kaitz et al., 2010). In addition, it is important to consider that in the relationship between maternal anxiety and children's behavioral issues, some genes are strong moderators of developmental outcomes (Fox et al., 2005), so it becomes even more difficult to decree the actual weight of maternal anxiety on the child's interactive patterns. Furthermore, the possible effects of maternal prenatal anxiety on child stress should be considered, which alters the functioning of the child's HPA axis, the dysfunction of which may have a long-term negative influence on development (Lin et al., 2017; Madigan et al., 2018; Zietlow et al., 2019). The HPA axis is

the main regulatory system for humans in response to stress (Baibazarova et al., 2013), and maternal anxiety in pregnancy is one of the stressors that most affects the regulation of the HPA axis (Talge te al., 2007), the final product of which is cortisol. High maternal cortisol levels affect the infant's HPA axis, increasing its cortisol levels and responsiveness to it (Luecken et al., 2013; Zijlmans et al., 2015). Cortisol reactivity (HPA axis) is predictive of preschool socioemotional development, particularly in terms of dyadic negative emotional states and poor reciprocity during interactions (Zietlow et al., 2019), both of which are possible indicators of a lack of emotional regulation skills (Feldman, 2015). Therefore, it is not easy to distinguish the pure influence of maternal anxiety on the quality of dyadic interaction from the influence of the child's HPA axis on mother-child interactive exchanges, as maternal interactive behaviors play a substantial role in the regulation of the child's HPA axis (Muller et al., 2015). Maternal anxiety and the child's cortisol reactivity could thus have circular effects on each other, affecting in a combined way the dyadic relationship within interactions and the child's social-emotional development.

Hence, maternal anxiety in pregnancy and in the perinatal period can have a negative impact on pregnancy itself, therefore on fetal development, on the formation of a cohesive triadic family context, on the subsequent development of the child, particularly in the socio-emotional domain, and on the building of a healthy mother-child relationship, thus on the quality of dyadic interactions. Therefore, there is the necessity for the monitoring of women's mental health in pregnancy, in addition to their medical conditions, and in the postpartum period, from the very first weeks of life, with the focus on the interactive modalities within the mother-child dyadic exchanges, the broad importance of which on the child's socio-emotional and behavioral development has been highlighted in the previous paragraphs.

To conclude, Intrauterine Growth Restriction is a medical condition related to pregnancy with respect to fetal development, which is reflected in postnatal development in relation to the observed domain and which, in addition, is related to maternal mental health, both in terms of the possibility of being affected by it and having a potential impact on it.
Therefore, with reference to what has been expounded in this chapter, IUGR condition and maternal anxiety influence social-emotional and behavioral development, reflected in the child's atypical interactional patterns and not always appropriate maternal parenting behaviors within dyadic exchanges. In addition, mothers of IUGR children are likely to

experience high levels of anxiety both in pregnancy and in the postpartum period, given the bidirectional relationship whereby prenatal maternal anxiety may be partly a cause of IUGR and this condition may increase maternal pre- and postnatal anxiety levels. Considering what has been explained, the quality of mother-child interactions of IUGR dyads with high levels of maternal anxiety could be affected by both IUGR and anxiety conditions, resulting in even poorer emotional exchanges, which could reflect social, emotional, and behavioral developmental problems of such individuals in daily life, potentially interfering with the building of a healthy attachment bond and a wholesome relationship.

CHAPTER 2: REASEARCH PAPER

The development of the human being begins during pregnancy in intrauterine life, a special time for the woman experiencing it and for those closest to her, such as her partner. During this time, within the womb, the fetus grows and the foundations of its development in extrauterine life are laid. According to Barker's "Developmental Origins of Health and Disease" hypothesis (DOHaD; Barker, 2004), fetal programming, which results in the quality of fetal development, shapes individual differences for chronic disease risk across the lifespan, and therefore adverse experiences during the period of pregnancy, through permanent physiological and metabolic changes, have effects on childhood neurodevelopmental programming and underlie adverse health outcomes and diseases in adulthood (Barker, 2004). It is hypothesized that the fetus, upon encountering prenatal adversities that alter the intrauterine environment, makes adaptations finalized to survival. When these fetal adaptations persist over time, the changes become irreversible and immediate beneficial effects are followed by long-term negative outcomes, as in the case of IUGR pregnancies (Gluckman & Hanson, 2006).

Intrauterine growth restriction (IUGR) is a complex obstetrical problem described as a fetal growth retardation, defined by the inability of the fetus to reach its biologically determined growth potential in utero due to nutritional abnormalities (ACOG, 2019), resulting on ultrasonography in an estimated fetal weight below the 10th percentile for gestational age (Alfirevic & Neilson, 1993). IUGR, which has a prevalence of between 5% and 7% of pregnancies, is the second leading cause of perinatal mortality and morbidity worldwide after prematurity (Murray et al, 2015), with the risk of death increased five to 10 times compared to fetuses with appropriate gestational age (AGA) (Gardosi, Clausson & Francis, 2009), resulting in approximately 50% of fetal deaths (Zamarian, Cruz & Nardozza, 2018) and around 10% of perinatal deaths (Richardus et al, 2003). The inability of the fetus to reach its genetic potential during intrauterine growth is a risk factor for developmental outcomes (Baschat, 2011; Kok et al., 2007), which are the combination of genetic factors and pre and postnatal environmental factors, such as, for example, social factors, parental care, and life experiences after birth (Karmiloff-Smith, 1994). The quality of parental care and parent-child interactions are the variables that most influence child development (Belsky & Fearon, 2002; De Wolff & Van Ijzendoorn, 1997).

Barker's (DOHaD) hypothesis that neurodevelopment has a fetal origin emphasizes the importance of fetus development in the intrauterine environment and additionally of maternal mental and physical well-being in pregnancy as mental health (Swanson & Wadhwa, 2008; Talge et al, 2007), which may influence fetal growth (Federenko & Wadhwa, 2004) and the quality of postnatal parenting care (De Carli et al., 2019), particularly when high levels of stress and anxiety are present. There is ample evidence of an association between maternal mental health, meaning symptoms or disorders related to stress, anxiety, and depression, and the condition of IUGR (Lewis et al., 2016). In addition, information about IUGR and its characteristics (e.g., fetal growth abnormalities) can have an impact on the quality of parental care (Geva et al., 2006), being a source of stress and anxiety for parents and particularly for the mother, who is more exposed to physical and mental stress in pregnancy. Focusing on maternal perinatal anxiety, which is associated with impaired fetal growth (Conde et al., 2010), particularly impaired head growth (Lewis et al., 2016), with an incidence risk about five times higher in atypical pregnancies such as IUGR (Fairbrother et al, 2017), is a possible obstacle to the healthy development of the mother-child relationship (Martins & Gaffan, 2000) and a strong predictor of self-regulation problems and non-optimal social-emotional development of the child (Barker et al., 2011; Korja et al., 2017; O'Donnell & Meaney, 2017). Anxiety, defined as "an emotional state, with the subjectively experienced quality of fear as a closely related emotion", in which the experience is negative and disproportionate to the perceived threat and is future-oriented (Lewis, 1970), in pregnancy is described as a common experience in anticipation of childbirth when experienced at low levels (Harpel, 2008). However, compared to 7% of the general population, during pregnancy about 16% of women experience high levels of prenatal anxiety (Ross & McLean, 2006; Rubertsson et al., 2014), conceptualized through three primary attributes, that are affective responses, cognitions, and somatic symptoms with three behavioral consequences, namely negative attitudes, excessive reassurance seeking, and avoidance behaviors (Bayrampour et al., 2016). Usually, the concerns of women with prenatal anxiety are related to pregnancy and possible adverse infant and/or maternal outcomes (Bayrampour et al., 2016). Regarding the postpartum period, incidence rates of maternal anxiety are comparable to those of prenatal anxiety, with approximately 8-12% of new mothers experiencing subclinical levels of anxiety (Goodman et al., 2014). During this period, given the responsibilities to one's newborn child, there may be concerns about one's health, social support received, breastfeeding, and possible financial difficulties, in relation to the child's well-being and development (Nakić et al., 2018).

Therefore, high levels of maternal perinatal anxiety have a negative influence on the child's developmental outcomes (Comaskey et al., 2017; Martini et al, 2020), predicting early alterations in neurocognitive, social-emotional, and behavioral domains (Glover, 2014) and potentially affecting parenting, the quality of dyadic exchanges, and consequently the construction of the mother-child relationship (Baibazarova et al, 2013; Hakanen et al., 2019; Korja & McMahon, 2021; Martini et al, 2015; Nicol-Harper et al, 2007; Parfitt & Ayers, 2014; Weinberg & Tronick, 1998).

The mother-child relationship is a two-way relationship characterized by dyadic interactions, in which the child is an active subject capable of learning and acting in the world with an innate predisposition to seek social stimuli and to share affects and experiences with each other (Lavelli, 2007; Meltzoff & Moore 1997; Trevarthen, 1998). Intersubjectivity, intended as the sharing of subjective states by two or more people (Trevarthen & Aitken, 2001), and the sense of relationship arise in the intrauterine environment, where the relationship with the mother and an initial knowledge of the world begins to be established (Castiello et al., 2010; Partanen et al., 2013). Infants, in fact, at birth possess already specific social-communicative skills, for example to signal a need (Bushnell, 2001; Meltzoff, 2002; Meltzoff & Moore, 1997; Schaffer, 1996; Trevarthen & Aitken, 2001; Tronick, 1989) and self-regulation skills directed at modulating their own affective and physiological states (Field, 1977; Gianino & Tronick, 1988; Spitz, 1965; Stern, 1974; Tronick, 2004, 2007). Within the mother-child relationship, the two members are components of a broad dyadic regulatory system, influencing each other in a continuous and circular way through verbal and nonverbal communication (Tronick, 1989), to achieve reciprocity and shared intentions and meanings, affectively attuning to each other (Beebe & Stern, 1977; Brazelton et al, 1975; Gianino & Tronick, 1988). This process of co-regulation allows the child to initiate, maintain, modify, terminate, or avoid interactions (Beebe et al., 2010) and fosters the consolidation of specific interactional patterns through shared activities and emotional states (Fogel, 1993), contributing to the implicit acquisition of relational knowledge and ways of being with others (Tronick et al., 1979; Tronick, 2002). A key aspect of dyadic interactions is emotional availability (EA; Biringen, 2000), a relationship-specific construct defined as the dyad's capacity for emotional sharing through the experience and sharing of emotional states (Biringen & Easterbrooks, 2012), which reflects the quality of dyadic exchanges. Emotional availability is associated with different developmental domains, namely social-emotional, behavioral, and cognitive (Ainsworth et al., 1978; Biringen et al., 2005; Harel et al, 2002;

Howes & Hong, 2008; Kang, 2005; Lehman et al., 2002; Licata et al, 2014; Moreno et al., 2008) at different ages. Therefore, the quality of dyadic mother-child interactions, observable through instruments such as the Emotional Availability Scales (EAS; Biringen, 2000, 2008) is predictive of the child's social-emotional, behavioral, and cognitive development (Aksan et al., 2006; Feldman, 2003; Kochanska et al., 2005).

2.1. AIMS AND HYPOTHESIS

Overall, the main objective of this work is to compare the levels of maternal health, specifically of perinatal anxiety, and parental functioning in women experiencing an IUGR pregnancy and who parent of an IUGR infant and in women with uncomplicated physiological pregnancies who parent of gestational age-appropriate infants (AGA). We also aim to investigate IUGR vs AGA differences in socio-emotional and behavioral child development at 4 months' post-partum, in particular with regard to the quality of dyadic interactions, through the construct of emotional availability.

Particularly, the first aim of the study is to evaluate the levels of maternal state anxiety during 3rd trimester pregnancy and at 4 months postpartum, by comparing STAI-Y-S scores between the experimental group of women carrying IUGR pregnancies, and the control group of women with uncomplicated pregnancies. Given the association between the IUGR condition and prenatal maternal anxiety as predisposing risk factors for each other (Glynn et al., 2008; Goldenberg et al., 1991; Hedegaard et al., 1993; Lewis et al., 2016; Sabri & Nabel, 2015; Tsakiridis et al., 2019; Uguz et al., 2011), we expect levels of maternal anxiety to be higher in the IUGR group, compared to the AGA group. Besides, given the observed steady trend of maternal anxiety from pregnancy to post-partum, (Dipietro et al., 2008; Grant et al., 2008; Tamaki et al., 1997), we expect that higher maternal anxiety levels to be maintained from 1st (pregnancy) to 2nd (4 months) assessment.

The second aim of the study is to compare IUGR vs AGA new mothers on parenting quality observed during free play interactive exchanges at 4 months. Considering the observations of IUGR greater passivity, higher irritability, less responsiveness and high negative affect during mother-infant interactions in comparison to AGA infants (Feldman & Eidelman, 2006; Feldman, 2007; Mello et al., 2014), and given the first hypothesis of greater maternal anxiety in the IUGR, we expect that both the atypical relational patterns of IUGR infants, combined with the negative influence of prenatal (Baibazarova et al., 2013; Hakanen et al., 2019; Korja & McMahon, 2021; Parfitt & Ayers, 2014) and postnatal (Martini et al., 2015;

Nicol-Harper et al., 2007) maternal anxiety on the quality of dyadic interaction, we expect IUGR new mothers to show greater difficulties in the parenting domain, in terms of less sensitive, less structuring, more intrusive and more hostile behaviors.

The third aim is to compare IUGR vs AGA infants on the observed responsive and involving behaviors during parent-infant interactive exchanges. More specifically, from the perspective of the transactional model (Sameroff & Chandler, 1975; Sameroff, 2009), we expect reciprocal and bidirectional influences between mother and child; since the latter's individual characteristics determine in part the involvement of the mother during interaction, who in turn influences the child through her responses (Sameroff & Fiese, 2000) and given the second hypothesis of lower sensitivity and greater intrusiveness of IUGR than AGA mothers, we hypothesize that IUGR infants score lower on the responsiveness and involvement scales, compared to AGA peers.

Ultimately, this research aims to explore whether, respectively, IUGR condition and maternal prenatal anxiety are predictive of EAS scores. Considering the previously listed hypotheses as true, we expect to be able to obtain results indicating that IUGR condition is predictive of lower EAS scores compared to dyads in the control group and high levels of maternal prenatal anxiety are predictive of lower EAS scores compared to dyads of mothers with low levels of prenatal anxiety.

2.2. METHODS

2.2.1. Participants and procedure

The present research is part of the longitudinal study "Neurobiological Bases and Socio-Emotional Development in Infants with Intrauterine Growth Retardation," a project conducted by the Department of Developmental Psychology and Socialization (DPSS) of the University of Padua in collaboration with the Department of Women's and Children's Health within the Obstetric-Gynecological Clinic of the University of Padua Hospital. The study aims to explore the neurobiological basis and the social-emotional, affective-relational, and behavioral development of children born with Intrauterine Growth Retardation (experimental group) in comparison with children born from physiological pregnancy (control group), during four stages during the child's first year of life.

The first stage (t0) occurs during the third trimester of pregnancy and involves the recruitment of expectant mothers at the obstetrics-gynecology department of Padua Hospital, where e-mail and/or telephone contact is made and where a battery of self-report questionnaires

regarding the bio-psycho-social well-being of the pregnant woman and her household is administered.

Recruitment was performed considering certain exclusion criteria, such as complicated pregnancies, neurocognitive disorders, maternal age under 18 years, drug addiction and risk of psychiatric disorders. As for infants, exclusion criteria including unrelated comorbidities, genetic diseases, fetal infections, congenital malformations (e.g., heart disease), neonatal metabolic and chromosomal disorders, brain abnormalities and infant neurological disorders, and premature birth (delivery below 37 gestational weeks) were followed.

The second (t1) and third (t2) stages, carried out at 4 and 9 months postpartum, respectively, at the University of Padua (within DPSS), again involve the administration of the batteries of self-report questionnaires to the woman to investigate some aspects of her mental well-being and child development; in addition, a recording of a dyadic mother-child interaction of about 15 minutes, coded through the Emotional Availability Scales (EAS), is made, aimed at observing and examining the quality of the interactive exchanges of the dyad under examination. In the stage at 9 months (t2), additionally, a 5-minute short interview (FMSS) is conducted with the mother, in which the woman's reflective function in relation to her child is examined.

In the fourth and final stage (t3), conducted at 12 months at DPSS, the procedures carried out in the 4-month stage (t1) are repeated, in addition to observation of the child's cognitive, language, motor, social-emotional and behavioral development through the administration of the Bayley-III scales for infants' development (BSID-III, age 0-6; Bayley).

All stages of the research were approved by the Institutional Review Board of the University of Padua. At each stage of the study, participants completed the assessments after reading and signing the informed consent form, explicitly agreeing to participate in the research. In t0 consent was for all pregnant women, while in t1 and later stages, as there was participation of a minor in the study, both parents had to sign the informed consent.

2.2.1.1. Research stages

In the present dissertation research, the first two stages are considered, respectively, the one carried out during pregnancy (t0) and the one at 4 months of age (t1); children's social-emotional and behavioral development is examined, and the focus is on the quality of mother-child interaction of IUGR dyads compared to non-IUGR dyads, focusing on the potential impact of maternal anxiety within the relational exchanges between the two partners.

2.2.2. Methods and materials

With the aims of the thesis research in consideration, the following are the most useful tools for investigation regarding the hypotheses, among all those administered.

State-Trait Anxiety Inventory – Form Y (STAI-ST)

The State-Trait Anxiety Inventory Form Y (STAI-ST; Spielberger, 1983) is a self-report questionnaire that measures anxiety in adults by assessing the presence and severity of symptoms and general propensity to anxiety (Julian, 2011) through the two scales, STAI-S and STAI-T, from which it is composed, referring to state and trait anxiety, respectively. Each scale consists of 20 items on a four-point Likert scale (1= "Not at all," 2= "Somewhat," 3= "Moderately so," 4= "Very much so") and the scales can be administered independently of each other. The total score can range from 20 to 80; scores ≥40 is indicative of high levels of anxiety.

In the present study, only the STAI-S is used to assess maternal state anxiety, during pregnancy (third trimester) and at 4 months postpartum. The questionnaire instructions required responding to the items by assessing the intensity of one's feelings and sensations "right now, at this moment"; the STAI-S scale, in fact, is indicative of the intensity of feelings of anxiety as an emotional state at a specific time (Spielberger & Reheiser, 2009).

Emotional Availability Scales (EAS)

EAS scales (EAS; Biringen, 2008) are an instrument based on the emotional availability construct, which sensitively and reliably assesses the quality of dyadic exchanges, considering co-regulatory processes (Oppenheim, 2012), through observation of video-recorded caregiver-child interactions.

EA scales theoretical background includes Attachment Theory (Bowlby, 1973, 1979; Ainsworth et al., 1978), Theory of Emotions (Emde, 1980; Mahler; Pine & Bergman, 1975) and systemic-transactional theories (von Bertalanffy, 1967; Sameroff & Fiese, 2000; Sameroff, 2009, 2010).

