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Mother-child play in children with Down syndrome and typical development

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Abstract

The present study compares child solitary and collaborative play with mother in 21 children with Down syndrome (DS) and 33 mental-age-matched typically developing (TD) children. In solitary play, children with DS showed less exploratory but similar symbolic play compared to TD children. From solitary to collaborative play, children with DS increased their exploratory play attaining the same level as TD children; Pretense significantly increased from solitary to collaborative play only in TD children . Differences between mothers' play in the two groups mirrored those between their children. Child and mother play in both groups showed similar attunement and synchrony. Mothers contribute to the play development of children with DS through their own adaptation to their children's limitations and potentialities alike.

Play has strong social and emotional overtones, but is demonstratively cognitive in nature as well, and through their play children explore, manipulate, understand, and modify their environment (Bornstein, 2007). Moreover, as they grow, more mature cognitive skills emerge and motivate more sophisticated play. Since Piaget (1962), it is widely recognized that children normally move in development from sensorimotor exploration to symbolic pretense in their play. For their part, when in collaborative play, mothers adjust their behaviors to assist their children's progress. So, in typical development, children's collaborative play with mothers is normally more sustained and complex than is their solitary play (e.g., Bornstein *et al*., 1996; Fiese, 1990; Slade, 1987a, 1987b; Užgiris & Raeff, 1995; Vibbert & Bornstein, 1989; Vygotsky, 1978). Despite the fact that play is integral to child development, to date specific contributions of maternal play to the play of children with intellectual disabilities have not been adequately explored. The main purpose of the present study is to contribute to the literatures on the development of play in children with Down syndrome (DS), which is the most common genetic cause of intellectual disability. To do so, we compare child solitary and collaborative play with mother, as well as mother collaborative play, in dyads with DS and typically developing (TD) mental-age-matched children.

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The cognitive development of play follows a universal progression, as extensively documented in the literature both for TD children and for children with DS (Beeghly & Cicchetti, 1987; Belsky & Most, 1981; Cunningham, Glenn, Wilkinson, & Sloper, 1985; Hill & McCune-Nicolich, 1981; McCune-Nicolich, 1981; Mundy, Sigman, Ungerer, & Sherman, 1987; Sigman & Ruskin, 1999; Tamis-LeMonda & Bornstein, 1996). In synopsis, children first play in modes geared to explore, that is in ways tied directly to concrete features of objects; later children play symbolically, that is in ways that incorporate representation and pretense. In specific, children's object play initially consists of exploratory sensorimotor manipulation whose main purpose is garnering information about objects, their properties, and their functions. Steadily, more sophisticated and hierarchically integrated forms of combinatorial play emerge. Eventually, children play symbolically and begin to represent their experiences. Symbolic play includes pretense about the self and about others, sequences of pretense, and substitutions in pretense. This universal trajectory of play development is associated with the emergence of new cognitive skills in the child, a principal reason why maturity in play is often considered to reflect children's cognitive level. Indeed, child play and mental age tend to be strongly associated in typically and atypically developing children alike (Beeghly & Cicchetti, 1987; Cunningham, Glenn, Wilkinson, & Sloper, 1985; Hill & McCune-Nicolich, 1981). The affective dimension of play is alsofundamental : Symbolizing in children correlates with both mental and interpersonal development (Beeghly *et al*., 1989; Noll & Harding, 2003; Venuti *et al*., in press).

Empirical comparisons between children with DS and TD children have identified both similarities and differences in the developmental progression of play. Specifically, both the course and content of symbolic play appear to be similar in children with DS and TD who are at the same cognitive level (Beeghly *et al*., 1989; Cielinski *et al*., 1995; Cunningham *et al*., 1985). However, children with DS tend to repeat the same play schemes (Sigman & Sena, 1993; Weiss, Beeghly, & Cicchetti, 1985). Children with DS also appear to be somewhat impaired in exploratory play (Brooks-Gunn & Lewis, 1984; Krakow & Kopp, 1982; Sigman & Sena, 1993), typically spending less time involved in manual exploration than in visual exploration (Vietze, 1983), a deficit that has been explained by their lack of object mastery (Ruskin, Mundy, Kasari, & Sigman, 1994). Other possible explanations for the deficit in exploratory play relate to other compromised areas that characterize the DS phenotype, such as sustained attention (Brown, Johnson, Paterson, Gilmore, Longhi, & Karmiloff-Smith, 2003; Landry & Chapieski, 1989), motor development (Vicari 2006), initiation (Schaefer & Cresthill 2002), and instrumental thinking (Fidler 2006).

Despite these broadly regular developmental processes, some variability characterizes play even in children of the same mental age and developmental level (e.g., Bornstein, Haynes, O'Reilly, & Painter, 1996; Tamis-LeMonda, Užgiris, & Bornstein, 2002), and one principal source of this variability derives from interactions children have with adult partners. Although cognitive abilities are requisite to play structure, motivation at and involvement in play emerge in interactive settings (Piaget, 1962; Werner & Kaplan, 1963). For this reason, the role of parents in the development of play in TD children is a recurrent topic in the developmental science literature (Bornstein *et al*., 1996; Fiese 1990; Howes, Ungerer, &

Matheson, 1992; Noll & Harding, 2003). Specifically, there is strong evidence that an adult partner's participation in child play enhances the complexity, the duration, and the frequency of child play (Bornstein, Venuti, & Hahn, 2002; Bornstein, Haynes, O'Really, Painter, 1996; Venuti, Rossi, Spagnoletti, Famulare, Bornstein, 1997); children learn from and model the play they see (Užgiris, Benson, Kruper, & Vasek, 1989); and children conclude play scenarios that others begin (Dunn & Wooding, 1977). Against a backdrop of individual developmental tendencies in children's play, then, are strong dyadic effects. For example, Venuti and colleagues (1997) collected data on solitary and collaborative play (using the same observation procedure we adopted in this study) from 89 TD dyads when children were 20 months of age and found that the amount of child symbolic play in a collaborative situation almost doubled the amount of child symbolic play when alone.

