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TITLE PAGE

“A Cross-sectional Study of Father-Daughter/Son Interactions from 1 Month to 3 years of age with the Feeding and Play Scales: Exploring the Psychometric Properties”

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A Cross-sectional Study of Father-Daughter/Son Interactions from 1 Month to 3 years of age with the Feeding and Play Scales: Exploring the Psychometric Properties

Abstract

The quality of father-infant/toddler interactions has become a focal point in studies of early child development. However, studies targeting early father-infant/toddler interactions may be hampered due to the lack of specific and validated measures; indeed, most of the applied observational instruments were originally designed to evaluate mother-child interactions. In a sample of 142 fathers-infant/toddler dyads, the current study aimed to test the reliability of the Feeding and Play Scales, which were initially created to assess mother-infant/toddler interactions. Also, we compared the father-infant/toddler feeding and play interactions at different developmental stages, from 1 month to 3 years of the child's age, and we evaluated the effect of the child's gender on the father-infant/toddler feeding and play interactions. Both scales showed satisfactory internal consistency, confirming that the measures are reliable in the evaluation of father-infant/toddler feeding and play interactions. Analyses showed significant correlations between the subscales of the Feeding and Play Scales, significant effects of the child's age and significant gender differences. Our research shows that the Feeding and Play Scales are promising instruments to study the role of fathers in the development of normal and disordered feeding in infants and toddlers.

Keywords: father–infant/toddler interactions, feeding observational scale, free-play observational scale, gender differences, research tool

1. Introduction

As more and more women enter the workforce, fathers are assuming an increasing number of childcare functions which traditionally were handled by mothers (Schoppe-Sullivan & Fagan, 2020). The father-child relationship is embedded within a broader sociocultural context that constantly changes over time based on societal beliefs and practices regarding the father's role in the family (Lamb & Lewis, 2013; Paquette, 2004). There has been a cultural change in industrial societies regarding the paternal role: increasingly 'new fathers' wish to assist at delivery, are seeking very early on to establish an intimate relationship with their child, and choose to get involved with the responsibilities of parenting.

A growing body of research indicates that paternal involvement with his offspring, especially supportive, authoritative fathering have short, medium, and long-term effects on the child's development, independent of the mother's parenting (Brown et al., 2012; Jia, Kotila, & Schoppe-Sullivan, 2012; Lamb & Lewis, 2013; NICHD Early Child Care Research Network, 2000; Paquette, 2004). Some studies have shown that paternal sensitivity in interactions with their young children and being emotionally attached to a sensitive father predicts better behavioral and psychological outcomes and is related with higher well-being, better cognitive development, and better social skills of the child (Barker, Iles, & Ramchandani, 2017; Grossman et al., 2002). Moreover, it has been shown that paternal engagement with their children, monitoring them and setting limits and rules have a direct impact on children's cognitive and socio-emotional development (Ramchandani, Domoney, Sethna, Psychogiou, Vlachos, Murray 2013; Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008). Bronte-Tinkew and colleagues demonstrated that paternal cognitively challenging activities, care, and warmth are linked with a decrease in the likelihood of the child's cognitive delay (Bronte-Tinkew, Carrano, Horowitz, & Kinukawa, 2008).

In regard to the role of fathers as resilience buffers, longitudinal research (Vakrat, Apter-Levy, & Feldman, 2017) of chronically depressed mothers of children from birth to 6 years of age demonstrated that sensitive fathers, who provide opportunities for child social engagement, can

moderate and compensate the effects of maternal depression on the child's development and on the family's cohesion. However, in families of depressed mothers when fathers showed low sensitivity, high intrusiveness, and provided little opportunities for the child's social engagement, the family process was less cohesive, showing a decrease in the family's harmonious, warm, and collaborative interactions (Vakrat, Apter-Levy, & Feldman, 2017).

Importantly, it has been shown that the quality of the father-child relationship is more significant than the quantity of time fathers dedicate to their children (Brown, McBride, Shin & Bost, 2007; Meuwissen & Carlson, 2015). In addition, fathers may have an indirect effect on their children by supporting their partners' parenting, influencing mother-child interactions, and economically supporting their children (Atzaba-Poria, Meiri, Millikovsky, Barkai, Dunaevsky-Idan, & Yerushalmi 2010; Cano, Perales, & Baxter, 2019).

During the last few years, a steady increase in research addressing the potential influence of fathers on their children's development has yielded new knowledge and contributed to the importance of studying families as a complex system. These prior studies provide general knowledge that fathers' parenting quality may be crucial predictors of the quality of the father-child relationship and child outcomes; however, much more research is needed to further corroborate these findings.

1.1 Fathers and feeding

Feeding interactions between parents and their children create the opportunity to regularly exchange verbal and nonverbal communications; these experiences contribute to the development of shared meanings and attachment bonds, and form the basis of healthy development (Black & Aboud, 2011; Chatoor, Hommel, Sechi, & Lucarelli 2018; Chatoor, Lucarelli, 2020; Fadda, Lucarelli, 2017). Yet, the majority of the existing studies have focused on mother-infant/toddler interactions (Blissett, Meyer, & Haycraft, 2006; Campbell et al., 2010; Patrick, Nicklas, Hughes, & Morales, 2005). However, fathers are becoming increasingly more engaged in child feeding (Harris, Jansen, Mallan, Daniels, & Thorpe, 2018; Mallan, Nothard, Thorpe, Nicholson, JWilson, Scuffham, & Daniels, 2014). Khandpur and colleagues noted that 62% of the fathers reported that they share responsibilities

in family meals and child feeding with their partner and around 15% of the fathers even reported to have the main responsibility for feeding (Khandpur, Charles & Davison 2016). These changes have led to efforts to deepen the understanding of fathers' psychological characteristics and practices during feeding interactions with their children (Harris, Jansen, Mallan, Daniels, & Thorpe, 2018; Haycraft & Blissett, 2012; Orrell-Valente et al., 2007; Khandpur, Blaine, Fisher, & Davison, 2014; Musher-Eizenman, de Lauzon-Guillain, Holub, Leporc, & Charles, 2009).