EAS fourth edition is the most recent version (Biringen, 2008) and includes two different coding manuals based on child's age, one aimed at infancy (Infancy/Early Childhood Version; ages 0-5) and one at school age and pre-adolescence (Middle Childhood/Youth Version; ages 6-14) (Biringen et al, 2010); using these scales it is possible to capture variations in the interaction patterns of typically developing children (van den Dries et al,

2012), but also interactive deficits in the atypical population (Dolev et al., 2009), as in the case of IUGR.

The appropriate setting for carrying out the interaction is not specific and pre-established; therefore, it is possible to assess emotional availability in a variety of different contexts: during free play or in a semi-structured situation when the main objective of the assessment is the quality of dyadic exchanges (Biringen, Damon et al, 2005; Biringen, Fidler et al., 2005; Biringen, Skillern et al., 2005; Dolev et al., 2009) or in a more structured and stressful situation when the goal is more specific (e.g., assessing a single skill of a dyad member). Delivery, on the other hand, is predetermined: the caregiver is asked to "interact with the child as usual", allowing the dyad to relate within a non-prescriptive context. According to Biringen and colleagues (Biringen, 2008; Biringen et al., 2014; Biringen & Easterbrooks, 2012) the minimum duration of interaction for a valid and reliable assessment is about 15-20 minutes, although effective assessments are possible for periods of 3-5 minutes, in which, however, situations are generally predisposed to elicit higher stress levels (Easterbrooks, Biesecker & Lyons-Ruth, 2000; Kogan & Carter, 1996).

The major advantage in using EAS scales in research is the possibility of obtaining close measurements across time (even with different caregivers), being able to observe even slight changes in interactional modes (Biringen et al, 2014; Biringen & Easterbrooks, 2012).

EAS consisting of six validated scales, representing the six dimensions, or principles, of emotional availability as “relational variables”, which, collectively, determine the quality of the dyadic relationship, in the variety of behaviors enacted and emotions experienced (Biringen et al, 2012); EAS are, therefore, a valid and sensitive measurement tool of dyad's affective quality and predictive of child's social-emotional development and attachment bond quality with that specific caregiver (Biringen et al., 2014). The observed interactive moment reflects the typical patterns of dyad members during daily interactions, working as a proxy for relationship quality (Biringen, 2009).

In the coding, an overall Likert scale score from 1 to 7 points is assigned to each scale, which in turn consists of seven sub-scales, the first two of which numbered 1-7 and the others five from one to three points, representing the main characteristics of each dimension; higher scores refer to a more optimal quality of interaction (Biringen, 2008; Biringen et al., 2014). Specifically, scores above 5.5 are considered high scores, reflecting optimal interaction skills, scores between 3.5 and 5 are in the middle range, in which are those who do not lack interactive skills, but sometimes have gaps for which the quality of interaction is not optimal;

scores toward 5 do not reflect some difficulties, while scores tending toward 3.5 are indicative of poor skills. Finally, scores below 3.5, belonging to the low range, signify poor quality of exchanges, where several interactive difficulties are present and there is a lack of dyadic emotional availability.

The first four scales concern adult behaviors, while the last two scales concern child behaviors; the following are the main characteristics of each scale.

Sensitivity

The adult sensitivity scale refers to the caregiver's ability to be emotionally connected and provide warmth to the child (sharing of positive affections, expressed congruently with each other both verbally and non-verbally) and to the presence of positive affective exchanges during the interaction, implying appropriateness and authenticity of the affective experience; affections are the main feature of sensitivity dimension. The seven components of the scale are affection, clarity in perception and appropriateness of responses to signals, timing, flexibility, acceptance of the child, amount of interaction, and conflict situations.

Structuring

The adult structuring scale concerns the ability to structure the interaction, understood as the ability to act as a guide for the child (scaffolding) in respect to the activities are carried out and to establish rules and limits to his or her behavior (what he or she can and can't do), demanding that are respected, to create a shared framework in which interactive exchanges take place. Structuring sub-scales are guidance (i.e., to provide guidance and proactive suggestions), success in attempts, amount of structuring, limits and boundaries setting, firmness in child's pressures, verbal and non-verbal structuring, peer role versus parent role.

Non-Intrusiveness

The dimension of non-intrusiveness refers to the ability to be emotionally available in the absence of interference, over-stimulation, and over-protection, therefore not limiting child's autonomy in the environment exploration; the scale components are following child leads, ports of entry to interaction without interruptions, commands (orders and directives), use of speech, didactic teaching, physical and verbal interferences, child's feedback on the adult intrusiveness.

Non-Hostility

The last scale concerning the adult is non-hostility, referred to the absence of behaviors and facial expressions in which hostility and/or negative affectivity are present; manifestations of hostility can be either veiled, such as expressions of boredom or impatience and raised tone of voice, or overtly hostile responses through frightening and/or threatening bodily and verbal indices. The scale consists of lack negativity in voice or face, lack ridiculing, lack threats of separations, maintaining calm during stressful situations, frightening behaviors, silences, hostile game themes.

Child Responsiveness

The child's first scale concerns the dimension of responsiveness, in which the central aspects are emotional responsiveness, as the willingness to involve oneself in the interaction with the adult manifesting enthusiasm and interest in participating, and the ability to emotional regulation, positive affectivity and behavioral organization toward the caregiver. In addition to responding modalities to the adult, the main characteristic of child's responsiveness dimension is affections, such as for the first scale concerning adult sensitivity. The sub-scales are affection and emotional regulation, responsiveness, autonomy seeking, physical positioning, role-reversal and hyper-responsiveness, lack of avoidance and task orientation.

Child Involvement

Finally, the child's involvement scale refers to child's initiative taking and parent's involvement in the interaction, therefore to the ability and desire to make the adult participant in the ongoing activity, for example, by showing him or her objects. The components observed are simple initiatives, elaborative initiatives, use of adult, lack of over-involvement, eye contact, body positioning, and verbal involvement.

2.2.3. Statistical analyses

Statistical analyses were conducted using the software R (R Core Team, 2013) and RStudio (RStudio Team, 2016). At first, descriptive analysis was conducted to evaluate frequency, mean, standard deviation and range of variation of socio-demographic, clinical-obstetric and clinical-psychological features of the mothers of our final sample, as well as of perinatal characteristics of the newborns.

Subsequently, before testing the research hypotheses, correlation analyses were carried out between the variables of interest, taking into consideration as covariates (confounding variables) maternal age, maternal marital status, maternal educational level, at-risk pregnancy, and other children.

Then, to test the first hypothesis, in which the two groups of mothers in the sample (IUGR vs. non-IUGR) were compared during the third trimester of pregnancy and at 4 months postpartum about maternal anxiety, *t-tests* were performed to see whether the experimental group scored significantly lower than the control group.

For the second hypothesis, which involved comparing IUGR and non-IUGR mothers regarding the four adult scales of the EA scales, with the expectation of observing lower scores in mothers of IUGR children, *t-tests* were conducted for each of the scales considered.

Similarly, the third hypothesis was tested, in which comparison was performed by *t-tests* between the experimental and control groups regarding the child's EA scales.

Finally, Simple Linear Regression Analyses were conducted for exploratory purposes to test whether, respectively, IUGR condition and prenatal maternal anxiety level could be predictive of the scores resulting from the EAS scales, therefore, of the quality of dyadic interactive exchanges; observations were conducted for each of the six scales.

2.3. RESULTS

2.3.1. Sample characteristics

For this work, data from 136 mothers collected during the last trimester of pregnancy (t0), of which 51 are IUGR mothers and 85 are mothers with uncomplicated physiological pregnancies, and 39 mother-child dyads at 4 months postpartum (t1), of which 11 are IUGR and 28 are non-IUGR, were analyzed.

Participants characteristics of the sample, relative to socio-demographic, clinical-obstetric and perinatal information, are shown in Table 1.

Table 1. *Participants' sociodemographic, clinical-obstetric, and perinatal characteristics*

Variables	*Values*
Socio-demographic variables	
Age, mean, sd (range)	34.04, 5.35 (18-47)
Nazionality, N (%)	
Italian	97 (80.83%)
Other	23 (19.17%)
Education level, N (%)	

Elementary/Primary school license	1 (0.83%)
Middle school license	5 (4.13%)
High school license	41 (33.88%)
Bachelor's degree	19 (15.70%)
Master's degree	47 (38.85%)
Ph.D. or specialization	8 (6.61%)
Marital status, N (%)	
Unmarried	7 (5.78%)
Married	67 (55.37%)
Cohabiting	46 (38.02%)
Other	1 (0.83%)
Clinical-obstetric variables	
Other children, N (%)	
No	65 (57.52%)
Yes	48 (42.48%)
Gestazional age, mean, sd (range)	36.38, 3.21 (27-41)
Risk pregnancy, N (%)	
No	72 (62.61%)
Yes	43 (37.39%)
Baby loss, N (%) **(?)**	
No	74 (63.79%)
Yes	42 (36.21%)
Antenatal course, N (%)	
No	13 (38.24%)
Yes	21 (61.76%)
Type of childbirth, N (%)	
Unassisted vaginal delivery	8 (23.53%)
Assisted vaginal delivery	18 (52.94%)
Emergency cesarean delivery	7 (20.59%)
Other	1 (2.94%)
Medical issues, N (%)	
No	19 (65.52%)
Hemorrhages/Bleeding	3 (10.34%)
Complications at delivery	4 (13.79%)
Mechanical delivery	1 (3.45%)
Other	2 (6.90%)
Perinatal variables	
Child/Infant gender, N (%)	
Male	17 (48.57%)
Female	18 (51.53%)
Gestational age at birth (week), mean, sd (range)	38.94, 1.54 (36-41)
Birthweight (g), mean, sd (range)	3177.90, 533.23 (2205-4380)
Type of breastfeeding, N (%)	
Exclusive (/Unique)	17 (48.57%)
Predominant (/Prevalent)	4 (11.43%)
Supplementary	10 (28.57%)
None	4 (11.43%)

Breastfeeding issues, N (%)	
No	22 (75.86%)
Yes	7 (24.14%)

2.3.2. Variables of interest description

Descriptive statistics (psychometric characteristics) of the variables of interest of this study are reported in Table 2.

Table 2. *Participants' psychometric characteristics of the variables of interest*

Variables	*Values*
Psychological variables t0	
STAI-Y-S (total score), mean, sd (range)	38.10, 9.89 (20-70)
Psychological variables t1	
STAI-Y-S (total score), mean, sd (range)	33.03, 7.85 (20-51)
EAS sensitivity (total score), mean, sd (range)	5.55, 0.94 (3.5-7)
EAS structuring (total score), mean, sd (range)	5.0, 0.83 (3-6.5)
EAS non-intrusiveness (total score), mean, sd (range)	5.42, 0.94 (3-6.5)
EAS non-hostility (total score), mean, sd (range)	6.32, 0.52 (5-7)
EAS child responsiveness (total score), mean, sd (range)	4.8, 0.84 (3-6.5)
EAS child involvement (total score), mean, sd (range)	4.15, 1.09 (2-6)

Figure 1 and Figure 2 shows the distribution of the main variables of the study.

Figure 1. *Histograms of the STAI-Y-S (total score) distribution of the sample, at different time-point (t0, t1)*

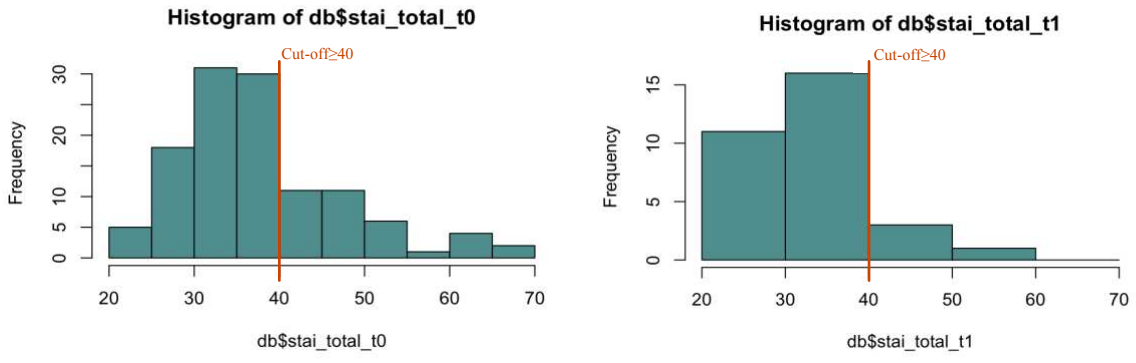
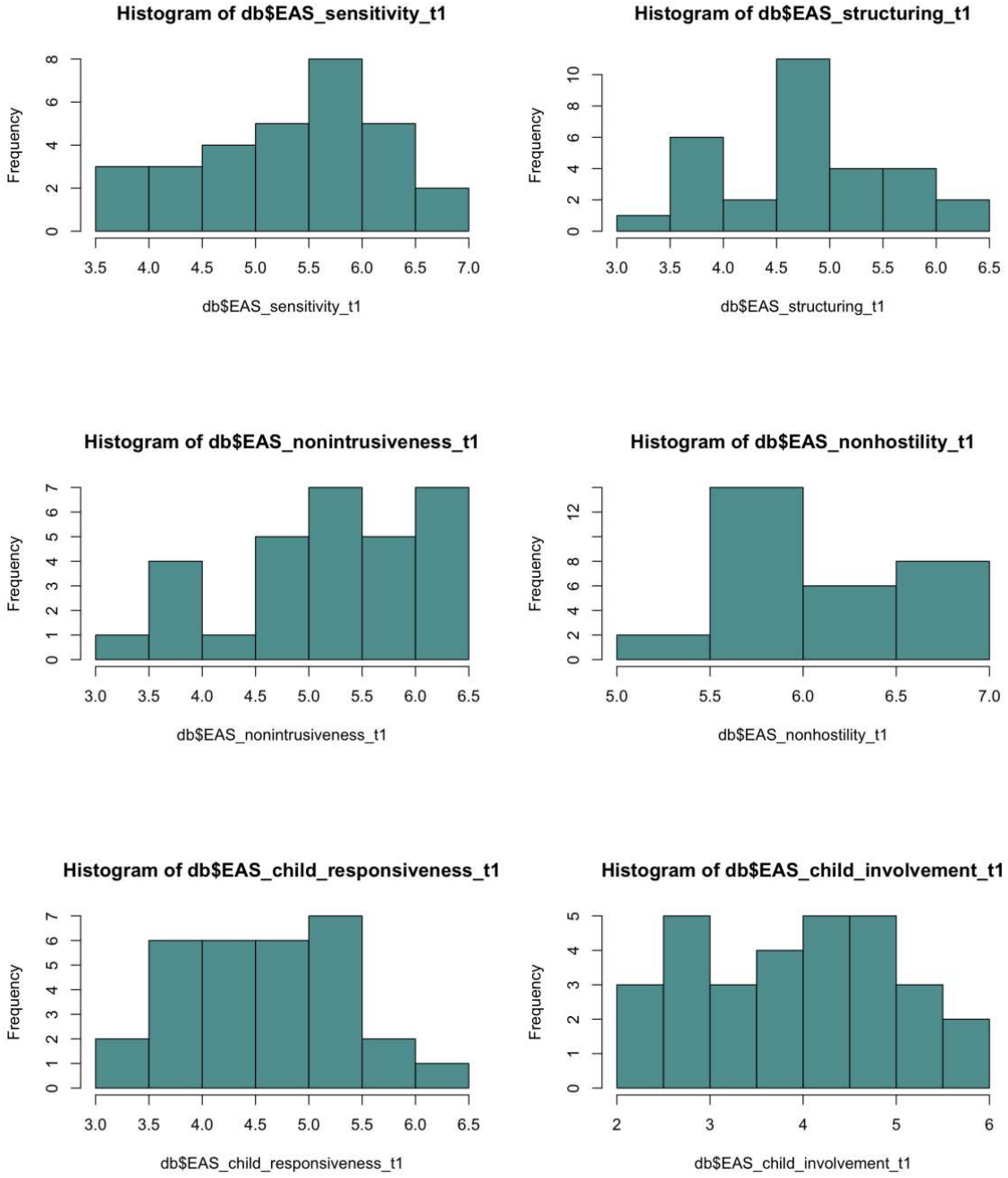


Figure 2. *Histograms of the six EAS scales (total score) distribution, in the final sample*



2.3.3. Data analysis Aim 1

Referring to the first aim of the study, to explore the differences in maternal anxiety levels between the experimental group and the control group at t0 (during pregnancy) and at t1 (at 4 months postpartum), as measured by the STAI-Y-S, two *t-tests* were conducted.

At t0, a significant difference was found in the anxiety levels obtained through the STAI between the two groups, whereby women with IUGR pregnancy obtained significantly lower

scores than women with uncomplicated physiological pregnancy, while at the second stage (t1) no significant differences were observed within the sample groups.
Results of mean comparisons are shown in Table 3.

Table 3. *Compared mean STAI-Y-S score of the sample groups at different times (t0, t1)*

Study stage	*IUGR mothers* *N = 44*	*Control group* *N = 75*	*t (degrees of freedom)*	*p-value*
t0	41.21 (10.04)	36.28 (9.40)	2.64 (85.44)	< .001
	IUGR mothers *N = 11*	*Control group* *N = 20*		
t1	32.46 (5.97)	33.35 (8.84)	-0.34 (27.56)	.74

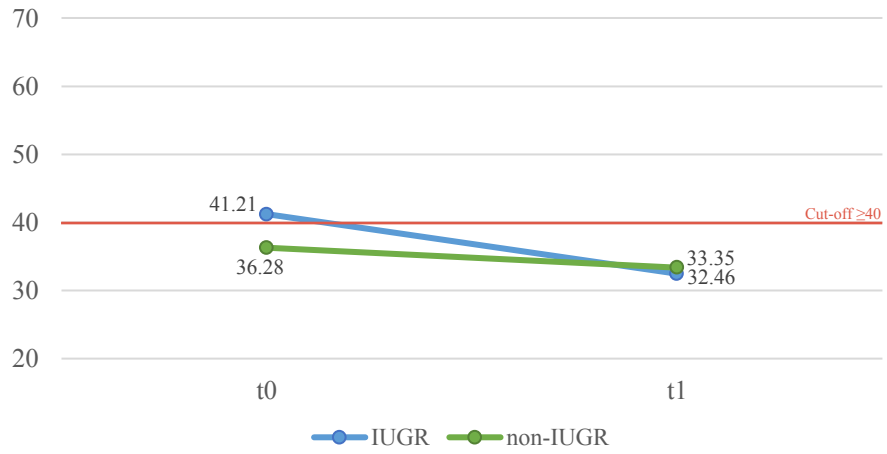
Table 4 shows the division of the sample groups into two categories related to the level of maternal anxiety, one including mothers with total STAI-Y-S scores below the cut-off (<40) and the other consisting of mothers whose total score is above the cut-off line (≥40), at the time-points of the study (t0, t1).