Concerning children with DS, few studies have investigated specific differences between child solitary and collaborative play with an adult (Cielieski *et al*., 1995; Venuti *et al*., 2008). In their study of mother-child play in children with DS and TD, Cielinski and colleagues (1995) found that child play sophistication in both groups was higher during collaborative play with mother than during solitary play, but the authors did not distinguish the quantity of exploratory and symbolic play activities specifically as we do here. Venuti and colleagues (2008), who considered the amounts of both exploratory and symbolic play in children with DS, found that the presence of the mother during play resulted in more child exploratory, but not symbolic, activity compared to solitary play. More generally, Feuerstein, Rand, and Rynders (1988) showed that by engaging children with DS in a carefully graduated series of learning activities in a supportive relationship, adults enables children to master more cognitive regulatory functions themselves than they could previously.

Starting from general evidence of positive maternal influences on child play, the particular behaviors mothers use to exert positive influences on their children's play still need to be specified. In typical development, mothers play in ways which children observe and learn from, they induce play, and they provide supports for play (Tamis-LeMonda, Katz, & Bornstein, 2002). Specifically, mothers engage in the same or similar activity as the child by mirroring and/or modelling child play. In typical development, a concurrent association often obtains between the sophistication levels of the child and the mother playing together, and sequential analysis shows that mothers also adjust their play to advance their children's play (Bornstein *et al*., 2002; Damast, Tamis-LeMonda, & Bornstein, 1996). Concerning DS, the few existing studies have reported that mothers of children with DS tend to be more directive and intrusive in play than mothers of TD children (Cielinski et al., 1995, Beeghly et al., 1989, 1996; Roach et al., 1998).

Our overall goal in the present study was to look more closely at several features of child solitary and mother-child collaborative play in children with DS compared to a group of mental age-matched TD children. Related to this comparison we had the following aims with the following expectations.

1. We compared the structure of play in the two groups to determine if one type of activity (exploratory versus symbolic) predominates in child solitary and

collaborative play. Considering the mental age of our sample, we expected that both groups of children would engage more in exploratory than symbolic play.

2. We compared play in solitary and collaborative conditions in the two groups. We expected that, relative to mental age-matched TD children, children with DS would display less exploratory play, but similar symbolic play, as reported in other studies.

3. We compared the effects of mothers' participation on child play in the two groups. We expected that both children with DS and TD would benefit from their mothers' participation in play by increasing symbolic play from solitary to collaborative play situations. We did not expect exploratory play to increase in either children with DS, due to their specific deficit, or TD children, as their mothers do not usually promote exploratory play at this age.

4. We compared children with DS and TD children for their relative order between solitary to collaborative play situations. We expected that children with TD and DS would be stable (i.e., children would maintain their relative order) across the two play situations..

5. We compared maternal play in the two groups during collaborative play in terms of mothers' play behaviors and in terms of the strategies they use to support their children's play. As mothers usually tailor their play to their children's level of play, we expected that mothers of children with DS would show similar symbolic play, but possibly lesser exploratory play, than mothers of TD children. Moreover, we expected that mothers of children with DS would use more controlling and restrictive strategies during collaborative play compared to mothers of TD children.

6. We compared children and mothers in the two groups in terms of their attunement (associations between mother and child exploratory or symbolic play) and synchrony (the probability that mother and child were contemporaneously focused on the same play level) during play. We expected mother-child dyads in both groups would be attuned and able to synchronize to their children' play, but because mothers of children with DS are often reported to be directive, these dyads might show diminished attunement or synchrony relative to TD dyads.

Method

Participants

A total of 54 children and their mothers took part. The index group consisted of 21 children with DS (*M* mental age = 19.96 months, *SD* 5.52; *M* chronological age = 34.81 months, *SD* = 10.48) and their mothers (*M* age = 35.23 years; *SD* = 6.34). All children with DS had the Trisomy 21 type, confirmed by chromosomal analysis. The control group consisted of 33 mental-age-matched typically developing children (*M* chronological age = 20.01 months; *SD* = .21) and their mothers (*M* age = 25.48 years; *SD* = 5.42). Children with DS were recruited from an Early Intervention Centre, and typically developing children from public daycare centres. The Bayley Scales of Infant and Toddler Development (2nd Edition, Bayley, 1993) were used to determine the developmental age of children with DS. No mental age data were

available for the control group, but interviews with parents, examination of health records, and observations during the study all indicated that they were all developing normally. Participants were ethnically homogeneous of European heritage. The SES of the families, calculated with the Four-Factor Index of Social Status (Hollingshead, 1975), indicated a middle-low status in the Italian population (DS: $M = 25.48$; $SD = 14.11$; TD: $M = 21.58$; $SD = 5.87$), $t(52) = 1.20$ *ns*.

Procedure

The present study followed a standardized protocol. Data were collected during two consecutive 10-min play sessions videorecorded continuously by a female observer. The findings of previous studies using 10-min play sessions lend credence to the validity of the temporal parameters (see Bornstein *et al*., 1996), and it should be noted that play in children and parents is also robust to context between home and laboratory (Bornstein *et al*., 1997). During the first session, the child played with the toy set on his or her own, while the mother filled out a questionnaire. During the second session, the mother was asked to play with her child as she typically would and to disregard the observer's presence as much as possible. A set of standard, age-appropriate toys (doll, blanket, tea set, toy telephone, toy train, two small picture books, foam ball, and set of nesting barrels) was used that represented feminine, masculine, and gender-neutral categories (Caldera *et al*., 1989) and allowed for different play behaviors ranging from exploration to pretense (see Bornstein *et al*., 1996; Bornstein & O'Reilly, 1993). Mothers and children could use any or all of the toys provided; the child's own toys were not present. The same play code was applied to the child's play in solitary and collaborative sessions and also to the mother's play. In addition, a code for *supportive maternal behaviors* was applied to the collaborative sessions.