Fathers' highly controlling parenting styles and feeding parenting practices have been found to be related to overweight in their children (Haycraft & Blissett, 2012; Johannsen, Johannsen, & Specker, 2006; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2013; Musher-Eizenman, de Lauzon-Guillain, Holub, Leporc, & Charles, 2009). On the other hand, pressure to eat has also been associated with lower child body weight, the child's slowness in eating and emotional undereating (Haycraft & Blissett, 2012; Zhang & McIntosh, 2011). Alternatively, fathers' praise and modeling of healthy eating behaviors is associated with lower nutritional risk. However, paternal concern about the child's health and pressure to eat is related to higher nutritional risk and more problematic eating behaviors (Haycraft & Blissett, 2012; Vollmer et al. 2015; Watterworth, Hutchinson, Buchholz, Darlington, Randall Simpson, Ma, ... & Guelph Family Health Study, 2017).

Also, fathers tend to be less effective monitoring their child's food consumption when compared to mothers (Khandpur, Blaine, Fisher and Davison, 2014), and they may show less ability to recognize their child's distress signals (Cerniglia, Cimino, & Ballarotto, 2014; Lamb, 2010; Shoppe-Sullivan, Brown, Cannon, Mangelsdorf, & Sokolowski, 2008). Still, several other studies found no significant differences in the feeding parenting practices between mothers and fathers (Blissett, Meyer, & Haycraft, 2006; Powell, Frankel, Umemura, & Hazen, 2017). Overall, these findings demonstrate that fathers have a strong impact on their children's feeding behaviors.

1.2 Fathers and play

Parent-infant/toddler play in the first years of life is known to support crucial cognitive, social, and communication skills, but most studies have focused on mothers and their infants. Several studies

about fathers' impact on child development have focused on paternal activities with their children (Lamb, 2010; Pleck, 2010), especially play activities (Paquette, 2004). Indeed, the typical paternal physical contact and rough-and-tumble play is associated with the child's emotional-regulation processes (Brown, Mangelsdorf, Shigeto, Wong, 2018; Dumont & Paquette, 2013; Feldman, 2003). Fathers' support and responsiveness during stimulating play activities is also associated with higher father-child attachment security (Fuertes, Faria, Beeghly, & Lopes-dos-Santos, 2016; Grossmann et al., 2002). Additionally, paternal sensitivity during play is associated with the child's self-regulation and language skills (Anderson, Roggman, Innocenti, & Cook., 2013; Cabrera, Shannon et al., 2007; Cook et al., 2011; John, Halliburton, & Humphrey, 2013). Furthermore, good play exchanges may promote motivation, joy, and interest for learning, enhancing school performance (Hirsh-Pasek, Golinkoff, Berk, & Singer, 2009).

Research revealed that fathers are involved in more playful interactions than mothers with their infants, and that fathers' interactions are more physical and stimulating than mothers' interactions with infants. Paquette (2004) describes as fathers tend to excite, surprise, and momentarily destabilize children, they also tend to encourage children to take risks, thus permitting children to learn to be braver, as well as to stand up for themselves. However, Paquette (2004) points out that this dynamic can only be effective in the context of an emotional bond between father and child.

Some studies also showed that fathers were more intrusive in their play and less responsive to infant cues compared to mothers (Grossmann, Grossmann, Kindler, & Zimmermann, 2008; Volling, McElwain, Notaro, & Herrera, 2002). Research reports that paternal intrusiveness appears to be a risk factor for the development of self-regulatory and social skills in children with developmental delays (Stevenson & Crnic, 2013). In addition, other studies found that fathers' intrusiveness is related to children's negativity in normally developing children during the first three years of life (Menashe-Grinberg, & Atzaba-Poria, 2017) and is associated to later child internalizing and externalizing problems, behavior dysregulation, and aggression (Ramchandani et al., 2013). However, the role of father-infant/toddler play interactions in child outcome needs further exploration and additional

studies can use play as a suitable context for the child to learn self-regulation (Dumont & Paquette, 2013).

1.3 Gender differences

The literature has found that fathers tend to behave differently with daughters and sons (Emmott, & Mace, 2018; Hewlett, 2017). Fathers of young children are more responsive to daughters' submissive emotional facial expressions (Chaplin, Cole, & ZahnWaxler, 2005) and are more likely to show warmth and to attend more to their daughters' pro-social behavior (Hastings, McShane, Parker, & Ladha, 2007).

These behaviors and attitudes appear to be neurobiologically grounded. Fathers of daughters seem to be more involved with their daughters, and have a stronger neural response to their daughter's happy facial expressions in the medial and lateral orbitofrontal cortex, whereas, fathers of sons are more involved in rough and tumble play, and have a stronger neural response to their son's neutral facial expressions in the medial and lateral orbitofrontal cortex (Mascaro, Rentscher, Hackett, Mehl, & Rilling, 2017).

However, it is important to underline that both child and parent gender as well as the child's temperament characteristics may influence parent-child relationships and have an effect on the other parent and other children in the family (Chatoor, Sechi, Vismara, & Lucarelli, 2020; Eagly & Wood, 2013; Sameroff, 2010; Sechi, Vismara, Rollé, Prino, & Lucarelli, 2020). Moreover, the co-parental and family subsystems should also be considered for a better understanding of the feeding and eating issues and to plan effective interventions (Lucarelli, Ammaniti, Porreca, & Simonelli, 2017).

Based on the above empirical and clinical evidence of the important role of fathers in the development of young children, the present study had the general purpose to test the reliability of the observational father-infant/toddler feeding and play scales which were originally developed for mother-infant/toddler interactions.