Table 4. *Percentages and number of subjects above or below the cut-off (≥40) of the sample groups, at different stages (t0, t1)*

STAI-Y-S scores	*Values of x* *(IUGR mothers)*	*Values of y* *(control group mothers)*
above the cut-off at t0	45.45% (n=20)	25.33% (n=56)
below the cut-off at t0	54.55% (n=24)	74.67% (n=19)
above the cut-off at t1	9.10% (n=1)	30.00% (n=6)
below the cut-off at t1	90.90% (n=10)	70.00% (n=14)

Figure 3 graphically compared the averages of the scores obtained by the two sample groups in the two different study stages.

Figure 3. *Maternal perinatal anxiety level of the sample groups along the stages*



2.3.4. Data analysis Aim 2

Relative to the second aim of our research, the *t-tests* conducted to explore the differences in the scores of individual EAS scales between mothers in the experimental group and those in the control group showed a significant difference in the scales of maternal sensitivity and structuring, in which IUGR mothers scored lower than non-IUGR mothers; on the other hand, regarding the scales of non-intrusiveness and non-hostility, no significant differences were observed.

T-tests results are reported in Table 5.

Table 5. *Compared mean score on the adult EAS scales of the sample groups*

EAS scale	*IUGR mothers N = 10*	*non-IUGR mothers N = 18*	*t (dg)*	*p-value*
Sensitivity	5.00 (1.07)	5.92 (0.65)	-2.67 (16.43)	.02
Structuring	4.50 (0.88)	5.33 (0.62)	-2.85 (18.18)	.01
Non-intrusiveness	5.13 (1.05)	5.61 (0.83)	-1.35 (19.93)	.19
Non-hostility	6.25 (0.50)	6.36 (0.54)	-0.58 (24.90)	.57

2.3.5. Data analysis Aim 3

Concerning the third aim, to explore the differences in EAS scale scores between children in the IUGR dyads and children belonging to the control group, *t-tests* executed showed significant differences within the two groups with respect to both child scales, where IUGR subjects recorded significantly lower overall scores than non-IUGR children.

The results of the *t-tests* are shown in Table 6.

Table 6. *Compared mean score on the child EAS scales of the sample groups*

EAS scale	*IUGR children N = 10*	*non-IUGR children N = 18*	*t (dg)*	*p-value*
Child responsiveness	4.33 (0.83)	5.11 (0.70)	-2.67 (20.72)	.015
Child involvement	3.46 (0.96)	4.61 (0.93)	-3.25 (23.16)	.004

2.3.6. Data analysis Aim 4

Regarding the fourth aim of our study, intended to explore whether, respectively, the IUGR condition and the prenatal maternal anxiety level are predictive of the scores obtained overall by the sample dyads in the EAS scales, therefore, of some quality of mother-child interaction aspects.

Simple Linear Regression Analyses were performed for each of the two variables investigated in relation to the six EAS scales individually, accounting for maternal age, marital status, education level, the presence of other children, and possible experience of risky pregnancy as potential confounding variables.

In regressions conducted, however, no significant relationship emerged with any of the scales, neither for the prenatal maternal anxiety nor for the IUGR condition.

2.4. DISCUSSION

The present study, in purpose of promoting awareness regarding the importance of maternal psychological well-being in the perinatal period for the subsequent development of the child, specifically of an adverse prenatal condition, such as IUGR, is proposed as an empirical contribution to the extensive existing literature on this topic. Particularly, focusing on perinatal maternal anxiety and socio-emotional and behavioral development (quality of dyadic mother-child interaction), it aims to compare IUGR mother-infant dyads and perinatal dyads with uncomplicated physiological pregnancies.

Pregnancy is a delicate period that lays the foundation for development, in which prenatal adversities, such as IUGR, can have unfavorable consequences in terms of the healthy

development of the fetus and subsequently the child (Gluckman & Hanson, 2006) and, in addition, on maternal mental health (Lewis et al., 2016).

Regarding prenatal maternal anxiety, the results of our study are in line with the literature, evidencing higher levels of anxiety symptoms in the population of women with IUGR pregnancy, compared with the group of control mothers. Whereas the results concerning maternal anxiety measured at 4 months postpartum, emphasizing a non-stable trend between pregnancy and the postpartum period, in which the average anxiety levels of IUGR mothers decrease, do not reflect findings from a series of studies.

On the quality of mother-child interaction, our results confirmed the differences known in the literature between IUGR dyads and control dyads regarding the adult's scales of sensitivity and structuring and those of responsivity and child involvement, revealing that mothers of IUGR-born individuals are less sensitive and less structuring within dyadic exchanges and such children show more passive behaviors, characterized by less responsivity and less involvement in the interaction than their AGA peers; no significant results were found regarding the non-intrusiveness and non-hostility scales. Finally, no evidence was found on prenatal maternal anxiety and IUGR condition as predictors of the quality of dyadic interaction, not reflecting what the study hypothesized.

2.4.1. On maternal perinatal anxiety

The first objective of this research was to explore the mean level of maternal anxiety, as measured by the STAI-Y-S, of women with IUGR pregnancy in comparison with women with uncomplicated physiological pregnancy at two different time periods, during the third trimester of pregnancy (t0) and at 4 months postpartum (t1). The results of the study are partly aligned with our hypothesis of finding a higher level of maternal anxiety in IUGR women at both stages; in fact, at t0 the maternal anxiety averages of the two groups have a significant difference, while at t1 the IUGR and control mothers show almost equal levels, reporting no significance in the difference between the means.

Specifically, about prenatal maternal anxiety, the mean score (of the STAI-Y-S) obtained in the third trimester of pregnancy (t0) by IUGR mothers is above the cut-ff line (≥40), although the mean score is slightly above it. The result of the between-group comparison confirms existing evidence in the literature on the association between maternal anxiety in pregnancy and IUGR (Glynn et al., 2008; Lewis et al., 2016; Sabri & Nabel, 2015; Tsakiridis et al., 2019; Uguz et al., 2011). In fact, pregnancy is a situation that exposes the woman to more

physical and mental stress, and the experience of a high-risk pregnancy, such as IUGR, may induce more stress on the woman, partly because of the information regarding the characteristics of the medical condition (e.g., fetal growth abnormalities) (Geva et al., 2006). In addition to information about known characteristics and outcomes, what might increase the anxious thoughts and worries of parents, particularly the woman, are the unknown aspects and unanswered questions, namely the real impact of the IUGR condition on their child's future development. In addition, normal daily concerns might be experienced with greater intensity, thus as more stressful and consequently as an additional source of anxiety. Stressful situations can generate anxiety (Lewis et al., 2016) and it is common to experience mild anxiety symptoms during pregnancy (Harpel, 2008). In our study, women with uncomplicated physiologic pregnancies who scored above the cut-off point of the STAI-Y-S (40) were 25%, a higher incidence than the 16% known in the literature, which still sees an increase in anxiety levels during the period of pregnancy, compared to the incidence of 7% in the general population (Ross & McLean, 2006; Rubertsson et al., 2014). Reporting high levels of prenatal anxiety in the population of mothers with IUGR pregnancies in our sample, on the other hand, is 45%, a high and significantly higher statistical data than in the group of control mothers, which confirms that experiencing an adverse prenatal condition increases the anxiety of pregnant women. In fact, in the case of complicated pregnancies, increased stress about their own condition may be reflected in increased anxious states and worries related to their pregnancy and delivery. In turn, high levels of maternal anxiety can increase the risk of pregnancy and fetal development (Abrar et al., 2020). Specifically, prenatal maternal anxiety is associated with reduced fetal growth (Conde et al., 2010), especially of the head (Lewis et al., 2016), low birth weight (Ding et al., 2014), short stature at birth, and reduced postnatal growth (Field, 2011).

Regarding maternal anxiety at 4 months postpartum (t1), however, in which no significant difference was observed between the two sample groups, the mean of control women remained basically unchanged from the previous stage, while that of women with IUGR pregnancy dropped by several points (with a slightly higher score than the control group), showing a decreasing trend in anxiety levels between the prenatal and postpartum periods, a different result from that hypothesized and in disagreement with what has been predominantly highlighted in the literature. Several studies have observed a stable trend in maternal anxiety levels between pregnancy and the postpartum period (Dipietro et al., 2008; Grant et al., 2008; Tamaki et al., 1997), with similar incidence rates among them for women

with subclinical levels of anxiety (Goodman et al., 2014). Our study observed results consistent with the literature for the group of mothers with physiological pregnancies, whose first and second assessment averages were 36.28 (t0) and 33.35 (t1), respectively, both below the cut-off point (≤40). Women with IUGR pregnancies, on the other hand, averaged 41.21, above the cut-off (high level of anxiety), in the first stage and an equal average of 32.46 in t1, although it is known that high levels of prenatal anxiety predict a higher risk of high anxiety even in the months after delivery (Tamaki et al, 1997) and that concerns related to the infant's well-being and one's own health may maintain stable or even increase anxiety in the mother (Nakić et al., 2018), as was observed in Britton's study, in which the sample's mean maternal anxiety levels increased in the weeks following labor (Britton, 2008).

There is, however, some thought to be put into place regarding possible risk and/or protective factors that may contribute to stable or increased anxiety after childbirth, which could provide explanations for the results obtained in our study. The most predictive factors are social support (perceived and received), particularly from the partner (Orr, 2004), socioeconomic status (specifically income, employment, and education level) (Kim et al., 2018; Martini et al., 2016), and daily responsibilities (domestic and work) (Feligreras-Alcalà et al., 2020; Yu et al., 2020).

An additional reason for the downward trend in the maternal anxiety level of the population of mothers with IUGR pregnancies in our study could be the fact that the delivery was successfully passed and that in comparison with children of the same age one's IUGR child appears to be similar aesthetically and physically, namely, does not appear smaller in age or with features that denote cognitive and/or behavioral atypicality at a glance. Therefore, concerns related to one's own postpartum well-being and that of one's child may decrease after labor, one of the factors most associated with the mother's anxiety waiting to delivery (Mudra et al., 2020).

Finally, we hypothesize that the women who continued in the research and thus performed the stage at 4 months postpartum (t1) may represent the portion of the population of IUGR mothers who are less anxious, in part because of the assessment involving the dyadic video-recorded play interaction, for which some women may have chosen not to participate because of social desirability; we believe that a highly anxious person, compared to a person with low levels of anxiety, is more likely to avoid the situation and consequently not expose themselves to third-party observation of videotaping with their child. This possible

explanation could be a hypothetical confirmation of the underestimation in the literature of the incidence of maternal anxiety in the postnatal period (Fairbrother et al., 2016).

Regarding the next results that we are going to explain, it must be considered that the quality of mother-child interactions was not significantly affected by the level of maternal anxiety at 4 months, as the two groups in the sample had on average similar scores between them and below the STAI-Y-S cut-off (≤40). However, there is evidence in the literature with respect to the association between high levels of prenatal maternal anxiety, which in our study was found to be above the cut-off line (≥40) for women with IUGR pregnancy, and poorer quality of dyadic exchanges (Baibazarova et al, 2013; Hakanen et al., 2019; Korja & McMahon, 2021; Parfitt & Ayers, 2014) in comparison with the normative population, reflected in interactions characterized by less reciprocity and sharing, poor joint activities, and low emotional expressiveness (Zietlow et al., 2019). Prenatal maternal anxiety, in fact, predicts mother-child emotional regulation and at high levels results in more negative states of both dyad members (Riva Crugnola et al., 2016).

2.4.2. Maternal interactive modalities (on EAS adult's scales)

The second objective of this study was to compare mothers in the two sample groups on the quality of parenting within dyadic free-play interactions with their child at 4 months after birth, as measured by EAS scales. Comparisons were made for each of the four adult scales, and the results partially confirm our hypotheses and some evidence from the literature of lower scores in mothers of IUGR children.

Regarding the sensitivity and structuring scales, where a significant difference was observed between the sample groups, our results are consistent with the hypotheses expressed and the literature, whereby mothers of IUGR children show less engagement in free play within daily interactions (Halpern et al., 2001), where they appear to be less flexible, less connected to their child and less able to create a framework of interactive sharing due to not always contingent responses to their child's signals and a poorer amount of structuring. As suggested by several researches, the explanation for these deficit behaviors could be in the atypical characteristics of the IUGR child during dyadic exchanges, such as frequent state changes (Feldman, 2007), high negative affectivity (Watt, 1989), higher irritability, lower responsiveness (Mello et al, 2014), a hostile type of crying (Figueras et al., 2009), fewer smiles and looks toward the parent, difficulty in attunement, less rhythmicity, and, in general,

greater passivity (Feldman & Eidelman, 2006). These atypical interactional features might make it more difficult for the mother to interpret signals (Feldman & Eidelman, 2006) and might activate in her compensatory behaviors (Miles & Holditch- Davis, 1995; Montirosso et al, 2017) with adaptive purpose, but not in tune with the child's demands (Howe et al, 2016). Specifically, the mean score obtained by the mothers in the IUGR group in the sensitivity scale is 5, a score that is in the middle range of the scale, reflecting a warm maternal affectivity, but with behaviors that are not always consistent in response to the child's signals, in comparison with the mothers in the control group, whose mean score of 5.92 is in a higher range, denoting greater warmth and greater involvement and enjoyment during interaction, resulting in fairly adequate responses to child demands and good emotional regulation of self and other. On the responsiveness scale, the average score obtained by IUGR mothers is 4.5, while that of non-IUGR mothers is 5.33. The former showed over-structuring or inconsistency in structuring a shared play environment, frequently losing connection with their child, while the non-IUGR mothers showed more success in guiding the interaction, supporting the child in choices and play activities.

On the other hand, with respect to the non-intrusiveness and non-hostility scales, our results did not confirm what was hypothesized, as we did not find significance in the comparisons between the two groups in the sample. Specifically, on non-intrusiveness, what was observed in the cohort of mothers in our study does not reflect the known evidence in the literature of more intrusive behaviors of IUGR mothers in dyadic interactions compared to mothers of AGA children (Feldman & Eidelman, 2006; Gorman et al, 2001; Van Beek et al., 1994; Watt, 1986). The mean score obtained on the non-intrusiveness scale is 5.13 for IUGR mothers and 5.61 for control mothers. Women in both groups, albeit with slight differences, almost never showed intrusive behaviors, maintaining helpfulness toward the child, and following his lead, except at times when they unintentionally obstructed it. On the non-hostility scale, on the other hand, both groups are placed at the high end of the scores, with averages of 6.25 and 6.36 for IUGR and non-IUGR women, respectively, reflecting a maternal interactive mode free of hostility, covert or overt, maintaining a gentle tone of voice and showing themselves emotionally well-regulated.

2.4.3. Infant's interactive modalities (on EAS child's scales)

Proceeding with the child's EAS scales, the third objective of the study was aimed at observing the comparison of IUGR vs AGA infants on interactive behaviors (responsive and

engagement) within mother-child exchanges (at 4 months postpartum), assuming lower overall scores on both scales in IUGR infants. The results, whereby the differences between the two groups were found to be significant for both scales, are consistent with the research hypotheses and literature on the previously mentioned interactional patterns of IUGR children within the first two years of life, a period when their socio-emotional difficulties in interactional exchanges persist (El Ayoubi et al., 2016).

Specifically, on the responsivity scale, IUGR children scored an average of 4.33, a medium-low score that results in flat or anxious affectivity, uncertain behaviors, and autonomy-seeking that is often not age-appropriate (too much or too little), while non-IUGR children have better regulation of their emotions and more positive affectivity, achieving an overall mean of 5.11. On the scale of mother's involvement by the child, however, IUGR children, with a score of 3.46 (low-medium), often showed lack of initiative in engaging their mother, sometimes moving away from her, in some cases avoiding eye contact, and with little use of verbal communication to signal a need or express emotion. In comparison, AGA children, who scored an average of 4.61, engaged their mother to a greater extent, including through looks and vocal sounds, albeit using stressful and/or anxious patterns.

2.4.4. Predictions about EAS scales

The last objective of this study was to explore whether, respectively, IUGR condition and prenatal maternal anxiety, were able to predict EAS scale scores, therefore, whether they are predictors of the quality of mother-child interactions. For this part of the research, the analyses were performed taking into consideration the confounding variables mentioned in the results section.

Limited to prenatal maternal anxiety, no results were found to confirm what our study hypothesized based on the above-mentioned known evidence on associations with the quality of dyadic exchanges. In fact, with respect to the association between maternal prenatal anxiety, thus the total scores obtained from the STAI-Y-S, and the EAS scales (total scores of each scale), no significant results were found for any of the six scales, indicating that maternal prenatal anxiety in the sample at t1 is not associated with maternal parenting behaviors and children's interactive patterns within the interactive exchanges of such dyads.

Referring to the association between IUGR condition and EAS scale scores, the results did not confirm our hypotheses, based on the interactive characteristics of IUGR children and the implications on parental parenting behaviors, that IUGR condition negatively affects the

quality of dyadic interactions in the first year of life (Sacchi et al., 2018; Tarabulsy et al., 1996). Therefore, no significant relationships were found with the mothers' scores on the four adult scales and the scores on both the responsiveness and child involvement scales, implying that, in our sample, being IUGR is not predictive of the dyad's subsequent way of being in interaction (and relationship) at 4 months postpartum.

2.5. STRENGHTS and LIMITATIONS of the STUDY

This study can be considered as an empirical contribution to the literature on the interacting patterns of IUGR children and their mothers in the first year of life. Essentially, our study further highlights some atypical interactive modalities of IUGR children and the repercussions of these modalities on maternal behaviors during dyadic exchanges at 4 months postpartum. In addition, this research provides further confirmation of the increased vulnerability of women prenatally diagnosed with IUGR in terms of mental health in pregnancy, of which the construct of prenatal anxiety was investigated in our study. The instruments used to collect data regarding dyadic interactions and maternal anxiety, the EAS scales and the STAI-Y-S self-report questionnaire, respectively, allowed a survey of the constructs very consistent with the literature on IUGR, as these instruments are often used in to measure these constructs.

This dissertation, moreover, may provide useful data for the upcoming work included within the larger research on from which our final sample is drawn: a longitudinal study focusing on four assessments from pregnancy to the first year of life, in which, in addition to t1, the quality of dyad interaction is also observed at subsequent stages (t2 at 9 months, t3 at 12 months).

This study, however, carries with it some limitations. First, the low sample size at 4 months postpartum (t1) did not allow for statistically powerful results in analyses of between-group comparisons. In addition, for the same reason, the trend in maternal anxiety levels observed between pregnancy and postpartum, in which the numerosity dropped significantly from one stage to the next (more than halved), may not be a representative result of the entire general population during pregnancy.