Play code—As described in Table 1, the play code consisted of a mutually exclusive and exhaustive category system that included 8 levels and a default (no play) category (see Bornstein & O'Reilly, 1993; Bornstein et al., 1996; Tamis-LeMonda & Bornstein, 1996); these play levels were derived from previous research on the progressive nature of play across the first years of life. Play was coded continuously by noting play level as well as start times and end times (accurate to 1 s). Levels 1–4 constitute the macrocategory Exploratory play, and Levels 5–8 constitute the macrocategory Symbolic play. For each level, four measures were calculated: the absolute frequency, the proportion frequency, the absolute duration, and the proportion duration. As these measures have been found to be consistently highly correlated in previous studies (see Bornstein *et al*., 1996), and showed high correlations in our sample (*r*s range = .48 to .86), their mean standard score was used as a summary index representing the amount of each play level and each macrocategory. The summary indexes, by considering frequencies and duration at the same time, controls the risk of results misinterpretation due to repetitive behaviors (high frequencies and short duration) or perservative behaviors (low frequency and long duration) known to occur in children with intellectual disability. Moreover, the summary index, taking into account the proportion of exploratory/symbolic play of the total duration of the session, controls any differences in the time children with DS versus TD children spent engaged in play during the observed 600s. Children with DS spent significantly more time not engaged in play than

TD children, both in the solitary, $t(53) = 6.62$, $p < .01$, and in the collaborative play sessions, $t(53) = 5.23$, $p < .01$ (Table 3).

Maternal supportive behaviours—This exclusive and exhaustive coding scheme, described in Table 2, was applied continuously (accurate to 1 s) to maternal behavior during collaborative sessions. It includes 5 categories of maternal behaviors aimed at supporting child play and a default category. The coding scheme was derived from a wider coding system on mother-child turn-taking during joint play (Venuti, 2001). The absolute frequencies observed during the whole session were calculated.

Interobserver agreement—For each of the two codes, coding was carried out by two professional research assistants who were blind to hypotheses and purposes of the study and to additional information about the dyads. Average kappas between each pair of coders was calculated on 40% of the sessions and ranged from .75 to .82 for the Play code and from .74 to .81 for the Maternal supportive behaviors code. In case of disagreement, the videorecord was jointly coded again by the two coders and, when necessary, disagreements were resolved with a third researcher who was trained and reliable on the same code.

Results

Analytic Plan

We first conducted preliminary analyses of the data. Then, we report descriptive statistics for child solitary and collaborative play, and for mother play and supportive behaviors in the two groups. To test our hypotheses about child play, an analysis of covariance (2 X 2 X 2) with group (DS vs. TD) as the between-subjects factor and play situation (solitary vs. collaborative) and type of play (exploratory vs. symbolic) as within-subjects factors was used on the summary indexes of child play; maternal age was a covariate. *T*-tests were used, where appropriate, as *post-hoc* tests and as follow-up analyses on the eight separate play levels with Bonferroni *p*-value adjustment.

To assess child stability in play from solitary to collaborative sessions, we used correlation analyses, and the Fisher's *z* (1921; see Howel, 2001, p. 278) was calculated to compare the two groups.

To assess degrees of dyadic attunement, correlations between mother and child play in the two groups were assessed and compared using Fisher's *z*. Also, to assess degrees of synchrony in the dyads, the conditional probability that both mother and child were engaged on the same macrocategory of play was compared in the two groups through separate *t*-tests, using Bonferroni *p*-value adjustment. Conditional probability is the probability of some event A *(e.g., a specific level of child play)* given the occurrence of some other event *B (e.g., a specific level of mother play*). It ranges between 0 and 1.

To test our hypotheses concerning maternal behaviors, *t*-tests, using Bonferroni *p*-value adjustment, were performed on maternal play. Moreover, separate *t*-tests, using Bonferroni *p*-value adjustment, were used to compare the two groups of mothers in terms of the frequencies of supportive behaviors they used during the whole play session, and the

conditional probabilities that their supportive behaviors co-occurred during child exploratory or symbolic play.

Preliminary Analyses

Prior to data analysis, all dependent variables and potential covariates were examined for normalcy, homogeneity of variance, outliers, correlations among variables, and influential cases (Fox, 1997). Transformations were applied to resolve problems of nonnormalcy, and residuals were examined for influential points. The distance of each case to the centroid was evaluated to screen for multivariate outliers (see Bollen, 1987; Tabachnick & Fidell, 1996). A significant correlation between maternal age and the summary index of child symbolic play in the collaborative session was found, $r(54) = .55$, $p < .001$; therefore, where appropriate, we used maternal age as a covariate, or we used residuals standardized for maternal age.

Descriptive Statistics

Table 3 presents descriptive statistics for child solitary and collaborative play and mother play by group. For purposes of clarity, descriptive statistics and figures report durations (in s); Durations correlated highly with the summary score, $r(52) = .86$, $p < .001$, used in further analyses. Table 4 presents descriptive statistics for frequencies of maternal supportive behaviors as well as the conditional probability that each category of maternal supportive behaviors co-occurred during child exploratory or symbolic play.

Child Play

A significant 3-way interaction of Group x Situation x Type of play emerged, $F(1,215) = 13.74$, $p < .001$. Furthermore, we found significant interactions for Group x Situation, $F(1,215) = 7.45$, $p < .005$, and Group x Type of play, $F(1,215) = 24.07$, $p < .001$. Main effects were found for group (the amount of play was higher in TD children, $F(1,215) = 9.47$, $p < .005$) and type of play (the amount of exploratory play was higher than symbolic play; $F(1,215) = 44.18$, $p < .001$). Neither a Situation x Type of play interaction nor a situation main effect was found.

In consideration of the interactions, separate paired-sample *t*-tests were used to evaluate the effect of type of play for each condition and for each group, the effect of group in each situation and level of play, and the effect of situation in each group and type of play.

Type of Play—In the solitary play session, we found no significant statistical differences between the amounts of exploratory and symbolic play in children with DS (Exploratory: $M = -.29$, Symbolic: $M = -.33$; $t(32) = -.34$, *ns*), but exploratory play in TD children exceeded their symbolic play (Exploratory: $M = .99$, Symbolic: $M = .52$; $t(32) = 7.06$, $p < .001$). In the collaborative play session, exploratory play exceeded symbolic play for both children with DS (Exploratory: $M = .19$, Symbolic: $M = -.28$), $t(20) = 1.96$, $p = .05$, and TD (Exploratory: $M = .29$, Symbolic: $M = -.30$), $t(32) = 3.39$, $p < .01$.