During infancy and toddlerhood, feeding interactions represent a vital domain for the child's development and her/his dyadic relationship with the caregiver (Chatoor et al., 1997). As the infant

grows, new social and motor abilities make other contexts, such as play, as much important within the caregiver-infant interactions. However, feeding and play have different characteristics: play is more likely to be spontaneous, whereas feeding interactions are structured events of daily life (Stern, 2010). Nonetheless, both situations may shed light on the affective attunement, and emotional co-construction of states within the dyadic interaction. Thus, the observation of the feeding and/or play interaction of the child with her/his caregiver offers the opportunity to evaluate the quality of their relationship within different domains (Chatoor et al., 1997; Chatoor et al., 1998; Fadda & Lucarelli, 2017; Stern, 2010).

The validity and reliability of the Feeding Scale have been previously published, [showing a five-factor structure: \(1\) Dyadic Reciprocity, \(2\) Dyadic Conflict, \(3\) Talk and Distraction, \(4\) Struggle for Control, and \(5\) Maternal Non-Contingency](#). Also, predictive validity of the Feeding was shown (Chatoor et al., 1997); progressively, several studies have successfully applied the Scale on mother-child dyads allowing [to discriminate between infants and toddlers with and without feeding disorders](#) (Ammaniti et al., 2004; Aviram, Atzaba-Poria, Pike, Meiri, & Yerushalmi, 2015; Fadda & Lucarelli, 2017; Lucarelli et al., 2013; Squire et al., 2014; Wendt et al., 2015).

Chatoor et al. (2018) validated the Parent-Child Play Scale, as a complementary scale to the Feeding Scale, showing that dysfunctional play combined with dysfunctional feeding interactions are associated with more negative mother–infant/toddler interactions. [Therefore, it can be applied for research or clinical purposes in the diagnosis and treatment of early feeding problems, to assess the ubiquity of mother–child problems and to evaluate the efficacy of intervention.](#)

The current study aimed at studying the above-mentioned observational tools in the context of father-child interactions. In particular, the following objectives were pursued:

(a) to examine the psychometrics properties of the Feeding and Play Scales with a sample of fathers;

- (b) to assess the correlation between father-infant/toddler feeding interactions and father-infant/toddler play interactions;
- (c) to compare the father-infant/toddler feeding and play interactions at different ages, from 1 to 36 months;
- (d) to evaluate the effect of the infant's gender on the father-infant/toddler feeding and play interactions.

2. Method

2.1. Sample

The participants in the present study were 142 infants and toddlers ranging in age from 1 month to three years and their biological fathers (age range from 22 to 51 years; $M_{Age} = 36.9$ years, $SD = 5.8$ years). Participants were recruited through announcements in the local media and posters that were placed around the hospital and in local pediatric offices.

We examined four age groups in the first year of life due to the rapid development, two age groups in the second year of life, and only one group in the third year of life. Each group consists of approximately 20 infants to be able to compare the groups to each other. We recruited 18 infants between 1 and 3 months, 18 infants between 3 and 6 months, 24 infants between 6 and 9 months, and 18 infants between 9 and 12 months. In addition, we recruited 21 toddlers between 12 and 18 months, 18 toddlers between 18 and 24 months, and 25 toddlers between 24 and 36 months. The total group of 142 infants/toddlers and fathers consisted of 73 (51%) boys and 69 (49%) girls; 67% were Caucasian, 30% African American, 1% Hispanic, and 2% Asian; 83% were from the middle, upper middle, and upper classes, and 17% were from the lower middle and lower socioeconomic classes, as determined by the Four-Factor Index of Social Status (Hollingshead, 1975).

2.2. Procedure

The families were informed about the study as well as the procedure, participated voluntarily, and each parent gave informed consent prior to their inclusion in the study. All procedures were reviewed and approved by the Internal Review Board of the Hospital where the study was performed.

Fathers and infants were videotaped by a trained research assistant for a free-play interaction and a feeding interaction (counterbalanced for order). Specifically, half of the dyads experienced the free-play first followed by meal, and half experienced meal first followed by free-play.

The researcher introduced the assessment tasks by explaining to the father that he should act as if at home and if difficulties arose, he should deal with them in the usual manner. The conditions for observations were kept constant as much as possible.

Each father was asked to bring the infant or toddler to the laboratory during a time when he would normally feed his child. The room was set up in a standardized way and gave the father the opportunity to position his daughter or son on his lap, in a highchair, or in a small chair at a low table depending on the child's age. The father was asked to bring the child's regular food and feed him or her in whatever manner he was accustomed to do at home. The feeding interactions were videotaped for about 20 minutes. If the child was still eating at the end of this period, the child could continue eating until the father indicated that the mealtime was over. However, in all cases, only the first 20 minutes of the meal was coded for subsequent analysis. The feeding interactions were then rated using the items of the Feeding scale. No dyad ended the feeding before the 20 minutes at disposal.

The play interactions were videotaped for about 10 minutes. The lab playroom was set up with age-appropriate toys for father-child play activity. The father was asked to play with their children as they would at home. For both feeding and play interactions, the observation period started when the researcher signaled to the father by knocking on the wall from an adjoining video control room.

2.3. Materials

2.3.1. Feeding scale

The Feeding Scale (FS; Chatoor, Getson, Menvielle, Brasseaux, O'Donnell, Rivera, & Mrazek 1997) is a global rating scale which was developed to assess mother–infant/toddler feeding interactions. Father–child dyads are videotaped during a 20-min feeding session.

This observational procedure allows to assess the quality of the mealtime exchanges according to five main subscales: dyadic reciprocity, maternal non-contingency, dyadic conflict, talk and distraction, and struggle for control. The Dyadic reciprocity subscale refers to the quality of understanding and affective engagement between the father and her child (e.g., “*father makes positive remarks*”); the Paternal Non-Contingency subscale refers to the father's incapacity to understand child signals and respond contingently (e.g., “*father handles child excessively*”); the Dyadic Conflict subscale evaluates the overt conflicts between fathers and their children overeating (e.g., “*child pushes food away*”); the Talk and Distraction subscale measures the struggles by the dyad to control or engage each other by talking or distracting each other during feeding (e.g., “*child appears easily distracted*”); lastly, the Struggle for Control subscale evaluates the efforts or behavior by father and child to control feeding (e.g., “*father forces bottle or food into child’s mouth*”).