Also making the final sample of mothers unrepresentative of the entire population of women in the perinatal period is that it is not a clinical sample and whose social conditions are generally quite favorable, such as medium to high level of education, the presence of a partner, and high social support received and perceived. For this reason, our study can be

considered representative with respect to a population with tendentially affluent living conditions and low risk for mental health, especially with respect to t1. Therefore, although in this work pregnant IUGR mothers overall scored a sub-clinical mean level in maternal anxiety, this dimension may have been underestimated. Furthermore, the recruitment that took place in the obstetrics department at the hospital in the third trimester of gestation close to the follow-up visits may have contributed to the non-adherence to the research project by the generally more anxious women (not necessarily with stable clinical levels or a diagnosis), particularly those with IUGR pregnancy due to the prenatal diagnosis they had recently had. We believe that this limitation is even greater in reference to the 4-month stage, in which new mothers who had participated at t0 were contacted again by telephone (or e-mail) to make appointments for conducting the dyadic interaction, as well as for compiling a new battery of questionnaires. The women who agreed to continue in the research with the second stage (t1) might be the less anxious ones in the final sample (at t0), since the fact that they had to be video-recorded and knowing that the video recordings were later observed and evaluated by unknown people might further increase their anxiety about the performance and consequently their social desirability, resulting in their choosing not to expose themselves to this situation and discontinue participation in the study.

Another limitation of this research concerns the administration of the questionnaires at the two different stages. During pregnancy, questionnaires were mostly filled out in the hospital close to the obstetrical visit, therefore, the women in the sample may have been in a hurry, stressed and unfocused. In some exceptions, when participants did not make it in time to finish filling in, they took the protocol home to complete it later (and send it to us later by e-mail), thus interrupting themselves in reading and completing the questionnaires. This situation may have been reflected in responses that were not always accurate with each other because of the different times when the questionnaires were being filled out; in fact, the emotional state of these women probably will not have been the same at the two or more different times of compilation. This condition was repeated several times, instead, in the 4-month stage (t1), in which the protocol was sent by e-mail at the time of new recruitment, to give mothers a chance to arrive at the department to carry out the dyadic interaction with the battery of questionnaires already completed. Those who brought the already completed questionnaires to the appointment (at t1), therefore, had the opportunity to interrupt the completion several times; however, it could have allowed such participants to select only calm and quiet moments to respond to the items, compared to those who performed the entire

stage at the time of the appointment. Very few participants filled out the protocol at 4 months directly in the department before or after the interaction, without interruption.

2.6. CONCLUSIONS and FUTURE RESEARCH DIRECTIONS

IUGR is an increasingly studied pregnancy-related medical condition, of which, however, many aspects are still unknown or need further investigation. Indeed, as extensive as the literature on the topic is, some evidence is still limited due to the heterogeneity of this population, or contradictory to each other, particularly regarding the development (cognitive, social-emotional, behavioral) of such individuals over time.

This dissertation fits into the copious literature on IUGR with reference to maternal mental well-being during pregnancy and the quality of mother-child interactive exchanges in the first year of life.

Considering our findings about prenatal maternal anxiety, in which IUGR women reported a significantly higher sub-clinical level than women in the control group, in line with the literature, we emphasize the importance of maternal mental well-being in pregnancy, with particular attention to at-risk pregnancy conditions, such as IUGR, by encouraging its monitoring throughout the prenatal period and in the first months after delivery. Maternal mental health during pregnancy, particularly anxiety and stress, can indeed influence fetal growth (Federenko & Wadhwa, 2004), the quality of parenting in dyadic interactions (De Carli et al., 2019), and the child's social-emotional and behavioral development (von Hinke et al., 2022).

Regarding the quality of mother-child interaction at 4 months postpartum, of which our findings are generally consistent with numerous research studies, we highlight the interactive difficulties of IUGR children, whose atypical patterns may have an influence on maternal behaviors (Feldman & Eidelman, 2006; Montirosso et al., 2017). IUGR children were mainly more passive and less emotionally regulated than their AGA peers, while IUGR mothers, compared to control mothers, mostly showed more negative affectivity and less ability to structuring interaction. The low sample numerosity at t1, however, did not allow us to obtain results with high external validity. Therefore, we suggest the use of samples with a large numerosity for future work to obtain a greater possibility of generalization of the results. A larger sample size is also needed to investigate potential predictors of the quality of dyadic exchanges; in this regard, in addition to prenatal maternal anxiety, additional constructs such as stress and depression in pregnancy and aspects of psychological well-being in the

postpartum period could also be investigated. Furthermore, given the importance of the child's relationship with his or her father (in addition to the usually primary relationship with the mother), on child development (Johansson et al., 2020), it would be interesting to investigate the quality of father-child interactions of IUGR individuals, on which a limited amount of research has been interested.

Regarding the present study, an interesting next work could be to continue in the comparisons between the IUGR group and the group with uncomplicated physiological pregnancy in relation to maternal anxiety and the observation of the interactive patterns of the dyads in the stages at 9 months (t2) and 12 months (t3), included in the broader research on which this dissertation is structured, aiming to observe the performance of the two groups and possible improvements or deteriorations in the interactive quality of IUGR dyads in the first year of life, a period when the socio-emotional difficulties of such children usually persist (El Ayoubi et al. , 2016).

In conclusion, we would like to emphasize the importance of studying the IUGR condition throughout the life course in all aspects of development, with the aim of making parents of such individuals more aware of the prenatal diagnosis they receive and to be able to develop increasingly accurate interventions in preparation for childbirth and in the months following birth, and increasingly appropriate trainings to support IUGR individuals during development.

REFERENCES

Abrar, A., Fairbrother, N., Smith, A. P., Skoll, A., & Albert, A. Y. K. (2020). Anxiety among women experiencing medically complicated pregnancy: A systematic review and meta-analysis. Birth, 47(1), 13–20. https://doi.org/10.1111/birt.12443

Ainsworth, M. D. S. (1978). The Bowlby-Ainsworth attachment theory. Behavioral and Brain Sciences, 1(3), 436–438. https://doi.org/10.1017/S0140525X00075828

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. N. (2015). Patterns of Attachment: A Psychological Study of the Strange Situation. Psychology Press.

Aksan, N., Kochanska, G., & Ortmann, M. R. (2006). Mutually responsive orientation between parents and their young children: Toward methodological advances in the science of relationships. Developmental Psychology, 42(5), 833–848. https://doi.org/10.1037/0012-1649.42.5.833

Aktan, N. M. (2012). Social Support and Anxiety in Pregnant and Postpartum Women: A Secondary Analysis. Clinical Nursing Research, 21(2), 183–194. https://doi.org/10.1177/1054773811426350

Alfirevic, Z., & Neilson, J. P. (1993). Fetal growth retardation: Methods of detection. Current Obstetrics & Gynaecology, 3(4), 190–195. https://doi.org/10.1016/0957-5847(93)90037-P

Altman, D. G., & Hytten, F. E. (1989). Intrauterine growth retardation: Let's be clear about it. British Journal of Obstetrics and Gynaecology, 96(10), 1127–1132. https://doi.org/10.1111/j.1471-0528.1989.tb03185.x

American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Obstetrics and the Society forMaternal-FetalMedicin. (2019). ACOG Practice Bulletin No. 204: Fetal Growth Restriction. Obstetrics and Gynecology, 133(2), e97–e109. https://doi.org/10.1097/AOG.0000000000003070

Ann Easterbrooks, M., & Biringen, Z. (2000). Guest editors' introduction to the special issue: Mapping the terrain of emotional availability and attachment. Attachment & Human Development, 2(2), 123–129. https://doi.org/10.1080/14616730050085518

Ashorn, P., Ashorn, U., Muthiani, Y., Aboubaker, S., Askari, S., Bahl, R., Black, R. E., Dalmiya, N., Duggan, C. P., Hofmeyr, G. J., Kennedy, S. H., Klein, N., Lawn, J. E., Shiffman, J., Simon, J., Temmerman, M., Okwaraji, Y., Krasevec, J., Bradley, E., … Hayashi, C. (2023). Small vulnerable newborns—Big potential for impact. The Lancet, 401(10389), 1692–1706. https://doi.org/10.1016/S0140-6736(23)00354-9

Austin, M.-P., Hadzi-Pavlovic, D., Leader, L., Saint, K., & Parker, G. (2005). Maternal trait anxiety, depression and life event stress in pregnancy: Relationships with infant temperament. Early Human Development, 81(2), 183–190. https://doi.org/10.1016/j.earlhumdev.2004.07.001

Baibazarova, E., van de Beek, C., Cohen-Kettenis, P. T., Buitelaar, J., Shelton, K. H., & van Goozen, S. H. M. (2013). Influence of prenatal maternal stress, maternal plasma cortisol and cortisol in the amniotic fluid on birth outcomes and child temperament at 3 months. Psychoneuroendocrinology, 38(6), 907–915. https://doi.org/10.1016/j.psyneuen.2012.09.015

Baker, J. K., Fenning, R. M., Crnic, K. A., Baker, B. L., & Blacher, J. (2007). Prediction of Social Skills in 6-Year-Old Children With and Without Developmental Delays: Contributions of Early Regulation and Maternal Scaffolding. American Journal on Mental Retardation, 112(5), 375–391. https://doi.org/10.1352/0895-8017(2007)112[0375:POSSIY]2.0.CO;2

Bar-Haim, Y., Marshall, P. J., & Fox, N. A. (2000). Developmental changes in heart period and high-frequency heart period variability from 4 months to 4 years of age.

Developmental Psychobiology, 37(1), 44–56. https://doi.org/10.1002/1098-2302(200007)37:1<44::AID-DEV6>3.0.CO;2-7

Barker, D. (2004). Developmental origins of adult health and disease. Journal of Epidemiology and Community Health, 58(2), 114–115. https://doi.org/10.1136/jech.58.2.114

Barker, D. J. P. (2003). Editorial: The Developmental Origins of Adult Disease. European Journal of Epidemiology, 18(8), 733–736.

Barker, D. J. P. (2004). The developmental origins of wellbeing. Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences. https://doi.org/10.1098/rstb.2004.1518

Barker, D. J. P., & Osmond, C. (1986). INFANT MORTALITY, CHILDHOOD NUTRITION, AND ISCHAEMIC HEART DISEASE IN ENGLAND AND WALES. The Lancet, 327(8489), 1077–1081. https://doi.org/10.1016/S0140-6736(86)91340-1

Barker, E. D., Jaffee, S. R., Uher, R., & Maughan, B. (2011). The contribution of prenatal and postnatal maternal anxiety and depression to child maladjustment. Depression and Anxiety, 28(8), 696–702. https://doi.org/10.1002/da.20856

Barnett, B., & Parker, G. (1986). Possible determinants, correlates and consequences of high levels of anxiety in primiparous mothers. Psychological Medicine, 16(1), 177–185. https://doi.org/10.1017/S0033291700002610

Baschat, A. A. (2011). Neurodevelopment following fetal growth restriction and its relationship with antepartum parameters of placental dysfunction. Ultrasound in Obstetrics & Gynecology, 37(5), 501–514. https://doi.org/10.1002/uog.9008

Batalle, D., Edwards, A. D., & O'Muircheartaigh, J. (2018). Annual Research Review: Not just a small adult brain: understanding later neurodevelopment through imaging the

neonatal brain. Journal of Child Psychology and Psychiatry, 59(4), 350–371. https://doi.org/10.1111/jcpp.12838

Battaglia, F. C., & Lubchenco, L. O. (1967). A practical classification of newborn infants by weight and gestational age. The Journal of Pediatrics, 71(2), 159–163. https://doi.org/10.1016/S0022-3476(67)80066-0

Bayrampour, H., Ali, E., McNeil, D. A., Benzies, K., MacQueen, G., & Tough, S. (2016). Pregnancy-related anxiety: A concept analysis. International Journal of Nursing Studies, 55, 115–130. https://doi.org/10.1016/j.ijnurstu.2015.10.023

Bayrampour, H., Tomfohr, L., & Tough, S. (2016). Trajectories of Perinatal Depressive and Anxiety Symptoms in a Community Cohort. The Journal of Clinical Psychiatry, 77(11), 21112. https://doi.org/10.4088/JCP.15m10176

Beebe, B., Jaffe, J., Markese, S., Buck, K., Chen, H., Cohen, P., Bahrick, L., Andrews, H., & Feldstein, S. (2010). The origins of 12-month attachment: A microanalysis of 4-month mother–infant interaction. Attachment & Human Development, 12(1–2), 3–141. https://doi.org/10.1080/14616730903338985

Beebe, B., & Lachmann, F. (2002). Organizing Principles of Interaction from Infant Research and the Lifespan Prediction of Attachment: Application to Adult Treatment. Journal of Infant, Child, and Adolescent Psychotherapy, 2(4), 61–89. https://doi.org/10.1080/15289168.2002.10486420

Beebe, B., & Stern, D. N. (1977). Engagement-Disengagement and Early Object Experiences. In N. Freedman & S. Grand (Eds.), Communicative Structures and Psychic Structures: A Psychoanalytic Interpretation of Communication (pp. 35–55). Springer US. https://doi.org/10.1007/978-1-4757-0492-1_3

Beeghly, M., & Tronick, E. (2011). Early Resilience in the Context of Parent–Infant Relationships: A Social Developmental Perspective. Current Problems in Pediatric

and Adolescent Health Care, 41(7), 197–201. https://doi.org/10.1016/j.cppeds.2011.02.005

Belsky, J., & Fearon, R. M. P. (2002). Early attachment security, subsequent maternal sensitivity, and later child development: Does continuity in development depend upon continuity of caregiving? Attachment & Human Development, 4(3), 361–387. https://doi.org/10.1080/14616730210167267

Berg, A. T. (1989). Indices of fetal growth-retardation, perinatal hypoxia-related factors and childhood neurological morbidity. Early Human Development, 19(4), 271–283. https://doi.org/10.1016/0378-3782(89)90062-5

Bernier, A., & Meins, E. (2008). A threshold approach to understanding the origins of attachment disorganization. Developmental psychology, 44(4), 969.

Bernstein, I. M., Horbar, J. D., Badger, G. J., Ohlsson, A., & Golan, A. (2000). Morbidity and mortality among very-low-birth-weight neonates with intrauterine growth restriction. American Journal of Obstetrics and Gynecology, 182(1), 198–206. https://doi.org/10.1016/S0002-9378(00)70513-8

Biringen, Z. (2000). Emotional Availability: Conceptualization and Research Findings. American Journal of Orthopsychiatry, 70(1), 104–114. https://doi.org/10.1037/h0087711

Biringen, Z. (2009). The universal language of love: assessing relationships through the science of emotional availability.

Biringen, Z. (2010). Emotional availability (EA): The assessment of and intervention for global parent-child relational quality.

Biringen, Z., Damon, J., Grigg, W., Mone, J., Pipp-Siegel, S., Skillern, S., & Stratton, J. (2005). Emotional availability: Differential predictions to infant attachment and

kindergarten adjustment based on observation time and context. Infant Mental Health Journal, 26(4), 295–308. https://doi.org/10.1002/imhj.20054

Biringen, Z., Derscheid, D., Vliegen, N., Closson, L., & Easterbrooks, M. A. (2014). Emotional availability (EA): Theoretical background, empirical research using the EA Scales, and clinical applications. Developmental Review, 34(2), 114–167. https://doi.org/10.1016/j.dr.2014.01.002

Biringen, Z., & Easterbrooks, M. A. (2012). Emotional availability: Concept, research, and window on developmental psychopathology. Development and Psychopathology, 24(1), 1–8. https://doi.org/10.1017/S0954579411000617

Biringen, Z., Fidler, D. J., Barrett, K. C., & Kubicek, L. (2005). Applying the Emotional Availability Scales to children with disabilities. Infant Mental Health Journal, 26(4), 369–391. https://doi.org/10.1002/imhj.20058

Biringen, Z., Robinson, J., & Emde, R. (2008). The emotional availability (EA) scales. Unpublished manual, 31998.

Biringen, Z., Skillern, S., Mone, J., & Pianta, R. (2005). Emotional availability is predictive of the emotional aspects of children's "school readiness" Journal of Early Childhood and Infant Psychology, 1, 81–98.

Blissett, J., Meyer, C., & Haycraft, E. (2007). Maternal mental health and child feeding problems in a non-clinical group. Eating Behaviors, 8(3), 311–318. https://doi.org/10.1016/j.eatbeh.2006.11.007

Bolten, M., Nast, I., Skrundz, M., Stadler, C., Hellhammer, D. H., & Meinlschmidt, G. (2013). Prenatal programming of emotion regulation: Neonatal reactivity as a differential susceptibility factor moderating the outcome of prenatal cortisol levels. Journal of Psychosomatic Research, 75(4), 351–357. https://doi.org/10.1016/j.jpsychores.2013.04.014

Bornstein, M. H. (2002). Development in Infancy: An Introduction (4th ed.). Psychology Press. https://doi.org/10.4324/9781410602596

Bornstein, M. H., & Tamis-LeMonda, C. S. (1989). Maternal responsiveness and cognitive development in children. New Directions for Child and Adolescent Development, 1989(43), 49–61. https://doi.org/10.1002/cd.23219894306

Bowlby, J. (1973). Attachment and loss. Volume II. Separation, anxiety and anger. In Attachment and loss. Volume II. Separation, anxiety and anger (p. 429 p.-429 p.). https://pesquisa.bvsalud.org/portal/resource/pt/psa-52619

Bowlby, J. (1979). The Bowlby-Ainsworth attachment theory. Behavioral and Brain Sciences, 2(4), 637–638. https://doi.org/10.1017/S0140525X00064955

Brazelton, T. B., Tronick, E., Adamson, L., Als, H., & Wise, S. (1975, January). Early mother-infant reciprocity. In Ciba Foundation Symposium 33-Parent-Infant Interaction (pp. 137-154). Chichester, UK: John Wiley & Sons, Ltd.

Brinker, R. P., Baxter, A., & Butler, L. S. (1994). An Ordinal Pattern Analysis of Four Hypotheses Describing the Interactions between Drug-addicted, Chronically Disadvantaged, and Middle-Class Mother-Infant Dyads. Child Development, 65(2), 361–372. https://doi.org/10.1111/j.1467-8624.1994.tb00756.x

Britton, J. R. (2008). Maternal anxiety: Course and antecedents during the early postpartum period. Depression and Anxiety, 25(9), 793–800. https://doi.org/10.1002/da.20325

Brodsky, D., & Christou, H. (2004). Current Concepts in Intrauterine Growth Restriction. Journal of Intensive Care Medicine, 19(6), 307–319. https://doi.org/10.1177/0885066604269663

Bushnell, I. w. r. (2001). Mother's face recognition in newborn infants: Learning and memory. Infant and Child Development, 10(1–2), 67–74. https://doi.org/10.1002/icd.248

Çankaya, S., & Şimşek, B. (2021). Effects of Antenatal Education on Fear of Birth, Depression, Anxiety, Childbirth Self-Efficacy, and Mode of Delivery in Primiparous Pregnant Women: A Prospective Randomized Controlled Study. Clinical Nursing Research, 30(6), 818–829. https://doi.org/10.1177/1054773820916984

Castiello, U., Becchio, C., Zoia, S., Nelini, C., Sartori, L., Blason, L., D'Ottavio, G., Bulgheroni, M., & Gallese, V. (2010). Wired to Be Social: The Ontogeny of Human Interaction. PLOS ONE, 5(10), e13199. https://doi.org/10.1371/journal.pone.0013199

Clavarino, A. M., Mamun, A. A., O'Callaghan, M., Aird, R., Bor, W., O'Callaghan, F., Williams, G. M., Marrington, S., Najman, J. M., & Alati, R. (2010). Maternal Anxiety and Attention Problems in Children at 5 and 14 Years. Journal of Attention Disorders, 13(6), 658–667. https://doi.org/10.1177/1087054709347203

Coco, L., Giannone, T. T., & Zarbo, G. (2014). Management of high-risk pregnancy. Minerva Ginecologica, 66(4), 383–389.