Group—In the solitary play situation, children with DS showed less exploratory play than TD children (DS: $M = -.29$, TD: $M = .99$), $t(52) = 5.27$, $p < .01$, but we did not find a

significant statistical difference between the two groups in symbolic play (DS: $M = -.33$, TD: $M = -.52$) $t(52) = 1.05$, *ns*. In the collaborative play situation, the two groups did not show significant statistical differences either in exploratory (DS: $M = -.19$, TD: $M = -.29$), $t(52) = .49$, *ns*, or symbolic play (DS: $M = -.30$, TD: $M = .28$), $t(52) = 1.05$, *ns*. However, follow-up analysis on the 8 individual play levels showed that in solitary play TD children were higher in Unitary functional activity (DS: $M = .03$, TD: $M = 1.09$), $t(52) = 3.98$, $p < .01$, inappropriate combinatorial activity (DS: $M = -.37$, TD: $M = .01$), $t(52) = 2.12$, $p < .05$, and appropriate combinatorial activity (DS: $M = -.40$, TD: $M = .82$), $t(52) = 3.12$, $p < .01$; in collaborative play, TD children were higher only in appropriate combinatorial activity (DS: $M = .01$, TD: $M = .78$), $t(52) = 2.24$, $p < .01$.

Situation—Figure 1 shows that children with DS explored more during collaborative than solitary play (Solitary: $M = -.29$, Collaborative: $M = .19$), $t(20) = 2.32$, $p < .05$, whereas TD children explored more in solitary than in collaborative play (Solitary: $M = .99$, Collaborative: $M = .29$), $t(32) = 3.53$, $p < .01$. Figure 2 shows that both children with DS and TD increased their symbolic play activity from the solitary to the collaborative situation, but this difference reached statistical significance only for TD children (Solitary: $M = -.52$, Collaborative: $M = -.30$), $t(32) = 2.59$, $p < .05$, and not for children with DS (Solitary: $M = -.33$, Collaborative: $M = -.28$), $t(32) = -.33$, *ns*. Moreover, follow-up analysis on the 8 individual play levels showed that for exploratory play children with DS specifically increased in unitary functional activity (Solitary: $M = .03$, Collaborative: $M = .89$), $t(20) = -3.15$, $p < .01$, whereas TD children specifically decreased their inappropriate combinatorial activity (Solitary: $M = .01$, Collaborative: $M = -.29$), $t(32) = 2.14$, $p < .05$; TD children increased in sequential pretense play (Solitary: $M = -.37$, Collaborative: $M = .19$), $t(32) = -3.44$, $p < .01$.

Child Play Stability

Children in the two groups did not show significant stability in the amount of exploratory play from solitary to collaborative play session (DS: $r(19) = .13$, *ns*; TD: $r(32) = .06$, *ns*, $z = .23$, *ns*). By contrast, strong positive correlations for both groups emerged from the solitary to the collaborative play situations for symbolic play (DS: $r(19) = .51$, $p < .001$; TD: $r(32) = .52$, $p < .001$; $z = -.04$, *ns*).

Maternal Play and Supportive Behaviors During Collaborative Session

As for maternal play behaviors, independent *t*-tests showed that mothers of TD children explored more than mothers of children with DS (DS: $M = -.45$, TD: $M = -.07$), $t(52) = 2.86$, $p < .01$. In particular, mothers of TD children used appropriate combinatorial activity more than mothers of children with DS (DS: $M = .11$, TD: $M = 1.25$), $t(52) = 3.45$, $p < .01$. By contrast, no significant statistical differences were found between the two groups in maternal symbolic play (DS: $M = -.44$, TD: $M = -.24$), $t(52) = 1.18$, *ns*.

As for maternal supportive behaviors (Table 4), independent *t*-tests showed no significant differences between mothers of the two groups in the total frequencies of widening, proposing, controlling of attention, controlling of action, or restriction, Moreover, no significant differences between the two groups of mothers emerged in the conditional

probabilities of their showing supportive behaviors while their children were in exploratory or symbolic play (Table 4).

Mother-Child Attunement and Synchrony

Correlational analysis showed strong positive associations between children and their mothers for exploratory play in both groups (DS: $r(19) = .48$, $p < .001$; TD: $r(32) = .61$, df =, $p < .001$). More specifically, in the group with children with DS a significant positive association emerged for unitary functional activity, $r(19) = .38$, $p < .01$, and in the TD group a significant positive correlation emerged for appropriate combinatorial activity, $r(32) = .62$, $p < .001$. No significant statistical associations were found between mother and child symbolic play although in both groups significant positive correlations emerged for one level of the symbolic macrocategory, namely sequential pretense (DS: $r(19) = .32$, $p < .01$; TD: $r(32) = .43$, $p < .01$). We compared correlation coefficients for child collaborative play with mother and mother collaborative play with child in TD versus dyads with DS using Fisher's *z*. A significant difference (Fisher's $z = 1.98$, $p < .05$) emerged only for unitary functional activity. Specifically, there was more congruence in mother-child with DS dyads than in mother-child with TD dyads at the lowest level of play.

Conditional probability was used to assess the degree of synchrony between mother and child play. We found that the mean conditional probability for dyads to be contemporaneously focused on exploratory play was . 25 (*SD* = .30) for children with DS and .22 (*SD* = .18) for TD children. Similarly, the mean conditional probability that mothers and children were at the same time playing symbolically was .20 (*SD* = .29) for children with DS and .23 (*SD* = .27) for TD children. *T-tests* did not reveal significant differences between the two groups in either exploratory, $t(52) = .50$, *ns*, or symbolic play, $t(52) = .36$, *ns*.