The Feeding Scale measures a wide range of interactive behaviors and identifies normal and/or at-risk feeding relational dynamics between father and child ages 1 month to 36 months of age of the child. The scale has 46 items (26 paternal items and 20 infant items), representing the five subscales cited above. Each item received a score on a Likert scale of 0 (*none*), 1 (*a little*), 2 (*pretty much*), and 3 (*very much*). If the behavior did not occur, it was rated as 0 (*none*); if the behavior was observed sometimes or rarely, it was rated as 1 (*a little*); if the behavior occurred several times, it was rated as 2 (*pretty much*); and if the behavior occurred often or repeatedly throughout the observational period, it was rated as 3 (*pretty much*). An example item is “Father talk to the infant” in which the coder rated “*none*” if the father remains completely silent throughout the feeding interaction; “*a little*” if the father speaks to the infant on occasion, but remains silent throughout most of the interval “*pretty much*” if the father speaks to the infant for most of the observational period, but there may be a few instances during which the father remains silent for an extended period of time; and “*very much*” if the father speaks to the infant throughout the entire observational period.

Low to moderate test-retest reliability has been demonstrated for each of the five factors, and inter-rater reliability varied from .82 to .92. Stability at different ages was tested for all subscales from 1 to 36 months of age in a sample of normally developing children.

2.3.2. Play scale

The Play Scale (PS; Chatoor, Hommel, Sechi, & Lucarelli, 2018), is a global rating scale developed to assess mother-infant/toddler play interactions. Father-child dyads are videotaped during a 10-min free-play session.

This scale has four main subscales: dyadic reciprocity, paternal unresponsiveness, dyadic conflict, and paternal intrusiveness. The Dyadic Reciprocity subscale reflects the quality of relatedness and affective engagement between the father and child (e.g., “*child smiles at father*”); the Paternal Unresponsiveness to Infant’s/Toddler’s Cues subscale measures to the degree to which a father fails to support and appears unaware of the child’s ongoing activities during play (e.g., “*father positions or holds infant with restriction of normal*”); the Dyadic Conflict subscale evaluates to the degree to which the father shows distress, anxiety, anger, and/or makes critical remarks about the child or criticizes the child’s play, and the degree to which the child appears distressed and/or angry during the entire observational period (e.g., “*father makes negative or critical remarks about infant’s play*”); lastly, the Paternal Intrusiveness subscale describes the extent to which the father handles her child unnecessarily, acts arbitrarily, and is disruptive to the child’s ongoing activities or the extent to which the parent directs the child’s play verbally and/or physically, or the father’s behaviors are not contingent or consistent with the child’s interests or cues (e.g., “*father directs child to do or not to do*”).

The scale was created for use with infants and toddlers ranging in age from 1 month to 36 months of the child’s age. The Play Scale entails 32 items (24 paternal items and 8 infant items). The PS uses a 4-point scale for rating the behavior and affects of father-infant/toddler dyads during play

interactions. Each item received a score on a Likert scale of 0 (*none*), 1 (*a little*), 2 (*pretty much*), and 3 (*very much*). If the behavior did not occur, it was rated as 0 (*none*); if the behavior was observed sometimes or rarely, it was rated as 1 (*a little*); if the behavior occurred several times, it was rated as 2 (*pretty much*); and if the behavior occurred often or repeatedly throughout the observational period, it was rated as 3 (*pretty much*). An example item is “Infant plays with father” in which the coder rated “none” if the infant does not play with the father; “a little” if the infant plays with the father only briefly; “pretty much” if the infant plays with the father several times throughout most of the observational period and “very much” if the infant plays with the father through the entire observational period.

Low to moderate test-retest reliability has been demonstrated for each of the four factors, and inter-rater reliability varied from .55 to .76. Stability at different ages was tested for all subscales from 1 to 36 months of age in a sample of normally developing children.

2.4. Data analysis

The videotaped parent–child feeding and play interactions were rated by two trained coders. Both coders were blind to group assignment, and both had been trained by Irene Chatoor in the scoring of the Feeding and Play Scales. Means values and standard deviations were calculated and ensured that the highest correlation between each item and other items in the same construct ranged between 0.3 and 0.9 (Hair, 2011). Internal consistency analysis was carried out through item-total correlations and Cronbach’s alpha-if-item-deleted. Specifically, for the feeding and play scales to have reliability, the lowest CITC in each construct must be more than 0.3, and the Cronbach’s alpha value should be more than 0.7.

To determine the factor structure of the feeding and play scales, Exploratory factor analysis (EFA) was performed using varimax rotation. Within the EFA, the Bartlett’s test of sphericity was used for applicability of the factor analysis, and the Kaiser-Meyer-Olkin measure was used to evaluate sampling adequacy.

For assessment of inter-rater reliability, 89% of the videotapes were coded twice. Agreement within the coders was computed as correlations on feeding and play subscale totals. Pearson's correlations were used to assess the relationship between the measures of dyadic feeding interactions and dyadic play interactions.

Analysis of variance (ANOVA) was carried out to compare Feeding and Play scales scores across the seven age groups. Next, a follow-up Bonferroni post hoc test was conducted to determine the specific, statistically significant differences between cohorts. Infant gender factors on father–infant interactions were examined by conducting a series of *t* tests for the data obtained with the feeding and play scales.

3. Results

3.1. Feeding Scale

3.1.1. Psychometric characteristics

Means, standard deviations and CITC are presented in Table 1. All CITC for individual items were above .3, indicating that all items correlated adequately with the rest of the items of the corresponding subscale (Table 1).