Cohen, E., Baerts, W., & van Bel, F. (2015). Brain-Sparing in Intrauterine Growth Restriction: Considerations for the Neonatologist. Neonatology, 108(4), 269–276. https://doi.org/10.1159/000438451

Cohn, J. F., & Tronick, E. Z. (1988). Mother-infant face-to-face interaction: Influence is bidirectional and unrelated to periodic cycles in either partner's behavior. Developmental Psychology, 24(3), 386–392. https://doi.org/10.1037/0012-1649.24.3.386

Comaskey, B., Roos, N. P., Brownell, M., Enns, M. W., Chateau, D., Ruth, C. A., & Ekuma, O. (2017). Maternal depression and anxiety disorders (MDAD) and child development: A Manitoba population-based study. PLOS ONE, 12(5), e0177065. https://doi.org/10.1371/journal.pone.0177065

Conde, A., Figueiredo, B., Tendais, I., Teixeira, C., Costa, R., Pacheco, A., Rodrigues, M. C., & Nogueira, R. (2010). Mother's anxiety and depression and associated risk factors during early pregnancy: Effects on fetal growth and activity at 20–22 weeks of gestation. Journal of Psychosomatic Obstetrics & Gynecology, 31(2), 70–82. https://doi.org/10.3109/01674821003681464

Contreras, J. M., Kerns, K. A., Weimer, B. L., Gentzler, A. L., & Tomich, P. L. (2000). Emotion regulation as a mediator of associations between mother–child attachment and peer relationships in middle childhood. Journal of family psychology, 14(1), 111.

Cowan, N., Elliott, E. M., Scott Saults, J., Morey, C. C., Mattox, S., Hismjatullina, A., & Conway, A. R. A. (2005). On the capacity of attention: Its estimation and its role in working memory and cognitive aptitudes. Cognitive Psychology, 51(1), 42–100. https://doi.org/10.1016/j.cogpsych.2004.12.001

Crosby, W. M. (1991). Studies in Fetal Malnutrition. American Journal of Diseases of Children, 145(8), 871–876. https://doi.org/10.1001/archpedi.1991.02160080047019

Crugnola, C. R. (2007). Il bambino e le sue relazioni. Attaccamento e individualità tra teoria e osservazione. Raffaello Cortina.

Cruz-Martinez, R., Figueras, F., Oros, D., Padilla, N., Meler, E., Hernandez-Andrade, E., & Gratacos, E. (2009). Cerebral blood perfusion and neurobehavioral performance in full-term small-for-gestational-age fetuses. American Journal of Obstetrics and Gynecology, 201(5), 474.e1-474.e7. https://doi.org/10.1016/j.ajog.2009.05.028

Dambi, J. M., Corten, L., Chiwaridzo, M., Jack, H., Mlambo, T., & Jelsma, J. (2018). A systematic review of the psychometric properties of the cross-cultural translations and adaptations of the Multidimensional Perceived Social Support Scale (MSPSS). Health and Quality of Life Outcomes, 16(1), 80. https://doi.org/10.1186/s12955-018-0912-0

Davies, C., & Robinson, K. (2010). Hatching Babies and Stork Deliveries: Risk and Regulation in the Construction of Children's Sexual Knowledge. Contemporary Issues in Early Childhood, 11(3), 249–262. https://doi.org/10.2304/ciec.2010.11.3.249

Davis, E. P., Glynn, L. M., Schetter, C. D., Hobel, C., Chicz-demet, A., & Sandman, C. A. (2007). Prenatal Exposure to Maternal Depression and Cortisol Influences Infant Temperament. Journal of the American Academy of Child & Adolescent Psychiatry, 46(6), 737–746. https://doi.org/10.1097/chi.0b013e318047b775

Dawson, G., Ashman, S. B., & Carver, L. J. (2000). The role of early experience in shaping behavioral and brain development and its implications for social policy. Development and Psychopathology, 12(4), 695–712. https://doi.org/10.1017/S0954579400004089

De Carli, P., Costantini, I., Sessa, P., Visentin, S., Pearson, R. M., & Simonelli, A. (2019). The expectant social mind: A systematic review of face processing during pregnancy and the effect of depression and anxiety. Neuroscience & Biobehavioral Reviews, 102, 153–171. https://doi.org/10.1016/j.neubiorev.2019.04.013

De Wolff, M. S., & van Ijzendoorn, M. H. (1997). Sensitivity and Attachment: A Meta-Analysis on Parental Antecedents of Infant Attachment. Child Development, 68(4), 571–591. https://doi.org/10.1111/j.1467-8624.1997.tb04218.x

Denis, A., Callahan, S., & Bouvard, M. (2015). Evaluation of the French Version of the Multidimensional Scale of Perceived Social Support During the Postpartum Period. Maternal and Child Health Journal, 19(6), 1245–1251. https://doi.org/10.1007/s10995-014-1630-9

Dexter, C. A., Wong, K., Stacks, A. M., Beeghly, M., & Barnett, D. (2013). Parenting and attachment among low-income African American and Caucasian preschoolers. Journal of Family Psychology, 27(4), 629–638. https://doi.org/10.1037/a0033341

Dib, E. P., Padovani, F. H. P., & Perosa, G. B. (2019). Mother-child interaction: Implications of chronic maternal anxiety and depression. Psicologia: Reflexão e Crítica, 32, 10. https://doi.org/10.1186/s41155-019-0123-6

Diego, M. A., Field, T., Hernandez-Reif, M., Schanberg, S., Kuhn, C., & Gonzalez-Quintero, V. H. (2009). Prenatal depression restricts fetal growth. Early Human Development, 85(1), 65–70. https://doi.org/10.1016/j.earlhumdev.2008.07.002

Diego, M. A., Jones, N. A., Field, T., Hernandez-Reif, M., Schanberg, S., Kuhn, C., & Gonzalez-Garcia, A. (2006). Maternal Psychological Distress, Prenatal Cortisol, and Fetal Weight. Psychosomatic Medicine, 68(5), 747. https://doi.org/10.1097/01.psy.0000238212.21598.7b

Ding, X.-X., Wu, Y.-L., Xu, S.-J., Zhu, R.-P., Jia, X.-M., Zhang, S.-F., Huang, K., Zhu, P., Hao, J.-H., & Tao, F.-B. (2014). Maternal anxiety during pregnancy and adverse birth outcomes: A systematic review and meta-analysis of prospective cohort studies. Journal of Affective Disorders, 159, 103–110. https://doi.org/10.1016/j.jad.2014.02.027

Dipietro, J. A., Costigan, K. A., & Sipsma, H. L. (2008). Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. Journal of Psychosomatic Obstetrics & Gynecology, 29(2), 115–124. https://doi.org/10.1080/01674820701701546

Dolev, S., Oppenheim, D., Koren-Karie, N., & Yirmiya, N. (2009). Emotional Availability in Mother-Child Interaction: The Case of Children with Autism Spectrum Disorders. Parenting, 9(3–4), 183–197. https://doi.org/10.1080/15295190902844332

Drake, K. L., & Ginsburg, G. S. (2011). Parenting Practices of Anxious and Nonanxious Mothers: A Multi-Method, Multi-Informant Approach. Child & Family Behavior Therapy, 33(4), 299–321. https://doi.org/10.1080/07317107.2011.623101

Dries, L. V. D., Juffer, F., Ijzendoorn, M. H. V., Bakermans-Kranenburg, M. J., & Alink, L. R. A. (2012). Infants' responsiveness, attachment, and indiscriminate friendliness after international adoption from institutions or foster care in China: Application of Emotional Availability Scales to adoptive families. Development and Psychopathology, 24(1), 49–64. https://doi.org/10.1017/S0954579411000654

Dunkel Schetter, C., & Tanner, L. (2012). Anxiety, depression and stress in pregnancy: Implications for mothers, children, research, and practice. Current Opinion in Psychiatry, 25(2), 141–148. https://doi.org/10.1097/YCO.0b013e3283503680

Easterbrooks, M. A., Bureau, J.-F., & Lyons-Ruth, K. (2012). Developmental correlates and predictors of emotional availability in mother–child interaction: A longitudinal study from infancy to middle childhood. Development and Psychopathology, 24(1), 65–78. https://doi.org/10.1017/S0954579411000666

El Ayoubi, M., Patkai, J., Bordarier, C., Desfrere, L., Moriette, G., Jarreau, P.-H., & Zeitlin, J. (2016). Impact of fetal growth restriction on neurodevelopmental outcome at 2 years for extremely preterm infants: A single institution study. Developmental Medicine & Child Neurology, 58(12), 1249–1256. https://doi.org/10.1111/dmcn.13218

El Marroun, H., Jaddoe, V. W. V., Hudziak, J. J., Roza, S. J., Steegers, E. A. P., Hofman, A., Verhulst, F. C., White, T. J. H., Stricker, B. H. C., & Tiemeier, H. (2012). Maternal Use of Selective Serotonin Reuptake Inhibitors, Fetal Growth, and Risk of Adverse Birth Outcomes. Archives of General Psychiatry, 69(7), 706–714. https://doi.org/10.1001/archgenpsychiatry.2011.2333

Emde, R. N. (2000). Next steps in emotional availability research. Attachment & Human Development, 2(2), 242–248. https://doi.org/10.1080/14616730050085590

Endler, N. S. (1997). Stress, Anxiety and coping: the multidimensional interaction model. Canadian Psychology/Psychologie canadienne, 38(3), 136.

Fairbrother, N., Young, A. H., Zhang, A., Janssen, P., & Antony, M. M. (2017). The prevalence and incidence of perinatal anxiety disorders among women experiencing a medically complicated pregnancy. Archives of Women's Mental Health, 20(2), 311–319. https://doi.org/10.1007/s00737-016-0704-7

Fallon, V., Halford, J. C. G., Bennett, K. M., & Harrold, J. A. (2018). Postpartum-specific anxiety as a predictor of infant-feeding outcomes and perceptions of infant-feeding behaviours: New evidence for childbearing specific measures of mood. Archives of Women's Mental Health, 21(2), 181–191. https://doi.org/10.1007/s00737-017-0775-0

Fang, S. (2005). Management of preterm infants with intrauterine growth restriction. Early Human Development, 81(11), 889–900. https://doi.org/10.1016/j.earlhumdev.2005.09.004

Fearon, R. P., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The Significance of Insecure Attachment and Disorganization in the Development of Children's Externalizing Behavior: A Meta-Analytic Study. Child Development, 81(2), 435–456. https://doi.org/10.1111/j.1467-8624.2009.01405.x

Federenko, I. S., & Wadhwa, P. D. (2004). Women's Mental Health During Pregnancy Influences Fetal and Infant Developmental and Health Outcomes. CNS Spectrums, 9(3), 198–206. https://doi.org/10.1017/S1092852900008993

Feldman, P. J., Dunkel-Schetter, C., Sandman, C. A., & Wadhwa, P. D. (2000). Maternal Social Support Predicts Birth Weight and Fetal Growth in Human Pregnancy:

Psychosomatic Medicine, 62(5), 715–725. https://doi.org/10.1097/00006842-200009000-00016

Feldman, R. (2003). Infant–mother and infant–father synchrony: The coregulation of positive arousal. Infant Mental Health Journal, 24(1), 1–23. https://doi.org/10.1002/imhj.10041

Feldman, R. (2007). Parent–infant synchrony and the construction of shared timing; physiological precursors, developmental outcomes, and risk conditions. Journal of Child Psychology and Psychiatry, 48(3–4), 329–354. https://doi.org/10.1111/j.1469-7610.2006.01701.x

Feldman, R. (2012). Parenting behavior as the environment where children grow. In The Cambridge handbook of environment in human development (pp. 535–567). Cambridge University Press. https://doi.org/10.1017/CBO9781139016827.031

Feldman, R. (2015). Mutual influences between child emotion regulation and parent–child reciprocity support development across the first 10 years of life: Implications for developmental psychopathology. Development and Psychopathology, 27(4pt1), 1007–1023. https://doi.org/10.1017/S0954579415000656

Feldman, R., & Eidelman, A. I. (2006). Neonatal State Organization, Neuromaturation, Mother-Infant Interaction, and Cognitive Development in Small-for-Gestational-Age Premature Infants. Pediatrics, 118(3), e869–e878. https://doi.org/10.1542/peds.2005-2040

Feldman, R., Granat, A., Pariente, C., Kanety, H., Kuint, J., & Gilboa-Schechtman, E. (2009). Maternal Depression and Anxiety Across the Postpartum Year and Infant Social Engagement, Fear Regulation, and Stress Reactivity. Journal of the American Academy of Child & Adolescent Psychiatry, 48(9), 919–927. https://doi.org/10.1097/CHI.0b013e3181b21651

Feldman, R., Greenbaum, C. W., Mayes, L. C., & Erlich, S. H. (1997). Change in mother-infant interactive behavior: Relations to change in the mother, the infant, and the social context. Infant Behavior and Development, 20(2), 151–163. https://doi.org/10.1016/S0163-6383(97)90018-7

Feligreras-Alcalá, D., Frías-Osuna, A., & del-Pino-Casado, R. (2020). Personal and Family Resources Related to Depressive and Anxiety Symptoms in Women during Puerperium. International Journal of Environmental Research and Public Health, 17(14), Article 14. https://doi.org/10.3390/ijerph17145230

Fenwick, J., Sidebotham, M., Gamble, J., & Creedy, D. K. (2018). The emotional and professional wellbeing of Australian midwives: A comparison between those providing continuity of midwifery care and those not providing continuity. Women and Birth, 31(1), 38–43. https://doi.org/10.1016/j.wombi.2017.06.013

Field, T. (2011). Prenatal depression effects on early development: A review. Infant Behavior and Development, 34(1), 1–14. https://doi.org/10.1016/j.infbeh.2010.09.008

Field, T., Diego, M. A., Hernandez-Reif, M., Figueiredo, B., Ascencio, A., Schanberg, S., & Kuhn, C. (2008). Prenatal dysthymia versus major depression effects on maternal cortisol and fetal growth. Depression and Anxiety, 25(6), E11–E16. https://doi.org/10.1002/da.20307

Field, T., Diego, M., Hernandez-Reif, M., Figueiredo, B., Deeds, O., Ascencio, A., Schanberg, S., & Kuhn, C. (2010). Comorbid depression and anxiety effects on pregnancy and neonatal outcome. Infant Behavior and Development, 33(1), 23–29. https://doi.org/10.1016/j.infbeh.2009.10.004

Field, T., Hernandez-Reif, M., Vera, Y., Gil, K., Diego, M., Bendell, D., & Yando, R. (2005). Anxiety and anger effects on depressed mother–infant spontaneous and imitative

interactions. Infant Behavior and Development, 28(1), 1–9. https://doi.org/10.1016/j.infbeh.2004.06.003

Field, T. M. (1977). Effects of Early Separation, Interactive Deficits, and Experimental Manipulations on Infant-Mother Face-to-Face Interaction. Child Development, 48(3), 763–771. https://doi.org/10.2307/1128325

Figueras, F., Oros, D., Cruz-Martinez, R., Padilla, N., Hernandez-Andrade, E., Botet, F., Costas-Moragas, C., & Gratacos, E. (2009). Neurobehavior in Term, Small-for-Gestational Age Infants With Normal Placental Function. Pediatrics, 124(5), e934–e941. https://doi.org/10.1542/peds.2008-3346

Fischbein, R. L., Nicholas, L., Kingsbury, D. M., Falletta, L. M., Baughman, K. R., & VanGeest, J. (2019). State anxiety in pregnancies affected by obstetric complications: A systematic review. Journal of Affective Disorders, 257, 214–240. https://doi.org/10.1016/j.jad.2019.07.007

Fogel, A. (1993). Developing through relationships. University of Chicago Press.

Fox, N. A., Nichols, K. E., Henderson, H. A., Rubin, K., Schmidt, L., Hamer, D., Ernst, M., & Pine, D. S. (2005). Evidence for a Gene-Environment Interaction in Predicting Behavioral Inhibition in Middle Childhood. Psychological Science, 16(12), 921–926. https://doi.org/10.1111/j.1467-9280.2005.01637.x

Furtado, M., Chow, C. H. T., Owais, S., Frey, B. N., & Van Lieshout, R. J. (2018). Risk factors of new onset anxiety and anxiety exacerbation in the perinatal period: A systematic review and meta-analysis. Journal of Affective Disorders, 238, 626–635. https://doi.org/10.1016/j.jad.2018.05.073

Gardosi, J., Clausson, B., & Francis, A. (2009). The value of customised centiles in assessing perinatal mortality risk associated with parity and maternal size. BJOG: An

International Journal of Obstetrics & Gynaecology, 116(10), 1356–1363. https://doi.org/10.1111/j.1471-0528.2009.02245.x

Gerardin, P., Wendland, J., Bodeau, N., Galin, A., Bialobos, S., Tordjman, S., Mazet, P., Darbois, Y., Nizard, J., Dommergues, M., & Cohen, D. (2010). Depression During Pregnancy: Is the Developmental Impact Earlier in Boys? A Prospective Case-Control Study. The Journal of Clinical Psychiatry, 71(3), 4181. https://doi.org/10.4088/JCP.09m05724blu

Geva, R., Eshel, R., Leitner, Y., Valevski, A. F., & Harel, S. (2006). Neuropsychological Outcome of Children With Intrauterine Growth Restriction: A 9-Year Prospective Study. Pediatrics, 118(1), 91–100. https://doi.org/10.1542/peds.2005-2343

Gianino, A., & Tronick, E. Z. (1988). COPING WITH INTERACTIVE STRESS IN INFANCY. Stress and Coping Across Development, 2, 47.

