Play in Children with Prenatal Cocaine Exposure: Development and Implications for Assessment

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Abstract:

Play assessment of children with prenatal cocaine exposure is discussed in terms of the developmental play level and behaviors manifest during spontaneous play and the clinical implications for assessing such children. Studies have found a number of subtle differences in the play skills of children with prenatal cocaine exposure compared to children with no cocaine exposure, however, sensitive outcome measures are needed to capture these subtle developmental differences. Suggestions for assessing play, an early developmental skill, using multidimensional play analyses that incorporate developmental play levels and associated play behaviors, such as initiation and perseveration are discussed.

Keyword: cocaine exposure | symbolic play | exploratory play

Article:

Early assessment of development in high-risk populations, such as children with prenatal cocaine exposure, is a challenging venture. Although a number of studies have attempted to delineate the developmental effects of prenatal cocaine exposure on- behavior, cognition, and language, a clear association between prenatal cocaine exposure and early developmental difficulties has not been definitively established. The issue is complicated by numerous methodological difficulties, such as biological and psychosocia1 risk factors and the use of insensitive outcome tools. This issue creates problems with interpretation and comparison of results across studies. The one consistent finding throughout studies that have found differences in subjects with prenatal cocaine exposure is the subtlety of effects (Lester & Tronick, 1994). The use of an appropriately sensitive outcome tool is essential.

There is, at present, few data on the development of children with prenatal cocaine exposure, and the data that have been reported are also limited by the methodological problems endemic to all developmental studies in this area. However, the results of preliminary studies suggest that the development of play may be disrupted. If this is so, it has important cognitive and social

implications. Piaget (1962) and Vygotsky (1967) are the most well-recognized theorists on the relationship between play and cognitive development. Both place an emphasis on the role of symbolic development in play despite clear differences in their interpretation of this relationship. Piaget believes that play is the product of an underlying capacity in the child for symbolic thought, which begins during infancy. As play matures the child displays more advanced cognitive maturity. Thus, a disruption in play may be indicative of a disruption in certain aspects of a child's underlying cognitions, such as symbolic thought. In contrast, Vygotsky believes that play develops through social relationships and activities in contexts that are socially constructed and mediated. Other researchers also have linked play to socialization and a child's knowledge of events that occur in the environment. It is these interpersonal relationships and social contexts that some associate with a child's early capacity to symbolize and communicate (Bretherton, Bates, Benigni, Camaioni, & Volterra, 1979; O'Connor & Bretherton; 1984; Slade, 1987; Vygotsky, 1978; Werner & Kaplan, 1963). There is a wide body of literature that suggests that a disruption in a child's social relationships/ attachments may result in disrupted cognitive and social development and have a negative impact on the development of play (Ainsworth, Blehar, Waters, & Wall, 1978; Slade, 1987).

With regard to language, Bates, Bretherton, Snyder, Shore, and Volterra (1979) reported that there is a relationship between the use of words for labeling and the ability to demonstrate functional play in the normally developing population. In disordered populations; however, the relationship between play, language, and cognitive/social development has not been clearly determined. There are studies that suggest that there is an appropriate but delayed sequence of play and language development (Williams, 1980); however, a number of other studies indicate that the relationship is not as linear as was first thought (Rescorla & Goosens, 1992; Skarkis, 1982; Skarkis-Doyle & Prutting, 1988; Terrel, Schwartz, Prelock, & Messick, 1984). **As** play is an early developing behavior, it provides a means of assessing a number of essential developmental skills at very young ages. For example, before 12 months of age, play can be assessed through close observation of discriminant exploratory activities, such as shaking a rattle or turning a bottle full of liquid. Early identification of disruptions in such skills as exploratory play acts may assist in identifying children at risk for poor developmental outcomes.

DEVELOPMENT OF PLAY IN CHILDREN WITH COCAINE EXPOSURE

The maturity and quality of spontaneous play in children prenatally exposed to cocaine have been studied by a number of investigators, and their results have revealed differences between cocaine-exposed and nonexposed subjects. Rodning and colleagues (1989) studied cognitive development, attachment, and play behavior in three groups of subjects. One group consisted of 8- to 18-month-old full-term infants with no history of prenatal drug exposure, the second group of 10 preterm infants who were prenatally exposed to PCP and cocaine, and the third group of 41 preterm infants with no history of drug exposure. Their findings suggested that the exposed group, as a whole, had significantly lower developmental scores than the two control groups, as measured by the Bayley Scale of Infant Development (BSID; Bayley, 1993) and the standardized unrevised Gesell Developmental Schedules. In terms of play behavior, the exposed group displayed fewer and less varied representational play events during a 16-min period of

spontaneous play than the other two groups. The drug-exposed group's play was also characterized by more disorganized acts with toys, such as batting, picking up and putting toys down, than did the other two groups, as well as lacking in organization, initiation, follow through, and variety. The authors reported that these deficits were more evident in unstructured, adult-directed play assessments than in structured play situations. In addition, the investigators found a high degree of insecurity and disorganization in attachment among children within the drug- exposed group who were raised by their biological mothers.