For Factor analysis, sampling adequacy was verified using the KMO test. The test gave an acceptable score of .7, thus the sample fulfilled the criteria to use Factor analysis. Exploratory factor analysis was performed to check the factorial structure of Feeding Scale. Factor analysis demonstrated that the five factors together explain 47.8% of the total variance.

Cronbach's alpha coefficients were calculated to assess the scale's internal consistency within its five dimensions. The results showed satisfactory internal consistency (dyadic reciprocity: $\alpha = .84$, paternal non-contingency $\alpha = .70$; dyadic conflict $\alpha = .78$; struggle for control $\alpha = .71$ and talk and distraction $\alpha = .83$).

INSERT TABLE 1

3.1.2. Reliability

With respect to the Feeding Scale, inter-rater reliability was .92 for dyadic reciprocity, .92 for maternal non-contingency, .96 for dyadic conflict, and .90 for struggle for control and .96 for talk and distraction.

3.2. Play Scale

3.2.1. Psychometric characteristics

Means, standard deviations, CITC are presented in Table 2. All CITC for individual items were above .3, indicating that all items correlated adequately with the rest of the corresponding subscale (Table 2).

For Factor analysis, sampling adequacy was verified using the KMO test. The test gave an adequate score of 0,809, thus the sample fulfilled the criteria to use Factor analysis. Exploratory factor analysis was performed to check the factorial structure of Feeding Scale. Factor analysis demonstrated that the five factors together explain 53.78% of the total variance.

Cronbach's alpha coefficients were calculated to assess the scale's internal consistency within its four dimensions. The results showed satisfactory internal consistency (dyadic reciprocity: $\alpha = .89$, paternal unresponsiveness $\alpha = .70$; dyadic conflict $\alpha = .77$ and paternal intrusiveness $\alpha = .70$).

INSERT TABLE 2

3.2.2. Reliability

Correlations between raters' scores were: .96 for dyadic reciprocity, .92 for paternal Unresponsiveness, .96 for dyadic conflict, and .90 for paternal intrusiveness.

3.3. Relationship between the measures of feeding and play interactions

Correlational analysis was conducted to explore the relationship between Feeding and Play subscales' dimensions. The results (Table 3) showed that high father-child reciprocity during feeding was significantly correlated with greater father-child reciprocity and to lower paternal unresponsiveness and paternal intrusiveness during play. The analysis showed that high father-child conflict during feeding was significantly correlated with paternal unresponsiveness and lower father-child reciprocity during play. Finally, higher paternal non contingency during feeding was significantly associated with lower father-child reciprocity and greater paternal unresponsiveness during play.

INSERT TABLE 3

3.4. Feeding and Play scores comparison across the seven age groups

With respect to the Feeding Scale, a significant main effect of age was found for the Talk and Distraction subscale ($F_{(6,137)} = 3.34; p < 0.01$) (see Table 4). The post hoc test showed that toddlers between 18 and 24 months ($p < .05$) and between 24 and 36 months ($p < .01$) showed a significantly higher level of talk and distraction than infants between 1 and 3 months. With respect to the Play Scale, a significant main effect of age was found for Dyadic Reciprocity ($F_{(6,137)} = 2.60; p < .05$) (see Table 4). The post hoc test showed that the group of toddlers between 18 and 24 months ($p < .05$) reported a significantly higher level of Dyadic Reciprocity than infants between 1 and 3 months.

3.5. Differences in regard to the child's gender

With respect to the gender, a significant mean difference was found for the Talk and Distraction Feeding subscale, $t(140) = 2.1; p < .04$. Results showed that fathers use more talk and distraction with boys than girls (Table 5).

4. Discussion

Fathers are becoming progressively more important caregivers in Western populations (Emmott & Mace, 2018); yet, studies examining father-child relationships may be hampered due to the lack of

specific and validated measures; indeed, most of the applied instruments were originally designed to evaluate mother-child interactions (Adamsons & Buehler, 2007; Cabrera, Fitzgerald, Bradley, & Roggman, 2014). However, to better understand the interactions of fathers with their young children, the current study, in a sample of 142 father-child dyads, was designed to test the reliability of the Feeding and Play Scales, which were initially created to assess mother-infant/toddler interactions.

Feeding and play are key experiences in the development of infants' cognitive, emotional, and social abilities (Biringen, 2000). Stern (1996) has pointed to the unique features of mother-infant interactions during feeding and play and their contribution to the child's development. Considering the increasing role of fathers in the care of young children, in this study, we tested the reliability of the Feeding and the Play Scales in order to evaluate the verbal and nonverbal communication exchanges between fathers and their infants and toddlers.

Since the Feeding Scale applied to father-infant/toddler dyads showed satisfactory internal consistency, we can confirm that this measure is reliable in the evaluation of father-infant/toddler feeding interactions. Interestingly, analyses showed a statistically significant difference between boys and girls in the 'Talk and Distraction' feeding subscale, with higher scores for father and son dyads. This result seems to confirm how biological differences between males and females may influence paternal behaviors (Raley & Bianchi, 2006). In fact, it is known that there are gender differences in temperament and self-regulation (Chatoor, Sechi Vismara & Lucarelli, 2020; Sechi, Vismara, Rollè, Prino & Lucarelli, 2020; Else-Quest, 2012); girls, compared to boys, display a higher capacity to regulate affects, behaviors and attention, whereas boys have higher activity levels than girls (Hong, Doan, Lopez, & Evans, 2017). In this regard, we suppose that the increase in the 'Talk and Distraction' subscale for boys may be related to these different gender characteristics.

In addition, analyses revealed also a significant main effect of age in the 'Talk and Distraction' subscale. The post hoc test showed that toddlers between 18 and 24 months and between 24 and 36 months engaged in a significantly higher level of 'Talk and Distraction' than infants between 1 and

3 months. This indicates that as young children learn to speak, they also become more verbally assertive during feedings.