Glover, V. (2014). Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. Best Practice & Research Clinical Obstetrics & Gynaecology, 28(1), 25–35. https://doi.org/10.1016/j.bpobgyn.2013.08.017

Gluckman, P. D., & Hanson, M. A. (2006). The Consequences of Being Born Small – An Adaptive Perspective. Hormone Research, 65(Suppl. 3), 5–14. https://doi.org/10.1159/000091500

Glynn, L. M., Schetter, C. D., Hobel, C. J., & Sandman, C. A. (2008). Pattern of perceived stress and anxiety in pregnancy predicts preterm birth. Health Psychology, 27(1), 43–51. https://doi.org/10.1037/0278-6133.27.1.43

Goldenberg, R. L., Cliver, S. P., Cutter, G. R., Hoffman, H. J., Copper, R. L., Gotlieb, S., & Davis, R. O. (1991). Maternal psychological characteristics and intrauterine growth retardation. Pre-and Peri-Natal Psychology Journal, 6(2), 129-134.

Goodman, J. H., Chenausky, K. L., & Freeman, M. P. (2014). Anxiety Disorders During Pregnancy: A Systematic Review. The Journal of Clinical Psychiatry, 75(10), 1177. https://doi.org/10.4088/JCP.14r09035

Goodman, S. H., & Gotlib, I. H. (1999). Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. Psychological Review, 106(3), 458–490. https://doi.org/10.1037/0033-295X.106.3.458

Gordijn, S. J., Beune, I. M., Thilaganathan, B., Papageorghiou, A., Baschat, A. A., Baker, P. N., Silver, R. M., Wynia, K., & Ganzevoort, W. (2016). Consensus definition of fetal growth restriction: A Delphi procedure. Ultrasound in Obstetrics & Gynecology, 48(3), 333–339. https://doi.org/10.1002/uog.15884

Gorman, K. S., Lourie, A. E., & Choudhury, N. (2001). Differential Patterns of Development: The Interaction of Birth Weight, Temperament, and Maternal Behavior. Journal of Developmental & Behavioral Pediatrics, 22(6), 366.

Graignic-Philippe, R., Dayan, J., Chokron, S., Jacquet, A.-Y., & Tordjman, S. (2014). Effects of prenatal stress on fetal and child development: A critical literature review. Neuroscience & Biobehavioral Reviews, 43, 137–162. https://doi.org/10.1016/j.neubiorev.2014.03.022

Grant, K.-A., McMahon, C., & Austin, M.-P. (2008). Maternal anxiety during the transition to parenthood: A prospective study. Journal of Affective Disorders, 108(1), 101–111. https://doi.org/10.1016/j.jad.2007.10.002

Grigoriadis, S., de Camps Meschino, D., Barrons, E., Bradley, L., Eady, A., Fishell, A., Mamisachvili, L., Cook, G. S., O'Keefe, M., Romans, S., & Ross, L. E. (2011). Mood and anxiety disorders in a sample of Canadian perinatal women referred for

psychiatric care. Archives of Women's Mental Health, 14(4), 325–333. https://doi.org/10.1007/s00737-011-0223-5

Grolnick, W. S., Price, C. E., Beiswenger, K. L., & Sauck, C. C. (2007). Evaluative pressure in mothers: Effects of situation, maternal, and child characteristics on autonomy supportive versus controlling behavior. Developmental Psychology, 43(4), 991–1002. https://doi.org/10.1037/0012-1649.43.4.991

Grote, N. K., Bridge, J. A., Gavin, A. R., Melville, J. L., Iyengar, S., & Katon, W. J. (2010). A Meta-analysis of Depression During Pregnancy and the Risk of Preterm Birth, Low Birth Weight, and Intrauterine Growth Restriction. Archives of General Psychiatry, 67(10), 1012–1024. https://doi.org/10.1001/archgenpsychiatry.2010.111

Hakanen, H., Flykt, M., Sinervä, E., Nolvi, S., Kataja, E.-L., Pelto, J., Karlsson, H., Karlsson, L., & Korja, R. (2019). How maternal pre- and postnatal symptoms of depression and anxiety affect early mother-infant interaction? Journal of Affective Disorders, 257, 83–90. https://doi.org/10.1016/j.jad.2019.06.048

Halpern, L. F., Garcia Coll, C. T., Meyer, E. C., & Bendersky, K. (2001). The contributions of temperament and maternal responsiveness to the mental development of small-for-gestational-age and appropriate-for-gestational-age infants. Journal of Applied Developmental Psychology, 22(2), 199–224. https://doi.org/10.1016/S0193-3973(01)00077-6

Hamid, F., Asif, A., & Haider, I. I. (2008). Study of anxiety and depression during pregnancy. Pak J Med Sci, 24(6), 861-4.

Harel, J., Eshel, Y., Ganor, O., & Scher, A. (2002). Antecedents of mirror self-recognition of toddlers: Emotional availability, birth order, and gender. Infant Mental Health Journal, 23(3), 293–309. https://doi.org/10.1002/imhj.10016

Harpel, T. S. (2008). Fear of the unknown: Ultrasound and anxiety about fetal health. Health, 12(3), 295–312. https://doi.org/10.1177/1363459308090050

Harvey, D., Prince, J., Bunton, J., Parkinson, C., & Campbell, S. (1982). Abilities of Children Who Were Small-for-Gestational-Age Babies. Pediatrics, 69(3), 296–300. https://doi.org/10.1542/peds.69.3.296

Hawdon, J. M., Hey, E., Kolvin, I., & Fundudis, T. (1990). Born Too Small—Is Outcome Still Affected? Developmental Medicine & Child Neurology, 32(11), 943–953. https://doi.org/10.1111/j.1469-8749.1990.tb08116.x

Hay, W. W., Jr, Catz, C. S., Grave, G. D., & Yaffe, S. J. (1997). Workshop Summary: Fetal Growth: Its Regulation and Disorders. Pediatrics, 99(4), 585–591. https://doi.org/10.1542/peds.99.4.585

Hedegaard, M., Henriksen, T. B., Sabroe, S., & Secher, N. J. (1993). Psychological distress in pregnancy and preterm delivery. British Medical Journal, 307(6898), 234–239. https://doi.org/10.1136/bmj.307.6898.234

Henrichs, J., Schenk, J. J., Roza, S. J., Berg, M. P. van den, Schmidt, H. G., Steegers, E. a. P., Hofman, A., Jaddoe, V. W. V., Verhulst, F. C., & Tiemeier, H. (2010). Maternal psychological distress and fetal growth trajectories: The Generation R Study. Psychological Medicine, 40(4), 633–643. https://doi.org/10.1017/S0033291709990894

Henrichs, J., Schenk, J. J., Schmidt, H. G., Velders, F. P., Hofman, A., Jaddoe, V. W. V., Verhulst, F. C., & Tiemeier, H. (2009). Maternal pre- and postnatal anxiety and infant temperament. The generation R study. Infant and Child Development, 18(6), 556–572. https://doi.org/10.1002/icd.639

Hernández-Martínez, C., Arija, V., Balaguer, A., Cavallé, P., & Canals, J. (2008). Do the emotional states of pregnant women affect neonatal behaviour? Early Human Development, 84(11), 745–750. https://doi.org/10.1016/j.earlhumdev.2008.05.002

Hompes, T., Vrieze, E., Fieuws, S., Simons, A., Jaspers, L., Van Bussel, J., Schops, G., Gellens, E., Van Bree, R., Verhaeghe, J., Spitz, B., Demyttenaere, K., Allegaert, K., Van den Bergh, B., & Claes, S. (2012). The influence of maternal cortisol and emotional state during pregnancy on fetal intrauterine growth. Pediatric Research, 72(3), Article 3. https://doi.org/10.1038/pr.2012.70

Howes, C., & Hong, S. S. (2008). Early emotional availability: Predictive of pre-kindergarten relationships among Mexican-heritage children? Journal of Early Childhood and Infant Psychology, 4, 4–26.

Howe, N., Della Porta, S., Recchia, H., & Ross, H. (2016). "Because if you don't put the top on, it will spill": A longitudinal study of sibling teaching in early childhood. Developmental Psychology, 52(11), 1832.

Huizink, A. C., Menting, B., De Moor, M. H. M., Verhage, M. L., Kunseler, F. C., Schuengel, C., & Oosterman, M. (2017). From prenatal anxiety to parenting stress: A longitudinal study. Archives of Women's Mental Health, 20(5), 663–672. https://doi.org/10.1007/s00737-017-0746-5

Huizink, A. C., Menting, B., Oosterman, M., Verhage, M. L., Kunseler, F. C., & Schuengel, C. (2014). The interrelationship between pregnancy-specific anxiety and general anxiety across pregnancy: A longitudinal study. Journal of Psychosomatic Obstetrics & Gynecology, 35(3), 92–100. https://doi.org/10.3109/0167482X.2014.944498

Huizink, A. C., Mulder, E. J. H., Robles de Medina, P. G., Visser, G. H. A., & Buitelaar, J. K. (2004). Is pregnancy anxiety a distinctive syndrome? Early Human Development, 79(2), 81–91. https://doi.org/10.1016/j.earlhumdev.2004.04.014

Johansson, M., Benderix, Y., & Svensson, I. (2020). Mothers' and fathers' lived experiences of postpartum depression and parental stress after childbirth: A qualitative study. International Journal of Qualitative Studies on Health and Well-Being, 15(1), 1722564. https://doi.org/10.1080/17482631.2020.1722564

JULIAN, L. J. (2011). Measures of Anxiety. Arthritis Care & Research, 63(0 11), 10.1002/acr.20561. https://doi.org/10.1002/acr.20561

Kaitz, M., Maytal, H. R., Devor, N., Bergman, L., & Mankuta, D. (2010). Maternal anxiety, mother–infant interactions, and infants' response to challenge. Infant Behavior and Development, 33(2), 136–148. https://doi.org/10.1016/j.infbeh.2009.12.003

Kang, M. J. (2005). Quality of Mother-Child Interaction Assessed by the Emotional Availability Scale: Associations With Maternal Psychological Well-Being, Child Behavior Problems and Child Cognitive Functioning [The Ohio State University]. https://etd.ohiolink.edu/acprod/odb_etd/etd/r/1501/10?clear=10&p10_accession_num=osu1124158815

Karlberg, J., Albertsson-Wikland, K., Baber, F., Low, L., & Yeung, C. (1996). Born small for gestational age: Consequences for growth. Acta Paediatrica, 85(417), 8–13. https://doi.org/10.1111/j.1651-2227.1996.tb14284.x

Karmiloff-Smith, B. A. (1994). Beyond Modularity: A Developmental Perspective on Cognitive Science. European Journal of Disorders of Communication, 29(1), 95–105. https://doi.org/10.3109/13682829409041485

Kertes, D. A., Donzella, B., Talge, N. M., Garvin, M. C., Van Ryzin, M. J., & Gunnar, M. R. (2009). Inhibited temperament and parent emotional availability differentially predict young children's cortisol responses to novel social and nonsocial events. Developmental Psychobiology, 51(7), 521–532. https://doi.org/10.1002/dev.20390

Kiff, C. J., Lengua, L. J., & Zalewski, M. (2011). Nature and Nurturing: Parenting in the Context of Child Temperament. Clinical Child and Family Psychology Review, 14(3), 251–301. https://doi.org/10.1007/s10567-011-0093-4

Kikkert, H. K., Middelburg, K. J., & Hadders-Algra, M. (2010). Maternal anxiety is related to infant neurological condition, paternal anxiety is not. Early Human Development, 86(3), 171–177. https://doi.org/10.1016/j.earlhumdev.2010.02.004

Kim, M. K., Lee, S. M., Bae, S.-H., Kim, H. J., Lim, N. G., Yoon, S.-J., Lee, J. Y., & Jo, M.-W. (2018). Socioeconomic status can affect pregnancy outcomes and complications, even with a universal healthcare system. International Journal for Equity in Health, 17(1), 2. https://doi.org/10.1186/s12939-017-0715-7

Kochanska, G., Aksan, N., & Carlson, J. (2005). Temperament, Relationships, and Young Children's Receptive Cooperation With Their Parents. Developmental Psychology, 41, 648–660. https://doi.org/10.1037/0012-1649.41.4.648

Kogan, N., & Carter, A. S. (1996). Mother-infant reengagement following the still-face: The role of maternal emotional availability an infant affect regulation. Infant Behavior and Development, 19(3), 359–370. https://doi.org/10.1016/S0163-6383(96)90034-X

Kok, R. D., van den Berg, P. P., van den Bergh, A. J., Nijland, R., & Heerschap, A. (2002). Maturation of the human fetal brain as observed by 1H MR spectroscopy. Magnetic Resonance in Medicine, 48(4), 611–616. https://doi.org/10.1002/mrm.10264

Korja, R., & McMahon, C. (2021). Maternal prenatal mood problems and lower maternal emotional availability associated with lower quality of child's emotional availability and higher negative affect during still-face procedure. Infancy, 26(6), 901–919. https://doi.org/10.1111/infa.12428

Korja, R., Nolvi, S., Grant, K. A., & McMahon, C. (2017). The Relations Between Maternal Prenatal Anxiety or Stress and Child's Early Negative Reactivity or Self-Regulation:

A Systematic Review. Child Psychiatry & Human Development, 48(6), 851–869. https://doi.org/10.1007/s10578-017-0709-0

Lachmann, B. B., Frank M. (1992). The Contribution of Mother-Infant Mutual Influence to the Origins of Self- and Object Representations. In Relational Perspectives in Psychoanalysis. Routledge.

Landry, S. H., Smith, K. E., & Swank, P. R. (2006). Responsive parenting: Establishing early foundations for social, communication, and independent problem-solving skills. Developmental Psychology, 42(4), 627–642. https://doi.org/10.1037/0012-1649.42.4.627

Lavelli, M. (2007). Intersoggettivita'. Origini e primi sviluppi (pp. 1-238). Raffaello Cortina.

Lee, P. A., Chernausek, S. D., Hokken-Koelega, A. C. S., Czernichow, P., & for the International SGA Advisory Board. (2003). International Small for Gestational Age Advisory Board Consensus Development Conference Statement: Management of Short Children Born Small for Gestational Age, April 24–October 1, 2001. Pediatrics, 111(6), 1253–1261. https://doi.org/10.1542/peds.111.6.1253

Leerkes, E. M., Blankson, A. N., & O'Brien, M. (2009). Differential Effects of Maternal Sensitivity to Infant Distress and Nondistress on Social-Emotional Functioning. Child Development, 80(3), 762–775. https://doi.org/10.1111/j.1467-8624.2009.01296.x

Leger, J., Levy-Marchal, C., Bloch, J., Pinet, A., Chevenne, D., Porquet, D., Collin, D., & Czernichow, P. (1997). Reduced final height and indications for insulin resistance in 20 year olds born small for gestational age: Regional cohort study. BMJ, 315(7104), 341–347. https://doi.org/10.1136/bmj.315.7104.341

Lehman, E. B., Steier, A. J., Guidash, K. M., & Wanna, S. Y. (2002). Predictors of Compliance in Toddlers: Child Temperament, Maternal Personality, and Emotional Availability. Portions of the research were presented at the Conference on Human

Development, Mobile, AL, March 6, 1998. Early Child Development and Care, 172(3), 301–310. https://doi.org/10.1080/03004430212124

Leitner, Y., Fattal-Valevski, A., Geva, R., Eshel, R., Toledano-Alhadef, H., Rotstein, M., Bassan, H., Radianu, B., Bitchonsky, O., Jaffa, A. J., & Harel, S. (2007). Neurodevelopmental Outcome of Children With Intrauterine Growth Retardation: A Longitudinal, 10-Year Prospective Study. Journal of Child Neurology, 22(5), 580–587. https://doi.org/10.1177/0883073807302605

Lewis, A. (1970). The ambiguous word 'anxiety'. International Journal of Psychiatry, 9, 62–79.

Lewis, A. J., Austin, E., & Galbally, M. (2016). Prenatal maternal mental health and fetal growth restriction: A systematic review. Journal of Developmental Origins of Health and Disease, 7(4), 416–428. https://doi.org/10.1017/S2040174416000076

Lewis, A. J., Austin, E., Knapp, R., Vaiano, T., & Galbally, M. (2015). Perinatal Maternal Mental Health, Fetal Programming and Child Development. Healthcare, 3(4), Article 4. https://doi.org/10.3390/healthcare3041212

Licata, M., Paulus, M., Thoermer, C., Kristen, S., Woodward, A. L., & Sodian, B. (2014). Mother–infant Interaction Quality and Infants' Ability to Encode Actions as Goal-directed. Social Development, 23(2), 340–356. https://doi.org/10.1111/sode.12057

Lin, C.-C., Su, S.-J., & River, L. P. (1991). Comparison of associated high-risk factors and perinatal outcome between symmetric and asymmetric fetal intrauterine growth retardation. American Journal of Obstetrics and Gynecology, 164(6, Part 1), 1535–1542. https://doi.org/10.1016/0002-9378(91)91433-W

Lin, Y., Xu, J., Huang, J., Jia, Y., Zhang, J., Yan, C., & Zhang, J. (2017). Effects of prenatal and postnatal maternal emotional stress on toddlers' cognitive and temperamental

development. Journal of Affective Disorders, 207, 9–17. https://doi.org/10.1016/j.jad.2016.09.010

Little, C., & Carter, A. S. (2005). Negative emotional reactivity and regulation in 12-month-olds following emotional challenge: Contributions of maternal–infant emotional availability in a low-income sample. Infant Mental Health Journal, 26(4), 354–368. https://doi.org/10.1002/imhj.20055

Loomans, E. M., der Stelt, O. van, van Eijsden, M., Gemke, R. J. B. J., Vrijkotte, T., & den Bergh, B. R. H. V. (2011). Antenatal maternal anxiety is associated with problem behaviour at age five. Early Human Development, 87(8), 565–570. https://doi.org/10.1016/j.earlhumdev.2011.04.014

Luecken, L. J., Lin, B., Coburn, S. S., MacKinnon, D. P., Gonzales, N. A., & Crnic, K. A. (2013). Prenatal stress, partner support, and infant cortisol reactivity in low-income Mexican American families. Psychoneuroendocrinology, 38(12), 3092–3101. https://doi.org/10.1016/j.psyneuen.2013.09.006

Madigan, S., Oatley, H., Racine, N., Fearon, R. M. P., Schumacher, L., Akbari, E., Cooke, J. E., & Tarabulsy, G. M. (2018). A Meta-Analysis of Maternal Prenatal Depression and Anxiety on Child Socioemotional Development. Journal of the American Academy of Child & Adolescent Psychiatry, 57(9), 645-657.e8. https://doi.org/10.1016/j.jaac.2018.06.012

Mahler, M. S., Pine, F., & Bergman, A. (1975). The Psychological Birth of the Human Infant. Symbiosis and Individuation. New York (Basic Books) 1975. https://opus4.kobv.de/opus4-Fromm/frontdoor/index/index/docId/28284

Martini, J., Asselmann, E., Einsle, F., Strehle, J., & Wittchen, H.-U. (2016). A prospective-longitudinal study on the association of anxiety disorders prior to pregnancy and

pregnancy- and child-related fears. Journal of Anxiety Disorders, 40, 58–66. https://doi.org/10.1016/j.janxdis.2016.04.007

Martini, J., Beesdo-Baum, K., Garthus-Niegel, S., & Wittchen, H.-U. (2020). The course of panic disorder during the peripartum period and the risk for adverse child development: A prospective-longitudinal study. Journal of Affective Disorders, 266, 722–730. https://doi.org/10.1016/j.jad.2020.01.018

Martini, J., Petzoldt, J., Einsle, F., Beesdo-Baum, K., Höfler, M., & Wittchen, H.-U. (2015). Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: A prospective-longitudinal study. Journal of Affective Disorders, 175, 385–395. https://doi.org/10.1016/j.jad.2015.01.012

Martins, C., & Gaffan, E. A. (2000). Effects of Early Maternal Depression on Patterns of Infant–Mother Attachment: A Meta-analytic Investigation. The Journal of Child Psychology and Psychiatry and Allied Disciplines, 41(6), 737–746. https://doi.org/10.1111/1469-7610.00661

Martins, E. C., Soares, I., Martins, C., Tereno, S., & Osório, A. (2012). Can We Identify Emotion Over-regulation in Infancy? Associations with Avoidant Attachment, Dyadic Emotional Interaction and Temperament. Infant and Child Development, 21(6), 579–595. https://doi.org/10.1002/icd.1760

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? Journal of Affective Disorders, 74(2), 139–147. https://doi.org/10.1016/S0165-0327(02)00012-5

McKee, K., Admon, L. K., Winkelman, T. N. A., Muzik, M., Hall, S., Dalton, V. K., & Zivin, K. (2020). Perinatal mood and anxiety disorders, serious mental illness, and delivery-

related health outcomes, United States, 2006–2015. BMC Women's Health, 20(1), 150. https://doi.org/10.1186/s12905-020-00996-6

McMahon, C. A., Boivin, J., Gibson, F. L., Hammarberg, K., Wynter, K., Saunders, D., & Fisher, J. (2013). Pregnancy-specific anxiety, ART conception and infant temperament at 4 months post-partum. Human Reproduction, 28(4), 997–1005. https://doi.org/10.1093/humrep/det029

Mello, B., Gagliardo, H., & Gonçalves, V. (2014). Neurodevelopment of small-for-gestational age infants: Behavioral aspects in first year. Arquivos de Neuro-Psiquiatria, 72, 517–523. https://doi.org/10.1590/0004-282X20140096

Meltzoff, A. N., & Moore, M. K. (1997). Explaining facial imitation: A theoretical model. Early Development and Parenting, 6(3–4), 179–192. https://doi.org/10.1002/(SICI)1099-0917(199709/12)6:3/4<179::AID-EDP157>3.0.CO;2-R

Meltzoff, A. N., & Prinz, W. (2002). The Imitative Mind: Development, Evolution and Brain Bases. Cambridge University Press.