Discussion

Play is universally a prevalent and perhaps essential activity for the developing child. Through play the child explores the physical characteristics of the objects in the world and develops his/her cognitive skills (Bornstein & O'Reilly, 1993). With cognitive maturation, play activities of greater sophistication are gradually achieved in accordance with a normative developmental path that proceeds from exploration of objects to pretense with them (Belsky & Most, 1981; Tamis-LeMonda & Bornstein, 1996). Cognitive abilities are requisite for play, but the potential to reach higher levels of sophistication is also activated by partners' participation in play. Several studies demonstrate that typically developing children's play with mother is more sustained and complex than is children's solitary play (e.g., Bornstein *et al*., 1996; Fiese, 1990; Slade, 1987a, 1987b; Užgiris & Raeff, 1995; Vibbert & Bornstein, 1989; Vygotsky, 1978). Moreover, parents of typically developing children usually adapt their play to match their children's developmental level and interests (Damast *et al*., 1996; Venuti *et al*., 1997). The purpose of the present study was to investigate solitary child play and mother-child collaborative play in children with DS by comparing them with mental-age-matched typically developing peers. Specifically, we aimed to compare the two groups of dyads in terms of: the structure of child play – to

determine if one type of activity (exploratory versus symbolic) predominates in child play; amounts of play in each session; the effects of mothers' participation on child play – by comparing child solitary and collaborative play within each group; the stability of child play between solitary to collaborative sessions; the structure and the amount of maternal play and of maternal supportive behaviors during collaborative play; and the level of attunement and synchrony between children and mothers while at play.

Considering our first aim concerning the structure of child play, we found, as expected of 20-month-old toddlers, a general prevalence of exploratory activity. This result is consistent with the literature about play development in typically developing children (Belsky & Most, 1981; Bornstein & O'Reilly, 1993). Both our groups had a mean mental age of approximately 20 months, which means they should have already achieved some symbolic play, which they had, but are still very much engaged in exploration of the environment. However, different from what we expected, during the solitary play session, the prevalence of exploration was evident only among TD children. This result may be explained by the specific deficit in exploratory competence that has previously been reported in children with DS and discussed below (Brooks-Gunn & Lewis, 1984; Krakow & Kopp, 1982; Sigman & Sena, 1993; Vietze, 1983).

Regarding our second aim, as expected and consistent with the assumption of a specific deficit in children with DS that goes beyond their mental age (Sigman & Sena, 1993), we found that children with DS explored less compared to TD children, This deficit has been attributed to a lack of object mastery (Ruskin et al., 1994) in children with DS, but it might also be a function of difficulties in sustained attention (Brown, Johnson, Paterson, Gilmore, Longhi, & Karmiloff-Smith, 2003; Landry & Chapieski, 1989), motor development (Vicari 2006), initiation (Schaefer & Cresthill, 2002), and instrumental thinking (Fidler 2006) that characterize the DS phenotype. The results also confirmed our expectation that children with DS would show the same amount of symbolic play compared to TD children of the same mental age. This result accords with other studies that have indicated a strong association between symbolic ability in play and mental age in both typically and atypically developing children (Beeghly & Cicchetti, 1987; Cunningham, Glenn, Wilkinson, & Sloper, 1985; Hill & McCune-Nicolich, 1981). Moreover, this finding is consistent with the literature reporting that representational abilities in DS seem to be relatively preserved (Venuti, 2007). However, because the chronological age of the children with DS was almost 3 years on average, but their mental age less than 2 years, our data show that children with DS play at their mental age and much less (about a 1/3) than their chronological age. In brief, although children with DS were cognitively maturing to levels that are necessary to equal the still-rudimentary level of symbolic activities displayed by TD children, they still explored less. Nonetheless, this difference was far less evident during collaborative play with mother, when children with DS engaged in more exploratory actions. When playing with their mothers, children with DS and TD did not differ in either exploratory or symbolic play.

Our third hypothesis of a beneficial effect of maternal participation to child play was confirmed, but, contrary to our expectations the results revealed a different pattern of how maternal play influences children's play in the two groups. In exploratory play, children with DS increased from solitary to collaborative play, which means that these children,

benefiting from their mothers' play, could engage more in what they specifically lack, namely exploratory play. It appears that, when mothers participate in child play in an interactional context, children with DS are able, to a certain extent, to overcome deficits in exploratory play and reach the same level of TD children of a corresponding mental age. Indeed, children with DS grow from solitary to collaborative play in a basic level of exploratory activity (unitary functional activity, which consists in the production of effects that are unique to a single object). In contrast, TD children decreased in their exploratory play from when they played alone to when they played with their mothers, and specifically they decreased in inappropriate combinatorial activity, the out-of-place and incorrect juxtaposition of objects. Indeed, when with their mothers, TD children appropriately display less of a less sophisticated type of play, which they had already mastered. In symbolic play, we did not find a significant positive effect of maternal play on the play of children with DS, who remained at the same level, whereas we found an increase in TD children's symbolic play between the two sessions. Specifically, when playing with their mothers, TD children showed more higher-level symbolic sequential pretense, which includes linking two or more pretense actions. In short, for TD children, the pattern of maternal influence we found is consistent with the literature, highlighting a positive effect in promoting increases of more sophisticated levels of play, while reducing more elementary activities (Bornstein *et al*., 1996; Fiese, 1990; Slade, 1987a, 1987b; Užgiris & Raeff, 1995; Vygotsky, 1978). This pattern was almost reversed for children with DS. One possible interpretation of these findings is that mothers of children with DS compensate for their children's specific deficits in exploratory ability by promoting mastery motivation and attention, but do not influence representational abilities that underlie symbolic play and are linked to children's developmental level.

Concerning the fourth aim, our expectations of child play stability across situations was confirmed but only for symbolic play. Correlation analysis demonstrated that children in the two groups were not stable between the solitary and collaborative play situations with respect to exploratory play. For symbolic activity, although comparing mean levels, the two groups differed between situations (TD children increased their symbolic play, whereas children with DS did not), at an individual level children in the two groups were similarly stable, that is they maintained their relative order from solitary to collaborative play. Those children who were at a high level when they played by themselves, were also at a high level when playing with their mothers. One possible interpretation of these findings is again that, beside the potential influence played by adults, symbolic activity, as demonstrated by a plethora of studies, is more directly linked to child developmental level (Beeghly & Cicchetti, 1987; Cunningham, Glenn, Wilkinson, & Sloper, 1985; Hill & McCune-Nicolich, 1981) and therefore tends to be more stable compared to exploratory play.