The Play Scale applied to father-infant/toddler dyads showed also satisfactory internal consistency. Therefore, we can confirm that the measure is reliable in the evaluation of father-infant/toddler play interactions.

Similarly, to the Feeding Scale, a significant main effect of age was found. The group of toddlers between 18 and 24 months showed a significantly higher level of 'Dyadic reciprocity' compared to infants between 1 and 3 months. This subscale describes positive affects and engagement between fathers and children and it appears that the increase in the child's cognitive, behavioral and socio-emotional skills contribute to the joy, excitement and shared pleasure during play (Menashe-Grinberg & Atzaba-Poria, 2017).

Analysis showed some significant correlations between feeding subscales and play subscales. In general, a negative interactional style during play is associated with poorer feeding interactions between fathers and children. Of special interest are the significant correlations between dyadic reciprocity during feeding and during play which show that positive interactions during play carry over into feeding and vice versa. On the other hand, paternal unresponsiveness and intrusiveness during play correlated significantly with paternal conflict during feeding which highlights the father's difficulty to tune into the child in both situations. In addition, the significant correlation between talk and distraction during feeding and paternal intrusiveness during play point to the father's need for control in regard to the child. Overall, these correlations reveal underlying interactional difficulties which can be observed in both situations.

In combination with the Feeding Scale, the Play Scale has the additional advantage to assist in determining whether the interactions between father and child are only a problem during feeding or are more generally problematic and open the door for interventions not only during feeding, but also during play that are pivotal experiences of everyday parent infant/toddler interactions (Chatoor et al. 2018; Stern, 1996).

4.1. Limitations

It is important to interpret our findings while considering some limitations. The reliability should be reinforced by a larger sample. It would be important to compare fathers coming from different socio-economic backgrounds.

Other variables such as the father's biological versus stepfather status, and ethnicity could well affect father-child feeding and play interactions quality, therefore further research should explore these backgrounds in order to provide new important understanding of the way that fathers and children contribute to the quality of father-child interaction.

Moreover, in order to understand how the scales may capture specific characteristics in clinical or high-risk samples, they should be tested comparing children with and without feeding problems or fathers with emotional problems. For instance, we may expect that depressed fathers would show less stimulation during play with their young infants, and less engagement during feeding (Sethna, Murray, Netsi, Psychogiou, & Ramchandani, 2015). Alternatively, an anxious father may display more controlling behaviors towards the child compared to fathers with no anxiety problems (Teetsel, Ginsburg, Drake, 2013).

Finally, videos were recorder in a laboratory setting. Although such procedure increases the standardization of the observational conditions among participants, we are aware that it may undermine ecological validity. However, we believe that laboratory observation offers a special window on how the dyads work under stress, as caused by the unusual environment. The consequent interactions, hence, provide unique information on the ability of the dyad to respond to stressful conditions.

5. Conclusions

Our study shows that the Feeding and Play Scales may be used as a reliable measure for father-infant/toddler feeding and play interactions. Indeed, comparing father-child interactions during feeding and play offers the possibility to recognize the transversality of the parent-child interactional

problems, hence guiding intervention. In fact, the observation of maladaptive father and child behaviors during feeding and play interactions can, at first, orient intervention, and, later, highlight the occurring changes within father–infant/toddler interactions during and after intervention. Videofeedback interventions may be considered particularly efficacious in that fathers may reflect from a dual perspective on his own interactions – subjective as well as distanced, supported by a therapist (Balldin et al., 2018; Klein Velderman et al., 2006).

Consequently, future studies applying these measures, can make an important contribution to the understanding of the paternal role in the development of their children, beyond and in addition to the mothers' influence (Chatoor & Lucarelli, 2020; Lucarelli, Sechi, Cimino & Chatoor, 2018). Hence, our results suggest that fathers should be included in research and intervention programs for children with feeding difficulties.

Ethics approval and consent to participate

Approved by the University Ethics Committee of the Department of Pedagogy, Psychology, Philosophy of the University of Cagliari, Italy. All parents gave written consent for their own involvement and permission for their child's involvement before participating in the study.

Authors' contributions

All authors conceived the study design. I. C. contributed to organize the recruitment of the sample and contributed to write all the sections of the manuscript. C.S. contributed to prepare data set, performed statistical analyses, and contributed to write all the sections of the manuscript of the manuscript. L.V. contributed to the interpretation of data and to write all the sections of the manuscript. L.L. contributed to write all the sections of the manuscript and supervised the research team. All authors reviewed and approved manuscript for publication.

Data Availability

The data that has been used is confidential. All relevant data are within the paper.

Declaration of competing interest

The authors have declared that no competing interests exist.

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Table 1. Means, standard deviations, and corrected item-total correlations of the Feeding Scale

		Mean	SD	Range	Load Factor	Corrected Item-total correlation	α if item deleted
	F shows pleasure	2,20	0,70	0-3	,45	0,44	0,83
	F cheerful	1,99	0,68	1-3	,46	0,44	0,83
	F makes positive remarks	1,02	0,78	0-3	,48	0,40	0,83
	F appears sad	0,90	0,81	0-3	,44	0,41	0,83
	F makes positive statements about I’s	1,62	0,88	0-3	,49	0,51	0,83
Factor I	I appears cheerful	1,70	0,75	0-3	,56	0,66	0,82
	F appears detached	1,43	0,82	0-3	,56	0,58	0,82
Dyadic reciprocity	F talks to infant	2,87	0,50	0-3	,60	0,44	0,83
	I smiles at mother	2,70	0,60	0-3	,57	0,42	0,83
	I looks at mother	2,79	0,59	0-3	,57	0,45	0,83
	F holds I stiffly	2,87	0,47	0-3	,64	0,43	0,83
	F waits for I to initiate interaction	1,58	0,58	0-3	,61	0,45	0,83