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression? BMC Psychiatry, 6(1), 12. https://doi.org/10.1186/1471-244X-6-12

Montirosso, R., Tronick, E., & Borgatti, R. (2017). Promoting Neuroprotective Care in Neonatal Intensive Care Units and Preterm Infant Development: Insights From the Neonatal Adequate Care for Quality of Life Study. Child Development Perspectives, 11(1), 9–15. https://doi.org/10.1111/cdep.12208

Moreno, A. J., Klute, M. M., & Robinson, J. L. (2008). Relational and Individual Resources as Predictors of Empathy in Early Childhood. Social Development, 17(3), 613–637. https://doi.org/10.1111/j.1467-9507.2007.00441.x

Mudra, S., Göbel, A., Barkmann, C., Goletzke, J., Hecher, K., Schulte-Markwort, M., Diemert, A., & Arck, P. (2020). The longitudinal course of pregnancy-related anxiety in parous and nulliparous women and its association with symptoms of social and generalized anxiety. Journal of Affective Disorders, 260, 111–118. https://doi.org/10.1016/j.jad.2019.08.033

Mulder, E. J. H., Robles de Medina, P. G., Huizink, A. C., Van den Bergh, B. R. H., Buitelaar, J. K., & Visser, G. H. A. (2002). Prenatal maternal stress: Effects on pregnancy and the (unborn) child. Early Human Development, 70(1), 3–14. https://doi.org/10.1016/S0378-3782(02)00075-0

Müller, M., Zietlow, A.-L., Tronick, E., & Reck, C. (2015). What Dyadic Reparation Is Meant to Do: An Association with Infant Cortisol Reactivity. Psychopathology, 48(6), 386–399. https://doi.org/10.1159/000439225

Murray, E., Fernandes, M., Fazel, M., Kennedy, S., Villar, J., & Stein, A. (2015). Differential effect of intrauterine growth restriction on childhood neurodevelopment: A systematic review. BJOG: An International Journal of Obstetrics & Gynaecology, 122(8), 1062–1072. https://doi.org/10.1111/1471-0528.13435

Murray, L., Cooper, P., Creswell, C., Schofield, E., & Sack, C. (2007). The effects of maternal social phobia on mother–infant interactions and infant social responsiveness. Journal of Child Psychology and Psychiatry, 48(1), 45–52. https://doi.org/10.1111/j.1469-7610.2006.01657.x

Murray, L., & Cooper, P. J. (1997). EDITORIAL: Postpartum depression and child development. Psychological Medicine, 27(2), 253–260. https://doi.org/10.1017/S0033291796004564

N, E. R. (1980). Emotional availability: A reciprocal reward system for infants and parents with implications for prevention of psychosocial disorders. Parent-Infant Relationships. https://cir.nii.ac.jp/crid/1570009750668197760

Nardozza, L. M. M., Júnior, E. A., Rizzo, G., & Deter, R. L. (2018). Fetal Growth Restriction: Current Evidence and Clinical Practice. Springer.

Naveed, S., Lashari, U. G., Waqas, A., Bhuiyan, M., & Meraj, H. (2018). Gender of children and social provisions as predictors of unplanned pregnancies in Pakistan: A cross-sectional survey. BMC Research Notes, 11(1), 587. https://doi.org/10.1186/s13104-018-3696-8

Ngai, F.-W., & Ngu, S.-F. (2015). Predictors of maternal and paternal depressive symptoms at postpartum. Journal of Psychosomatic Research, 78(2), 156–161. https://doi.org/10.1016/j.jpsychores.2014.12.003

Nichols, T. (2017). Differential Susceptibility Effects of Maternal Sensitivity in Childhood on Small for Gestational Age (SGA) Adults' Wealth. Masters Theses. https://trace.tennessee.edu/utk_gradthes/5006

Nichols, T., Jaekel, J., Bartmann, P., & Wolke, D. (2020). Differential susceptibility effects of maternal sensitivity in childhood on small for gestational age adults' wealth. Development and Psychopathology, 32(1), 197–203. https://doi.org/10.1017/S0954579418001669

Nicol-Harper, R., Harvey, A. G., & Stein, A. (2007). Interactions between mothers and infants: Impact of maternal anxiety. Infant Behavior and Development, 30(1), 161–167. https://doi.org/10.1016/j.infbeh.2006.08.005

Nievar, M. A., & Becker, B. J. (2008). Sensitivity as a Privileged Predictor of Attachment: A Second Perspective on De Wolff and van IJzendoorn's Meta-analysis. Social Development, 17(1), 102–114. https://doi.org/10.1111/j.1467-9507.2007.00417.x

O'Connor, T. G., Monk, C., & Fitelson, E. M. (2014). Practitioner Review: Maternal mood in pregnancy and child development – implications for child psychology and psychiatry. Journal of Child Psychology and Psychiatry, 55(2), 99–111. https://doi.org/10.1111/jcpp.12153

O'Donnell, K. J., & Meaney, M. J. (2017). Fetal Origins of Mental Health: The Developmental Origins of Health and Disease Hypothesis. American Journal of Psychiatry, 174(4), 319–328. https://doi.org/10.1176/appi.ajp.2016.16020138

Oppenheim, D. (2012). Emotional availability: Research advances and theoretical questions. Development and Psychopathology, 24(1), 131–136. https://doi.org/10.1017/S0954579411000721

Orr, S. T. (2004). Social Support and Pregnancy Outcome: A Review of the Literature. Clinical Obstetrics and Gynecology, 47(4), 842. https://doi.org/10.1097/01.grf.0000141451.68933.9f

Ott, W. J. (1993). Intrauterine growth retardation and preterm delivery. American Journal of Obstetrics and Gynecology, 168(6, Part 1), 1710–1717. https://doi.org/10.1016/0002-9378(93)90681-8

Padilla, N., Falcón, C., Sanz-Cortés, M., Figueras, F., Bargallo, N., Crispi, F., Eixarch, E., Arranz, A., Botet, F., & Gratacós, E. (2011). Differential effects of intrauterine growth restriction on brain structure and development in preterm infants: A magnetic resonance imaging study. Brain Research, 1382, 98–108. https://doi.org/10.1016/j.brainres.2011.01.032

Pallini, S., Baiocco, R., Schneider, B., Madigan, S., & Atkinson, L. (2014). Early Child-Parent Attachment and Peer Relations: A Meta-Analysis of Recent Research. Journal of Family Psychology : JFP : Journal of the Division of Family Psychology of the

American Psychological Association (Division 43), 28, 118–123. https://doi.org/10.1037/a0035736

Parfitt, Y., & Ayers, S. (2014). Transition to Parenthood and Mental Health in First-Time Parents. Infant Mental Health Journal, 35(3), 263–273. https://doi.org/10.1002/imhj.21443

Parkinson, C. E., Wallis, S., & Harvey, D. (1981). School Achievement and Behaviour of Children Who Were Small-for-dates at Birth. Developmental Medicine & Child Neurology, 23(1), 41–50. https://doi.org/10.1111/j.1469-8749.1981.tb08445.x

Partanen, E., Kujala, T., Tervaniemi, M., & Huotilainen, M. (2013). Prenatal Music Exposure Induces Long-Term Neural Effects. PLOS ONE, 8(10), e78946. https://doi.org/10.1371/journal.pone.0078946

Pearson, R. M., Bornstein, M. H., Cordero, M., Scerif, G., Mahedy, L., Evans, J., Abioye, A., & Stein, A. (2016). Maternal perinatal mental health and offspring academic achievement at age 16: The mediating role of childhood executive function. Journal of Child Psychology and Psychiatry, 57(4), 491–501. https://doi.org/10.1111/jcpp.12483

Pena, I. C., Teberg, A. J., & Finello, K. M. (1988). The premature small-for-gestational-age infant during the first year of life: Comparison by birth weight and gestational age. The Journal of Pediatrics, 113(6), 1066–1073. https://doi.org/10.1016/S0022-3476(88)80584-5

Phillips, A. C., Batty, G. D., Gale, C. R., Deary, I. J., Osborn, D., MacIntyre, K., & Carroll, D. (2009). Generalized Anxiety Disorder, Major Depressive Disorder, and Their Comorbidity as Predictors of All-Cause and Cardiovascular Mortality: The Vietnam Experience Study. Psychosomatic Medicine, 71(4), 395. https://doi.org/10.1097/PSY.0b013e31819e6706

Piccinini, C. A., Frizzo, G. B., Brys, I., & Lopes, R. de C. S. (2014). Parenthood in the context of maternal depression at the end of the infant's first year of life. Estudos de Psicologia (Campinas), 31, 203–214. https://doi.org/10.1590/0103-166X2014000200006

Pike, K., Jane Pillow, J., & Lucas, J. S. (2012). Long term respiratory consequences of intrauterine growth restriction. Seminars in Fetal and Neonatal Medicine, 17(2), 92–98. https://doi.org/10.1016/j.siny.2012.01.003

Piper, J. M., Xenakis, E. M.-J., McFarland, M., Elliott, B. D., Berkus, M. D., & Langer, O. (1996). Do growth-retarded premature infants have different rates of perinatal morbidity and mortality than appropriately grown premature infants? Obstetrics & Gynecology, 87(2), 169–174. https://doi.org/10.1016/0029-7844(95)00400-9

Pluess, M., Bolten, M., Pirke, K.-M., & Hellhammer, D. (2010). Maternal trait anxiety, emotional distress, and salivary cortisol in pregnancy. Biological Psychology, 83(3), 169–175. https://doi.org/10.1016/j.biopsycho.2009.12.005

Polte, C., Junge, C., von Soest, T., Seidler, A., Eberhard-Gran, M., & Garthus-Niegel, S. (2019). Impact of Maternal Perinatal Anxiety on Social-Emotional Development of 2-Year-Olds, A Prospective Study of Norwegian Mothers and Their Offspring. Maternal and Child Health Journal, 23(3), 386–396. https://doi.org/10.1007/s10995-018-2684-x

Porreca, A., Biringen, Z., Parolin, M., Saunders, H., Ballarotto, G., & Simonelli, A. (2018). Emotional Availability, Neuropsychological Functioning, and Psychopathology: The Context of Parental Substance Use Disorder. BioMed Research International, 2018, e5359037. https://doi.org/10.1155/2018/5359037

Radoš, S. N., Tadinac, M., & Herman, R. (2018). Anxiety During Pregnancy and Postpartum: Course, Predictors and Comorbidity with Postpartum Depression. Acta Clinica Croatica, 57(1), 39–51. https://doi.org/10.20471/acc.2018.57.01.05

Rees, S., Channon, S., & Waters, C. S. (2019). The impact of maternal prenatal and postnatal anxiety on children's emotional problems: A systematic review. European Child & Adolescent Psychiatry, 28(2), 257–280. https://doi.org/10.1007/s00787-018-1173-5

Resnik, R. (2002). Intrauterine growth restriction12 1We would like to thank the following individuals who, in addition to members of our Editorial Board, will serve as referees for this series: Dwight P. Cruikshank, MD, Ronald S. Gibbs, MD, Gary D. V. Hankins, MD, Philip B. Mead, MD, Kenneth L. Noller, MD, Catherine Y. Spong, MD, and Edward E. Wallach, MD. 2We have invited select authorities to present background information on challenging clinical problems and practical information on diagnosis and treatment for use by practitioners. Obstetrics & Gynecology, 99(3), 490–496.

Richardus, J. H., Graafmans, W. C., Verloove-Vanhorick, S. P., & Mackenbach, J. P. (2003). Differences in perinatal mortality and suboptimal care between 10 European regions: Results of an international audit. BJOG: An International Journal of Obstetrics and Gynaecology, 110(2), 97–105. https://doi.org/10.1016/S1470-0328(02)02053-0

Riva Crugnola, C., Ierardi, E., Ferro, V., Gallucci, M., Parodi, C., & Astengo, M. (2016). Mother-Infant Emotion Regulation at Three Months: The Role of Maternal Anxiety, Depression and Parenting Stress. Psychopathology, 49(4), 285–294. https://doi.org/10.1159/000446811

Rodebaugh, T. L., & Heimberg, R. G. (2008). Emotion Regulation and the Anxiety Disorders: Adopting aSelf-Regulation Perspective. In A. J. J. M. Vingerhoets, I.

Nyklíček, & J. Denollet (Eds.), Emotion Regulation: Conceptual and Clinical Issues (pp. 140–149). Springer US. https://doi.org/10.1007/978-0-387-29986-0_9

Rona, R. J., Gulliford, M. C., & Chinn, S. (1993). Effects of prematurity and intrauterine growth on respiratory health and lung function in childhood. British Medical Journal, 306(6881), 817–820. https://doi.org/10.1136/bmj.306.6881.817

Ross, L. E., McLean, L. M., & Psych, C. (2006). Anxiety disorders during pregnancy and the postpartum period: a systematic review. Depression, 6(9), 1-14.

Rubertsson, C., Hellström, J., Cross, M., & Sydsjö, G. (2014). Anxiety in early pregnancy: Prevalence and contributing factors. Archives of Women's Mental Health, 17(3), 221–228. https://doi.org/10.1007/s00737-013-0409-0

Ryan, R., O'Farrelly, C., & Ramchandani, P. (2017). Parenting and child mental health. London Journal of Primary Care, 9(6), 86–94. https://doi.org/10.1080/17571472.2017.1361630

Sabri. (n.d.). The impact of anxiety and depression during pregnancy on fetal growth and the birth outcome. Retrieved 1 November 2023, from https://new.ejpsy.eg.net/article.asp?issn=1110-1105;year=2015;volume=36;issue=2;spage=95;epage=100;aulast=Sabri

Sacchi, C., De Carli, P., Mento, G., Farroni, T., Visentin, S., & Simonelli, A. (2018). Socio-Emotional and Cognitive Development in Intrauterine Growth Restricted (IUGR) and Typical Development Infants: Early Interactive Patterns and Underlying Neural Correlates. Rationale and Methods of the Study. Frontiers in Behavioral Neuroscience, 12. https://www.frontiersin.org/articles/10.3389/fnbeh.2018.00315

Sacchi, C., Marino, C., Nosarti, C., Vieno, A., Visentin, S., & Simonelli, A. (2020). Association of Intrauterine Growth Restriction and Small for Gestational Age Status With Childhood Cognitive Outcomes: A Systematic Review and Meta-analysis.

JAMA Pediatrics, 174(8), 772–781. https://doi.org/10.1001/jamapediatrics.2020.1097

Sacchi, C., O'Muircheartaigh, J., Batalle, D., Counsell, S. J., Simonelli, A., Cesano, M., Falconer, S., Chew, A., Kennea, N., Nongena, P., Rutherford, M. A., Edwards, A. D., & Nosarti, C. (2021). Neurodevelopmental Outcomes following Intrauterine Growth Restriction and Very Preterm Birth. The Journal of Pediatrics, 238, 135-144.e10. https://doi.org/10.1016/j.jpeds.2021.07.002

Salo, S., Kivistö, K., Korja, R., Biringen, Z., Tupola, S., Kahila, H., & Kivitie-Kallio, S. (2009). Emotional Availability, Parental Self-Efficacy Beliefs, and Child Development in Caregiver-Child Relationships with Buprenorphine-Exposed 3-year-olds. Parenting, 9(3–4), 244–259. https://doi.org/10.1080/15295190902844563

Sameroff, A. (2009). The transactional model. American Psychological Association.

Sameroff, A. (2010). A Unified Theory of Development: A Dialectic Integration of Nature and Nurture. Child Development, 81(1), 6–22. https://doi.org/10.1111/j.1467-8624.2009.01378.x

Sameroff, A. J., & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. Review of child development research, 4(1), 187-244.

Sameroff, A. J., & Fiese, B. H. (2000). Transactional regulation: The developmental ecology of early intervention. Handbook of early childhood intervention, 2(4), 135.