Mothers of TD children are able to scaffold their children's symbolic play, whereas mothers of children with DS appear less successful, but can help them win exploratory play. It could be that mothers of children with DS, compared to mothers of TD children, concentrate more on a kind of activity that requires a lower cognitive level and focus less on more sophisticated activities. But this possibility is actually not supported by our results; mothers did not predominately display more exploratory than symbolic play. Our results, linked to

the fifth aim of this study, indicate, as we expected, that mothers of children with DS play less at exploration than mothers of TD children, while the two groups of mothers do not differ in terms of symbolic play. Therefore, differences between mothers in the two groups appear to mirror patterns of differences between their children. As for maternal supportive behaviors, we did not find the expected results concerning the higher directiveness of mothers of children with DS compared to those of TD children that has been found in previous studies. In the present investigation, mothers in the two groups did not differ in the number of attempts to restrict and control their children's behavior and attention. One possible interpretation may be related to cultural issues. We know from cross-cultural studies of mother-child interaction in typical development that Italian mothers tend to display higher levels of sensitivity and sociability toward their young children (Bornstein, Putnick, Heslington, Gini, Suwalsky, Venuti, de Falco, Giusti, & Zingman de Galperín, 2008; Hsu & Lavelli, 2005); this cultural proclivity could explain why we did not see an of maternal directiveness and intrusiveness in our sample as has been reported in studies carried out in other countries, such as the United States (Cielinski et al., 1995, Beeghly et al., 1989, 1996; Roach et al., 1998). Also, the mothers in the two groups we studied displayed similar numbers of attempts to initiate new play activities as well as to increase their children's play complexity. Thus, in our study, it does not appear that mothers of children with DS and TD exert different influences on child play through different supportive behaviors; it might be the case, however, that mothers' specific effects on child play result from their attunement and synchrony with the child.

Last, opposed to what expected for dyadic attunement in play, we found similar patterns in the two groups. Specifically, both groups showed significant positive associations between exploratory play behaviors in mothers and children at play levels (exploration) the children tended to display more. Perhaps for exploratory play, mothers of both children with DS and TD tailor their behaviors to their children's interests, and at the same time children initiate and/or follow their mothers' bids and respond to them with play behaviors of similar kinds. Considering specific exploratory play categories, we found that dyads with DS and TD showed different magnitudes of correlation only in terms of the lowest play level (i.e. unitary functional activity), where the association was stronger in mother-child with DS dyads than in mother-TD child dyads. Moreover, a positive association emerged only in TD dyads for a more complex exploratory activity -- appropriate combinatorial activity. Concerning symbolic play in general, we did not find significant associations between partner play in the two groups. However, in both groups significant positive associations emerged in sequential pretense, which includes linking different acts together and may include symbolic behaviors towards the partner. Thus, generally, we observed good congruence in the play levels children displayed most, and in a specific symbolic activity that may include dyadic exchanges. In addition, conditional probability analyses yielded specific information about mother-child synchrony within play exchanges. We found that in both groups the chance that mothers and children contemporaneously focused on the same type of play hovered around 40%, and no differences were found between exploratory and symbolic play.

Taken together, these results may have relevance for clinical practice. Similar to mothers of TD children, during a joint play session mothers of children with DS were able to attune to

their children's play level and to synchronize with them in a common play activity, without being controlling or restrictive. Through this scaffolding, mothers were able to help their children to concentrate more in play, facilitating an increase of a kind of play that otherwise appears specifically challenging for these children. This result is consistent with the idea that early intervention programs for children with DS, and perhaps children with other intellectual disabilities, should support the natural strengths of mothers (and fathers) in terms of parenting their special needs children. Moreover, these results suggest that mother-child play could be a powerful therapeutic context for young children with DS and should therefore be systematically encouraged by clinicians. Consistent with contemporary opinion on developmental psychopathology (Greenspan, 1997), our results provide some evidence that, while engaged in natural and relaxing play activities, children can be helped by a supportive parent to successfully face their developmental challenges.

Alongside the several strengths in this study, some limitations should also be noted. First, as is common in studies of clinical populations, the sample was relatively small and unbalanced in terms of child gender. Second, our sample came from a homogeneously middle-to-low socioeconomic status. Third, the inclusion of other variables, such as the function of maternal play (beyond level), might enrich future understanding of child-mother play in children with DS and TD. Fourth, we did not consider developmental age of the TD children; although we deduced from clinical reports, interviews from the parents, and our own observations that these children were not delayed or atypical in their general development, controlling for their actual developmental age would have augmented the validity of our findings. Fifth, the findings reported here might apply uniquely to mother-child play; we have to consider that studies of father- or caregiver-child dyads might yield different patterns of results. Finally, the inclusion of children with intellectual disabilities with mixed aetiology, would enable future research to draw conclusions more specific to the population of children with DS or to draw general conclusions about children with ID. The behavioral phenotype associated with DS has been thoroughly investigated, and includes a mixed profile of strengths and weaknesses. Thus, it is inappropriate to reach conclusions regarding intellectual disability in general based on a study of play that includes only children with DS. Absent a comparison group of children with ID of different aetiology, we cannot tell if our findings are more generally a function of ID, or a specific result of Down syndrome.

In conclusion, we observed essential maternal contributions to child play development in children with DS that seem to be achieved through mothers' adaptation to their children's limitations and potentialities alike. Results offer some evidence that mothers of children with DS, as mothers of TD children, adequately scaffolds their children's play without being overintrusive. From their part, children with DS during collaborative play with their mothers, seem to master activities that are specifically demanding when they are playing on their own. Altogether the findings of this study identify important strengths in mother-child play that could represent areas of potential remediation through intervention for children with DS.