	I avoids F's gaze	0,95	0,79	0-3	,61	0,47	0,83	
	F positions I without regard for support	1,33	0,82	0-3	,55	0,56	0,82	
	F positions I for reciprocal exchange	2,73	0,59	0-3	,50	0,32	0,84	
	I falls asleep and stops feeding	2,89	0,45	0-3	,46	0,35	0,84	
	<i>% of variance</i>				20,36			
Factor II <i>Dyadic conflict</i>	I turns away from food	0,31	0,49	0-3	,51	0,34	0,76	
	I appears angry	0,38	0,59	0-3	,53	0,32	0,77	
	I appears distressed	0,32	0,54	0-3	,62	0,52	0,75	
	I refuses to open mouth	0,30	0,51	0-3	,48	0,38	0,76	
	I cries when food offered	0,08	0,27	0-2	,54	0,42	0,76	
	I pushes food away	0,38	0,55	0-2	,48	0,44	0,75	
	I stiffens when touched	0,64	0,68	0-2	,50	0,57	0,74	
	F appears distressed	0,46	0,65	0-2	,62	0,45	0,75	
	F makes negative remarks	0,46	0,63	0-2	,42	0,37	0,76	
	F appears angry	0,18	0,40	0-2	,42	0,39	0,76	
	I arches from food	0,58	0,63	0-2	,49	0,44	0,75	
	F makes negative statements about I's	0,37	0,58	0-1	,40	0,42	0,76	
		<i>% of variance</i>				9,52		
	Factor III <i>Talk and distraction</i>	I appears easily distracted	0,72	0,74	0-2	,56	0,69	0,77
I vocalizes to F.		0,92	0,83	0-3	,63	0,58	0,82	
F distracts or allows infant to distract		0,96	0,88	0-3	,63	0,75	0,74	
F commands I to eat, to do or not to do		1,15	0,81	0-2	,62	0,62	0,80	
	<i>% of variance</i>				7,37			
Factor IV <i>Struggle for control</i>	F forces bottle or food into I's mouth	0,34	0,68	0-2	,516	0,40	0,68	
	I holds food in mouth	0,32	0,60	0-2	,436	0,44	0,66	
	I spits food out	0,17	0,47	0-3	,427	0,54	0,64	
	F appears concerned about messiness	0,45	0,72	0-3	,648	0,36	0,69	
	I thrusts tongue rhythmically	0,25	0,49	0-3	,555	0,39	0,67	
	F handles I roughly	0,24	0,50	0-3	,496	0,39	0,67	
	F controls feeding by overriding I's cues	0,12	,36	0-3	,531	0,49	0,66	
	<i>% of variance</i>				5,78			
Factor V <i>Paternal non-contingency</i>	F interrupts feeding causing distress in I	0,66	0,77	0-3	,44	0,37	0,69	
	F handles I excessively	0,19	0,47	0-3	,41	0,40	0,66	
	I cries when bottle or food is taken away	0,65	0,75	0-3	,57	0,46	0,65	
	F restricts movement of I	0,15	0,41	0-2	,57	0,47	0,65	
	F misses I's cues	0,11	0,34	0-2	,57	0,48	0,65	
	I vomits or ruminates	0,20	0,51	0-2	,62	0,50	0,63	
	F touches I playfully	0,06	0,23	0-1	,43	0,41	0,68	
	<i>% of variance</i>				4,73			

Note. For simplicity, only loadings for retained items in each factor are displayed; Infant is replaced by "I" and Father by "F" in item names.

Table 2. Means, standard deviations, and corrected item-total correlations of the Play Scale

		<i>Mean</i>	<i>SD</i>	<i>Range</i>	<i>Load Factor</i>	<i>Corrected Item-total correlation</i>	<i>α if item deleted</i>
Factor I <i>Dyadic reciprocity</i>	I Appears cheerful	1,8	0,64	0-3	,46	0,41	0,88
	I Smiles at mother	2,1	0,68	0-3	,76	0,65	0,87
	I Plays with mother	1,9	0,64	0-3	,63	0,55	0,87
	F Makes encouraging, FTalks infant	1,8	0,69	0-3	,74	0,73	0,86
	F Attends to infant's play	,8	0,73	0-3	,42	0,43	0,88
	I Vocalizes at mother	1,6	0,61	0-3	,69	0,69	0,87
	F Shows pleasure towards	1,0	0,79	0-3	,48	0,61	0,87
	F Makes positive remarks	1,5	0,69	0-3	,70	0,70	0,87
	F Positions infant or	2,9	0,48	1-3	,69	0,37	0,88
	I Looks at mother	1,2	0,53	0-2	,44	0,58	0,87
	F Appears cheerful	1,3	0,68	0-3	,43	0,39	0,88
	F Appears sad	0,9	0,76	0-3	,59	0,49	0,88
	I Avoids mother's gaze	1,3	0,66	0-3	,48	0,53	0,87
	F Engages in pleasurable	1,5	0,75	0-3	,57	0,66	0,87
	<i>% of variance</i>	2,8	0,58	0-3	,66	0,38	0,88
Factor II <i>Paternal Unresponsiveness</i>	F Appears detached				27,12		
	F Holds infant stiffly	0,18	0,42	0-2	,48	0,43	0,66
	F Appears oblivious in	0,11	0,31	0-1	,65	0,55	0,64
	F Positions or holds infant	0,20	0,41	0-2	,44	0,38	0,68
	F Positions infant without	0,15	0,35	0-1	-,59	0,50	0,65
	F Handles infant in abrupt	0,39	0,61	0-2	,52	0,42	0,68
	<i>% of variance</i>	0,27	0,50	0-2	,56	0,43	0,66
Factor III <i>Dyadic conflict</i>	F Makes negative or				11,30		
	I Appears angry	0,15	0,35	0-1	,63	0,67	0,70
	F Appears angry	0,09	0,28	0-1	,69	0,72	0,70
	I Appears distressed	0,13	0,35	0-2	,52	0,58	0,72
	F Appears distressed	0,27	0,50	0-3	,40	0,41	0,77
	F Makes negative or	0,28	0,52	0-2	,54	0,38	0,78
	<i>% of variance</i>	0,12	0,34	0-2	,52	0,54	0,73
Factor IV <i>Paternal intrusiveness</i>	F Controls infant's play				7,95		
	F Handles infant	0,63	0,75	0-3	,41	0,37	0,68
	F Directs infant to do or	1,56	0,71	0-3	,52	0,42	0,66
	F Waits for infant to	1,01	0,80	0-3	,79	0,53	0,61
	F Shows infant excessively	0,73	0,69	0-3	,69	0,54	0,61
<i>% of variance</i>	1,43	0,75	0-3	,40	0,41	0,67	
				7,42			

Note. For simplicity, only loadings for retained items in each factor are displayed; Infant is replaced by "I" and Father by "F" in item names.