Saunders, M. N. K., Lewis, P., Thornhill, A., & Bristow, A. (2015). Understanding research philosophy and approaches to theory development (M. N. K. Saunders, P. Lewis, & A. Thornhill, Eds.; pp. 122–161). Pearson Education. http://catalogue.pearsoned.co.uk/educator/product/Research-Methods-for-Business-Students/9781292016627.page

Savchev, S., Sanz-Cortes, M., Cruz-Martinez, R., Arranz, A., Botet, F., Gratacos, E., & Figueras, F. (2013). Neurodevelopmental outcome of full-term small-for-gestational-age infants with normal placental function. Ultrasound in Obstetrics & Gynecology, 42(2), 201–206. https://doi.org/10.1002/uog.12391

Scher, A. (2001). Mother–child interaction and sleep regulation in one-year-olds. Infant Mental Health Journal, 22(5), 515–528. https://doi.org/10.1002/imhj.1015

Seeds, J. W., & Peng, T. (1998). Impaired growth and risk of fetal death: Is the tenth percentile the appropriate standard? American Journal of Obstetrics and Gynecology, 178(4), 658–669. https://doi.org/10.1016/S0002-9378(98)70475-2

Seth, S., Lewis, A. J., & Galbally, M. (2016). Perinatal maternal depression and cortisol function in pregnancy and the postpartum period: A systematic literature review. BMC Pregnancy and Childbirth, 16(1), 124. https://doi.org/10.1186/s12884-016-0915-y

Schaffer, H. R. (1996). Social development. Blackwell Publishing.

Shandor Miles, M., & Holditch-Davis, D. (1995). Compensatory parenting: How mothers describe parenting their 3-year-old, prematurely born children. Journal of Pediatric Nursing, 10(4), 243–253. https://doi.org/10.1016/S0882-5963(05)80021-1

Shankar, M., Navti, O., Amu, O., & Konje, J. C. (2002). Assessment of stillbirth risk and associated risk factors in a tertiary hospital. Journal of Obstetrics and Gynaecology, 22(1), 34–38. https://doi.org/10.1080/01443610120101682

Sharif, M., Zaidi, A., Waqas, A., Malik, A., Hagaman, A., Maselko, J., LeMasters, K., Liaqat, R., Bilal, S., Bibi, T., Ahmad, I., Sikander, S., & Rahman, A. (2021). Psychometric Validation of the Multidimensional Scale of Perceived Social Support During Pregnancy in Rural Pakistan. Frontiers in Psychology, 12. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.601563

Sharma, D., Farahbakhsh, N., Shastri, S., & Sharma, P. (2016). Intrauterine growth restriction – part 2. The Journal of Maternal-Fetal & Neonatal Medicine, 29(24), 4037–4048. https://doi.org/10.3109/14767058.2016.1154525

Sharma, D., Shastri, S., Farahbakhsh, N., & Sharma, P. (2016). Intrauterine growth restriction – part 1. The Journal of Maternal-Fetal & Neonatal Medicine, 29(24), 3977–3987. https://doi.org/10.3109/14767058.2016.1152249

Shonkoff, J. P., & Meisels, S. J. (2000). Handbook of Early Childhood Intervention. Cambridge University Press.

Simpson, J. A., Rholes, W. S., Campbell, L., Tran, S., & Wilson, C. L. (2003). Adult attachment, the transition to parenthood, and depressive symptoms. Journal of Personality and Social Psychology, 84(6), 1172–1187. https://doi.org/10.1037/0022-3514.84.6.1172

Skouteris, H., Wertheim, E. H., Rallis, S., Milgrom, J., & Paxton, S. J. (2009). Depression and anxiety through pregnancy and the early postpartum: An examination of prospective relationships. Journal of Affective Disorders, 113(3), 303–308. https://doi.org/10.1016/j.jad.2008.06.002

Soothill, P. W., Bobrow, C. S., & Holmes, R. (1999). Small for gestational age is not a diagnosis. Ultrasound in Obstetrics & Gynecology, 13(4), 225–228. https://doi.org/10.1046/j.1469-0705.1999.13040225.x

Spielberger, C. D. (1983). State-trait anxiety inventory for adults.

Spielberger, C. D., & Reheiser, E. C. (2009). Assessment of Emotions: Anxiety, Anger, Depression, and Curiosity. Applied Psychology: Health and Well-Being, 1(3), 271–302. https://doi.org/10.1111/j.1758-0854.2009.01017.x

Spitz, R. A. (1965). The first year of life: A psychoanalytic study of normal and deviant development of object relations.

Stern, D. N. (1974). Mother and infant at play: The dyadic interaction involving facial, vocal, and gaze behaviors.

Stern, D. N. (2018). The Interpersonal World of the Infant: A View from Psychoanalysis and Developmental Psychology. Routledge.

Steward, D. K. (2001). Biological vulnerability in infants with failure to thrive: The association with birthweight. Child: Care, Health and Development, 27(6), 555–567. https://doi.org/10.1046/j.1365-2214.2001.00225.x

Strauss, R. S., & Dietz, W. H. (1997). Effects of intrauterine growth retardation in premature infants on early childhood growth. The Journal of Pediatrics, 130(1), 95–102. https://doi.org/10.1016/S0022-3476(97)70316-0

Sung, I.-K., Vohr, B., & Oh, W. (1993). Growth and neurodevelopmental outcome of very low birth weight infants with intrauterine growth retardation: Comparison with control subjects matched by birth weight and gestational age. The Journal of Pediatrics, 123(4), 618–624. https://doi.org/10.1016/S0022-3476(05)80965-5

Suveg, C., & Zeman, J. (2004). Emotion Regulation in Children With Anxiety Disorders. Journal of Clinical Child & Adolescent Psychology, 33(4), 750–759. https://doi.org/10.1207/s15374424jccp3304_10

Swanson, J. D., & Wadhwa, P. M. (2008). Developmental origins of child mental health disorders. Journal of Child Psychology and Psychiatry, and Allied Disciplines, 49(10), 1009–1019. https://doi.org/10.1111/j.1469-7610.2008.02014.x

Talge, N. M., Neal, C., Glover, V., & the Early Stress, Translational Research and Prevention Science Network: Fetal and Neonatal Experience on Child and Adolescent Mental Health. (2007). Antenatal maternal stress and long-term effects on child neurodevelopment: How and why? Journal of Child Psychology and Psychiatry, 48(3–4), 245–261. https://doi.org/10.1111/j.1469-7610.2006.01714.x

Tamaki, R., Murata, M., & Okano, T. (1997). Risk factors for postpartum depression in Japan. Psychiatry and Clinical Neurosciences, 51(3), 93–98. https://doi.org/10.1111/j.1440-1819.1997.tb02368.x

Tarabulsy, G. M., Tessier, R., & Kappas, A. (1996). Contingency detection and the contingent organization of behavior in interactions: implications for socioemotional development in infancy. Psychological Bulletin, 120(1), 25.

Teti, D. M., Kim, B.-R., Mayer, G., & Countermine, M. (2010). Maternal emotional availability at bedtime predicts infant sleep quality. Journal of Family Psychology, 24(3), 307–315. https://doi.org/10.1037/a0019306

Thiagayson, P., Krishnaswamy, G., Lim, M. L., Sung, S. C., Haley, C. L., Fung, D. S. S., Allen, J. C., & Chen, H. (2013). Depression and anxiety in Singaporean high-risk pregnancies—Prevalence and screening. General Hospital Psychiatry, 35(2), 112–116. https://doi.org/10.1016/j.genhosppsych.2012.11.006

Tietz, A., Zietlow, A.-L., & Reck, C. (2014). Maternal bonding in mothers with postpartum anxiety disorder: The crucial role of subclinical depressive symptoms and maternal avoidance behaviour. Archives of Women's Mental Health, 17(5), 433–442. https://doi.org/10.1007/s00737-014-0423-x

Tolsa, C. B., Zimine, S., Warfield, S. K., Freschi, M., Rossignol, A. S., Lazeyras, F., Hanquinet, S., Pfizenmaier, M., & Hüppi, P. S. (2004). Early Alteration of Structural and Functional Brain Development in Premature Infants Born with Intrauterine Growth Restriction. Pediatric Research, 56(1), Article 1. https://doi.org/10.1203/01.PDR.0000128983.54614.7E

Trevarthen, C. (1974). Conversations with a two month-old. Parent-Infant Psychodynamics: Wild Things, Mirrors and Ghosts, 62, 25–34.

Trevarthen, C. (1993). The self born in intersubjectivity: The psychology of an infant communicating.

Trevarthen, C. (1998). The concept and foundations of infant intersubjectivity. https://psycnet.apa.org/record/1999-02453-001

Trevarthen, C., & Aitken, K. J. (2001). Infant Intersubjectivity: Research, Theory, and Clinical Applications. The Journal of Child Psychology and Psychiatry and Allied Disciplines, 42(1), 3–48. https://doi.org/10.1017/S0021963001006552

Trevarthen, C., & Bullowa, M. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. Before Speech (Cambridge), 321–347.

Trevarthen, C., & Hubley, P. (2023). Secondary intersubjectivity: Confidence, confiding, and acts of meaning in the first year. In A. Lock (Ed.), Action, gesture and symbol: The emergence of language.

Tronick, E. Z. (2004). Why is connection with others so critical? Dyadic meaning making, messiness and complexity governed selective processes which co-create and expand individuals' states of consciousness. Emotional development, 293-315.

Tronick, E. (2005). Why is connection with others so critical? The formation of dyadic states of consciousness and the expansion of individuals' states of consciousness: coherence governed selection and the co-creation of meaning out of messy meaning making.

Tronick, E. (2007). The neurobehavioral and social-emotional development of infants and children (pp. xii, 571). W W Norton & Co.

Tronick, E., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The Infant's Response to Entrapment between Contradictory Messages in Face-to-Face Interaction. Journal of the American Academy of Child Psychiatry, 17(1), 1–13. https://doi.org/10.1016/S0002-7138(09)62273-1

Tronick, E., Als, H., & Brazelton, T. B. (1979). Early Development of Neonatal and Infant Behavior. In F. Falkner & J. M. Tanner (Eds.), Human Growth: Volume 3 Neurobiology and Nutrition (pp. 305–328). Springer US. https://doi.org/10.1007/978-1-4684-0817-1_9

Tronick, E., & Beeghly, M. (2011). Infants' Meaning-Making and the Development of Mental Health Problems. The American Psychologist, 66(2), 107–119. https://doi.org/10.1037/a0021631

Tronick, E. Z. (1989). Emotions and emotional communication in infants. The American Psychologist, 44(2), 112–119. https://doi.org/10.1037//0003-066x.44.2.112

Tronick, E. Z. (2002). The Increasing Differentiation and Nontransferability of Ways of Being Together. Journal of Infant, Child, and Adolescent Psychotherapy, 2(4), 47–60. https://doi.org/10.1080/15289168.2002.10486419

Tsakiridis, I., Bousi, V., Dagklis, T., Sardeli, C., Nikolopoulou, V., & Papazisis, G. (2019). Epidemiology of antenatal depression among women with high-risk pregnancies due to obstetric complications: A scoping review. Archives of Gynecology and Obstetrics, 300(4), 849–859. https://doi.org/10.1007/s00404-019-05270-1

Turner, S. M., Beidel, D. C., Roberson-Nay, R., & Tervo, K. (2003). Parenting behaviors in parents with anxiety disorders. Behaviour Research and Therapy, 41(5), 541–554. https://doi.org/10.1016/S0005-7967(02)00028-1

Uguz, F., Gezginc, K., & Yazıcı, F. (2011). Are major depression and generalized anxiety disorder associated with intrauterine growth restriction in pregnant women? A case-control study. General Hospital Psychiatry, 33(6), 640.e7-640.e9. https://doi.org/10.1016/j.genhosppsych.2011.05.007

Van Batenburg-Eddes, T., Brion, M. j., Henrichs, J., Jaddoe, V. w. v., Hofman, A., Verhulst, F. c., Lawlor, D. a., Davey Smith, G., & Tiemeier, H. (2013). Parental depressive and

anxiety symptoms during pregnancy and attention problems in children: A cross-cohort consistency study. Journal of Child Psychology and Psychiatry, 54(5), 591–600. https://doi.org/10.1111/jcpp.12023

van Beek, Y., Hopkins, B., & Hoeksma, J. B. (1994). Development of communicative behaviors in preterm infants: The effects of birthweight status and gestational age. Infant Behavior and Development, 17(2), 107–117. https://doi.org/10.1016/0163-6383(94)90046-9

van de Loo, K. F. E., Vlenterie, R., Nikkels, S. J., Merkus, P. J. F. M., Roukema, J., Verhaak, C. M., Roeleveld, N., & van Gelder, M. M. H. J. (2018). Depression and anxiety during pregnancy: The influence of maternal characteristics. Birth, 45(4), 478–489. https://doi.org/10.1111/birt.12343

Van den Bergh PhD, B. R. H. (1990). The influence of maternal emotions during pregnancy on fetal and neonatal behavior. Journal of Prenatal & Perinatal Psychology & Health, 5(2), 119.

Van den Bergh, B. R. H., Mulder, E. J. H., Mennes, M., & Glover, V. (2005). Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: Links and possible mechanisms. A review. Neuroscience & Biobehavioral Reviews, 29(2), 237–258. https://doi.org/10.1016/j.neubiorev.2004.10.007

Van Der Bruggen, C. O., Stams, G. J. J. M., & Bögels, S. M. (2008). Research Review: The relation between child and parent anxiety and parental control: a meta-analytic review. Journal of Child Psychology and Psychiatry, 49(12), 1257–1269. https://doi.org/10.1111/j.1469-7610.2008.01898.x

van der Wal, M. F., van Eijsden, M., & Bonsel, G. J. (2007). Stress and Emotional Problems During Pregnancy and Excessive Infant Crying. Journal of Developmental & Behavioral Pediatrics, 28(6), 431. https://doi.org/10.1097/DBP.0b013e31811ff8f4

Von Bertalanffy, L. (1967). General theory of systems: Application to psychology. Social Science Information, 6(6), 125–136. https://doi.org/10.1177/053901846700600610

von Hinke, S., Rice, N., & Tominey, E. (2022). Mental health around pregnancy and child development from early childhood to adolescence. Labour Economics, 78, 102245. https://doi.org/10.1016/j.labeco.2022.102245

Vondra, J. I., Shaw, D. S., Swearingen, L., Cohen, M., & Owens, E. B. (2001). Attachment stability and emotional and behavioral regulation from infancy to preschool age. Development and Psychopathology, 13(1), 13–33. https://doi.org/10.1017/S095457940100102X

Voßbeck, S., de Camargo, O. K., Grab, D., Bode, H., & Pohlandt, F. (2001). Neonatal and neurodevelopmental outcome in infants born before 30 weeks of gestation with absent or reversed end-diastolic flow velocities in the umbilical artery. European Journal of Pediatrics, 160(2), 128–134. https://doi.org/10.1007/s004310000680

Wan, M. W., Green, J., Elsabbagh, M., Johnson, M., Charman, T., Plummer, F., & Team, the B. (2013). Quality of interaction between at-risk infants and caregiver at 12–15 months is associated with 3-year autism outcome. Journal of Child Psychology and Psychiatry, 54(7), 763–771. https://doi.org/10.1111/jcpp.12032

Warren, S. L., Gunnar, M. R., Kagan, J., Anders, T. F., Simmens, S. J., Rones, M., Wease, S., Aron, E., Dahl, R. E., & Sroufe, A. L. (2003). Maternal Panic Disorder: Infant Temperament, Neurophysiology, and Parenting Behaviors. Journal of the American Academy of Child & Adolescent Psychiatry, 42(7), 814–825. https://doi.org/10.1097/01.CHI.0000046872.56865.02

Watt, J. (1986). Interaction and development in the first year. II. The effects of intrauterine growth retardation. Early Human Development, 13(2), 211–223. https://doi.org/10.1016/0378-3782(86)90009-5

Watt, J. (1987). Temperament in small-for-dates and pre-term infants: A preliminary study. Child Psychiatry and Human Development, 17(3), 177–188. https://doi.org/10.1007/BF00706228

Watt, J. (1989). The Consequences of Intrauterine Growth Retardation: What Do We Know? Australian and New Zealand Journal of Obstetrics and Gynaecology, 29(3), 279–287. https://doi.org/10.1111/j.1479-828X.1989.tb01743.x

Watt, J. (1990). Interaction, intervention, and development in small-for-gestational-age infants. Infant Behavior and Development, 13(3), 273–286. https://doi.org/10.1016/0163-6383(90)90035-7

Watt, J., & Strongman, K. T. (1985). Mother-infant interactions at 2 and 3 months in preterm, small-for-gestational-age, and full-term infants; their relationship with cognitive development at 4 months. Early Human Development, 11(3), 231–246. https://doi.org/10.1016/0378-3782(85)90077-5

Weinberg, M. K., & Tronick, E. Z. (1998). Emotional Characteristics of Infants Associated With Maternal Depression and Anxiety. Pediatrics, 102(Supplement_E1), 1298–1304. https://doi.org/10.1542/peds.102.SE1.1298

Wenzel, A. (2011). Anxiety symptoms during pregnancy and the postpartum period.

Wenzel, A., Haugen, E. N., Jackson, L. C., & Brendle, J. R. (2005). Anxiety symptoms and disorders at eight weeks postpartum. Journal of Anxiety Disorders, 19(3), 295–311. https://doi.org/10.1016/j.janxdis.2004.04.001

Whaley, S. E., Pinto, A., & Sigman, M. (1999). Characterizing interactions between anxious mothers and their children. Journal of consulting and clinical psychology, 67(6), 826.

Wienerroither, H., Steiner, H., Tomaselli, J., Lobendanz, M., & Thun-Hohenstein, L. (2001). Intrauterine blood flow and long-term intellectual, neurologic, and social

development. Obstetrics & Gynecology, 97(3), 449–453. https://doi.org/10.1016/S0029-7844(00)01158-3

Wijnroks, L. (1999). Maternal recollected anxiety and mother–infant interaction in preterm infants. Infant Mental Health Journal, 20(4), 393–409. https://doi.org/10.1002/(SICI)1097-0355(199924)20:4<393::AID-IMHJ3>3.0.CO;2-I

Woodruff-Borden, J., Morrow, C., Bourland, S., & Cambron, S. (2002). The Behavior of Anxious Parents: Examining Mechanisms of Transmission of Anxiety From Parent to Child. Journal of Clinical Child & Adolescent Psychology, 31(3), 364–374. https://doi.org/10.1207/S15374424JCCP3103_08

Yu, M., Qiu, T., Liu, C., Cui, Q., & Wu, H. (2020). The mediating role of perceived social support between anxiety symptoms and life satisfaction in pregnant women: A cross-sectional study. Health and Quality of Life Outcomes, 18(1), 223. https://doi.org/10.1186/s12955-020-01479-w

Zietlow, A.-L., Nonnenmacher, N., Reck, C., Ditzen, B., & Müller, M. (2019). Emotional Stress During Pregnancy – Associations With Maternal Anxiety Disorders, Infant Cortisol Reactivity, and Mother–Child Interaction at Pre-school Age. Frontiers in Psychology, 10. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02179

Zijlmans, M. A. C., Riksen-Walraven, J. M., & de Weerth, C. (2015). Associations between maternal prenatal cortisol concentrations and child outcomes: A systematic review. Neuroscience & Biobehavioral Reviews, 53, 1–24. https://doi.org/10.1016/j.neubiorev.2015.02.015