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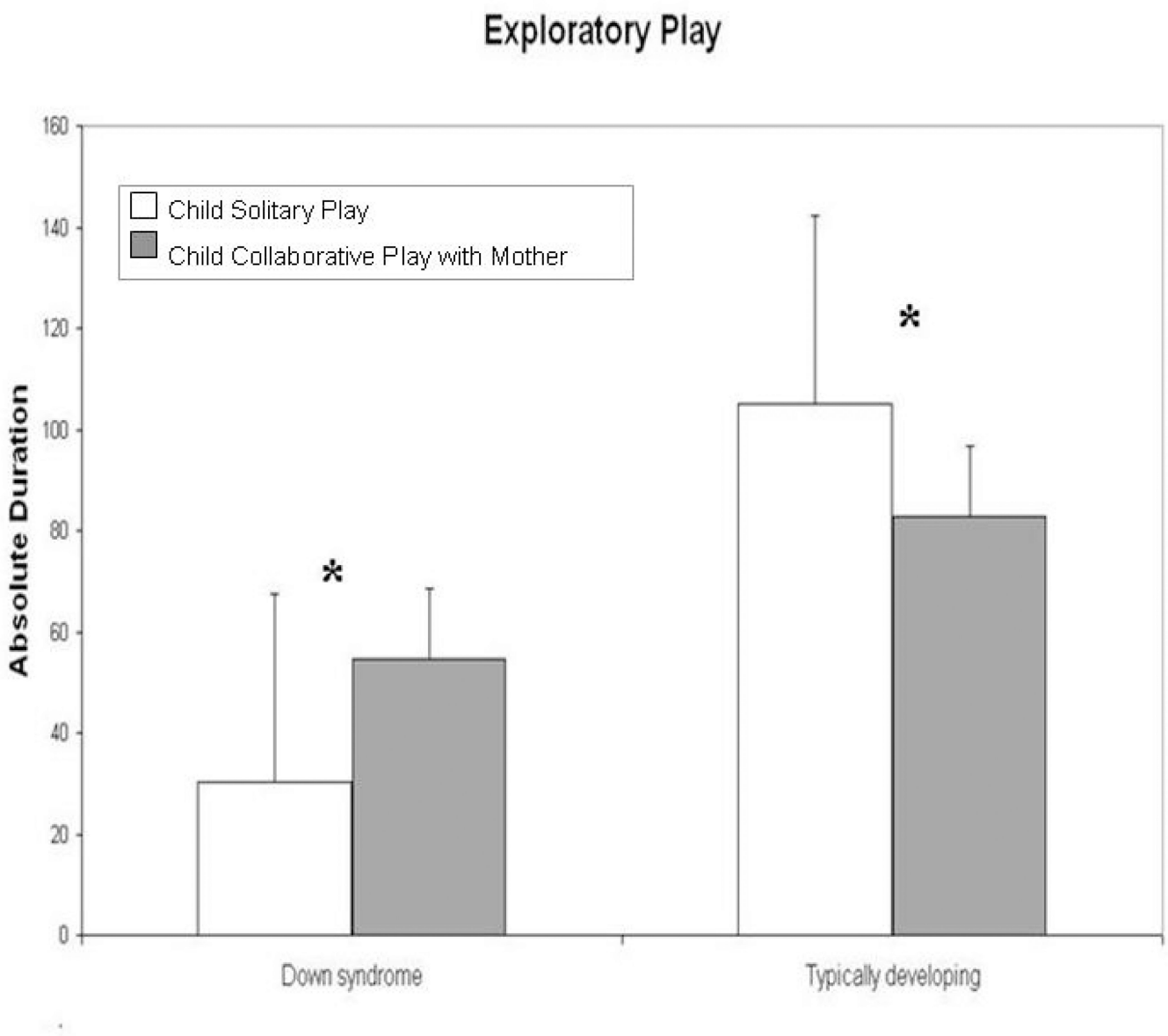

Figure 1.
Child exploratory play across situations by group
* = paired *t* test significant for $p < .05$