Table 3 The relationship between the measures of feeding and play interactions

		<i>Feeding Scale</i>			
<i>Play scale</i>	Dyadic reciprocity	Dyadic conflict	Talk distraction	Struggle control	Paternal non contingency
Dyadic reciprocity	0,504***	-0,304**	-0,233*	0,171	-0,277**
Paternal Unresponsiveness	-,0356**	0,387***	0,139	0,129	0,304**
Dyadic Conflict	-0,138	0,128	0,066	0,074	0,068
Paternal Intrusiveness	-0,220*	0,188*	0,184*	0,106	0,149

* = $p < 0,05$, ** = $p < 0,01$; *** $p < 0,001$

Table 4. Means, standard deviations, and differences in Feeding and Play scales across age groups.

	<i>Age groups</i>							F	p
	<i>Age in Months</i>	<i>Age in Months</i>	<i>Age in Months</i>	<i>Age in Months</i>	<i>Age in Months</i>	<i>Age in Months</i>	<i>Age in Months</i>		
	1-3	3.1-6	6.1-9	9.1-12	12.1-18	18.1-24	24.1-36		
	(N=18)	(N=18)	(N=24)	(N=18)	(N=21)	(N=18)	(N=25)		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
<i>Feeding scale</i>									
Dyadic Reciprocity	1,73 ^a (0,3)	1,96 ^a (0,3)	2,03 ^a (0,3)	1,95 ^a (0,4)	2,02 ^a (0,4)	2,07 ^a (0,3)	1,73 ^a (0,3)	1,95	0,08
Dyadic conflict	0,26 ^a (0,3)	0,25 ^a (0,2)	0,39 ^a (0,3)	0,51 ^a (0,3)	0,38 ^a (0,3)	0,36 ^a (0,2)	0,35 ^a (0,3)	1,42	0,21
Talk distraction	0,49 ^a (0,5)	0,89 ^{ab} (0,6)	0,91 ^{ab} (0,7)	0,77 ^{ab} (0,6)	0,88 ^{ab} (0,5)	1,22 ^b (0,7)	1,26 ^b (0,8)	1,60	0,004
Struggle control	0,38 ^a (0,3)	0,23 ^a (0,1)	0,26 ^a (0,2)	0,32 ^a (0,2)	0,25 ^a (0,2)	0,20 ^a (0,2)	0,18 ^a (0,1)	3,34	0,15
Paternal non contingency	0,25 ^a (0,3)	0,21 ^a (0,2)	0,32 ^a (0,2)	0,31 ^a (0,3)	0,29 ^a (0,2)	0,27 ^a (0,2)	0,24 ^a (0,2)	0,43	0,85
<i>Play scale</i>									
Dyadic reciprocity	1,39 ^a (0,4)	1,51 ^{ab} (0,3)	1,59 ^{ab} (0,5)	1,75 ^{ab} (0,4)	1,71 ^{ab} (0,3)	1,81 ^b (0,4)	1,73 ^{ab} (0,4)	2,60	0,02
Paternal Unresponsiveness	0,20 ^a (0,3)	0,17 ^a (0,1)	0,25 ^a (0,2)	0,18 ^a (0,2)	0,10 ^a (0,1)	0,18 ^a (0,3)	0,15 ^a (0,2)	0,84	0,54
Dyadic Conflict	0,19 ^a (0,2)	0,08 ^a (0,1)	0,15 ^a (0,2)	0,18 ^a (0,2)	0,06 ^a (0,1)	0,13 ^a (0,2)	0,20 ^a (0,2)	1,39	0,22
Paternal Intrusiveness	1,03 ^a (0,4)	0,89 ^a (0,3)	0,87 ^a (0,4)	1,15 ^a (0,4)	1,16 ^a (0,6)	0,96 ^a (0,5)	0,97 ^a (0,4)	1,19	0,32

Note. Means followed by the same letter at the same row are not significantly different, according to the pairwise *t* test with Bonferroni correction.

Table 5. Descriptive Statistics and *t*-test results for Feeding and Play scales scores by Child Sex

	<i>Male</i> Mean (<i>SD</i>)	<i>Female</i> Mean (<i>SD</i>)	<i>t</i>	<i>p</i>
<i>Feeding scale</i>				
Dyadic Reciprocity	1,96 (0,3)	1,99 (0,4)	-0,5	0,61
Dyadic conflict	0,35 (0,3)	0,36 (0,3)	-0,04	0,97
Talk distraction	1,05 (0,6)	0,81 (0,6)	2,1	0,04
Struggle control	0,25 (0,2)	0,26 (0,2)	-0,40	0,69
Paternal non contingency	0,29 (0,3)	0,25 (0,2)	0,88	0,38
<i>Play</i>				
Dyadic reciprocity	1,64 (0,4)	1,65 (0,4)	-0,22	0,83
Paternal Unresponsiveness	0,20 (0,2)	0,14 (0,2)	1,56	0,12
Dyadic Conflict	0,15 (0,2)	0,13 (0,5)	0,66	0,51
Paternal Intrusiveness	0,96 (0,5)	1,96 (0,4)	1,08	0,28