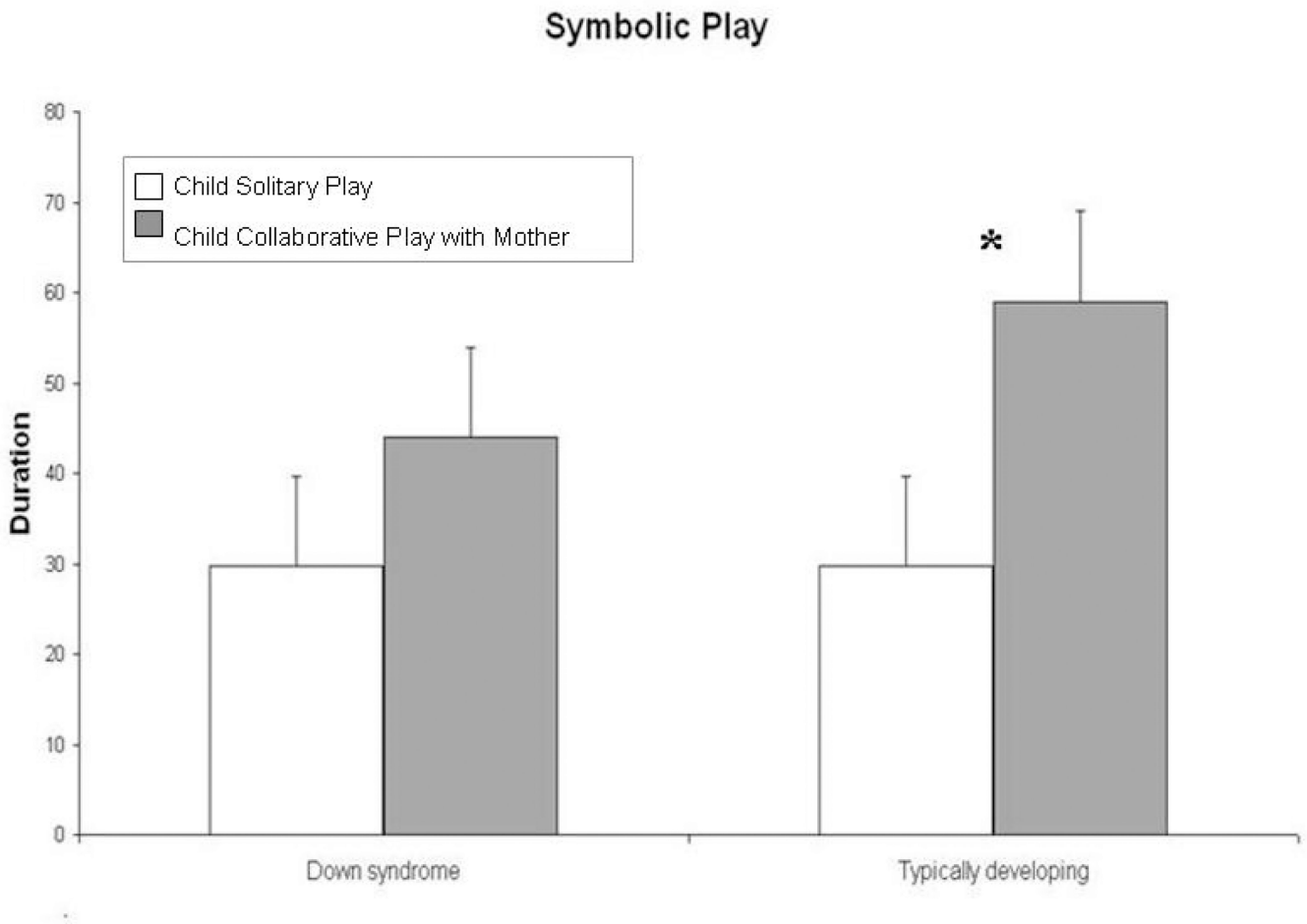

Figure 2.
Child symbolic play across situations by group
* = paired *t* test significant for $p < .05$

Table 1

Play coding scheme

Play levels	Description	Kappa
Exploratory play		
1. Unitary functional activity	Production of effects that were unique to a single object (e.g., dialing a telephone)	.77
2. Inappropriate combinatorial activity	Inappropriate juxtaposition of two or more objects (e.g., putting the ball on the telephone)	.79
3. Appropriate combinatorial activity	Appropriate juxtaposition of two or more objects (e.g., putting the handset on the telephone base)	.82
4. Transitional play	Approximated pretense but without confirmatory evidence (e.g., putting the telephone handset to ear without vocalization)	.75
Symbolic play		
5. Self-directed pretense	Pretense activity directed toward self (drinking from an empty cup)	.80
6. Other-directed pretense	Pretense activity directed towards someone or something else (e.g., putting a doll to sleep)	.81
7. Sequential pretense	Linking two or more pretense actions (e.g., pouring into an empty cup from the teapot and then drinking)	.82
8. Substitution pretense	One or more object substitutions (e.g., pretending a cup is a telephone and talking into it)	.79
Default	Not engaged in any of the above behaviors	

Table 2

Maternal supportive behaviors coding scheme

Type of behavior	Description	Kappa
Widening	Description of the features of the toys and demonstration of how they work, while increasing play sophistication.	.76
Control of attention	Attempt to direct child attention	.74
Control of Action	Attempt to direct child action	.78
Restriction	Attempt to prevent the child from completing an action towards himself/herself or the environment	.79
Proposition	Proposing a new play action	.80
Default	Not engaged in any of the above behaviors	

Table 3

Descriptive statistics of child and mother play (durations in s)

	Child Solitary Play				Child Collaborative Play				Maternal Play			
	Down syndrome		Typical development		Down syndrome		Typical development		Down syndrome		Typical development	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Exploratory play	30.43	41.32	104.93	80.19	54.57	49.42	82.72	58.58	52.29	40.80	80.05	49.13
1. Unitary functional activity	9.76	18.67	38.14	37.08	27.57	25.75	27.34	25.34	37.43	27.30	32.25	31.39
2. Inappropriate combinatorial activity	2.14	5.17	9.59	15.75	3.24	10.50	4.16	9.27	0.14	0.65	3.65	10.88
3. Appropriate combinatorial activity	3.95	11.63	42.70	75.00	16.14	33.90	35.68	50.17	14.62	29.11	42.91	44.52
4. Transitional play	14.57	25.93	14.50	22.56	7.62	17.11	12.14	23.39	0.10	0.44	1.24	4.37
Symbolic play	29.67	32.22	29.75	35.00	43.86	56.76	59.41	44.38	50.86	57.03	30.87	35.21
5. Self-directed pretense	15.76	23.93	14.25	17.10	18.33	47.97	21.36	27.31	2.95	6.02	2.31	5.72
6. Other-directed pretense	7.52	18.00	7.84	17.05	4.52	9.15	9.25	11.80	23.81	46.37	14.35	19.36
7. Sequential pretense	6.19	14.56	7.66	22.13	20.52	30.79	28.57	38.13	22.38	35.45	13.56	23.63
8. Substitution pretense	.19	0.87	.00	.00	0.48	1.54	0.25	1.20	1.71	4.31	.65	3.70
Unengagement (Default)	539.89	83.11	456.36	98.14	501.63	87.41	457.81	87.26	496.84	76.35	489.06	73.08

Table 4

Descriptive statistics of maternal supportive behaviors

	Absolute Frequency					Conditional Probability of co-occurence during Child Exploratory Play					Conditional Probability of co-occurence during Child Symbolic Play				
	Down syndrome		Typical development			Down syndrome		Typical development			Down syndrome		Typical development		
	M	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t(1,46)*	*M*	*SD*	*M*	*SD*	*t(1,46)*
Widening	4.30	4.52	2.67	4.23	1.34	.04	.04	.02	.03	1,30	.07	.13	.04	.07	.84
Proposition	7.33	6.64	4.71	6.41	2.60	.05	.04	.02	.07	1,32	.04	.08	.03	.10	.31
Control of attention	2.70	5.08	3.62	5.92	.37	.10	.17	.09	.18	.10	.07	.16	.05	.11	.45
Control of action	15.26	13.21	15.67	21.54	−.08	.09	.07	.14	.14	−1,48	.11	.15	.09	.17	.24
Restriction	3.37	3.72	3.05	5.05	.24	.02	.02	.02	.05	−.13	.02	.04	.04	.12	−.72
Unengagement (Default)						.71	.26	.65	.38	1,54	.66	.35	.60	.40	.52