Quality of spontaneous play was also studied by Beckwith and colleagues (1994). The spontaneous play behavior of 31 subjects who were 24 months old and prenatally exposed to drugs and that of an age-matched control group of 21 subjects with no history of drug exposure was compared. Results indicated that the exposed group played in different ways than did the control group. The exposed group continued to use early exploratory play acts, such as mouthing, banging, and waving toys, rather than symbolic play. They also demonstrated less sustained attention to tasks, were less purposeful in choosing toys for play activities, and had fewer positive social interactions with caregivers.

Metosky and Vondra (1995) studied the play behavior of a group of l8-month old toddlers who were exposed to drugs prenatally and a group of age-matched control subjects with no history of drug exposure. The study was designed to compare the behavioral organization strategies and symbolic representational abilities of the two groups. The results of their study suggested differences between the groups in quality of play, amount of time spent in play activities, and periods of irritability. Prenatally drug exposed toddlers spent less time in symbolic play, and 10% of them did not demonstrate any symbolic play. In contrast, symbolic play was demonstrated by all of the unexposed children. The drug-exposed children were also observed to be more irritable during play activities and were reported by their mothers to have poor coping and adapting skills.

Lundgren and Mentis (1994, 1996) studied the quality and level of play in two studies of children between 18 and 24 months of age and with histories of prenatal cocaine-exposure. In the earlier study, play skills of a group of five children with prenatal drug exposure and a group of five age-matched control children with no history of drug exposure were compared using a multidimensional play analysis, which was developed for the study. This analysis was based on the work of Nicolich (1977) and expanded to include a more detailed assessment of play initiation and attention to play activity. Although results were based on a small sample, they indicated differences in play skills across a number of domains. The play behavior of the exposed children was more passive in terms of play initiation, suggesting that they relied on the investigator to initiate new play activities more often than did children with no cocaine exposure whose play behavior was characterized by a more self-initiated search for toys. Play in the cocaine-exposed children was also more limited in terms of the variety of play acts performed on objects during a play period. The non-exposed children played with toys in a number of different ways before going on to the next toy or set of toys, whereas children with cocaine exposure tended to use a limited range of play acts with a single toy. In addition, their level of play was more immature, most frequently occurring at Level A, a very early level of play, which is

characterized by exploratory behavior. In addition, three of the five exposed children demonstrated perseverative behavior during play. These results suggested that play may be vulnerable to disruption in children with prenatal cocaine exposure.

In their 1996 study, Lundgren and Mentis provided a more in-depth assessment of the exploratory and symbolic play development of a group of eight children with prenatal cocaine exposure and a similar number of age-matched control children with no history of drug exposure using two, multidimensional play analyses. Play was evaluated in terms of developmental level and type of the play behaviors observed during a 20-min period of spontaneous play. Activities performed on or with an object during the play period were classified as either exploratory or symbolic. Exploratory events were any form of presymbolic play activity (Nicolich, 1977). For example, an exploratory act would be a child shaking or mouthing a truck. Symbolic events consist of pretend schemes involving the child with an object or combination of objects (Nicolich, 1977). The results of this study indicated that both groups of children spent the majority of their time exploring objects. However, the play of children with prenatal cocaine exposure was more immature in terms of the developmental play level achieved spontaneously, with the majority of the cocaine-exposed children achieving a spontaneous play level of 2 (self-centered pretend), whereas the majority of the non-exposed group achieved a level of 4 (combination-pretend play). Self-centered play is characterized by play with one object, for example, a child picking up a spoon and pretending to eat with it. Combination-pretend play is characterized by activities involving a number of participants and a number of schemes, for example, a child picking up a spoon and feeding himself, his father, and a doll. Cocaine- exposed children were more passive in terms of their self-initiation of play acts than were children with no exposure to cocaine. The play behavior of the two groups also differed in the amount of time spent with one set of toys. The non-exposed group organized their play most frequently around one set of toys for extended periods of play, but the cocaine-exposed children played most frequently with just one toy for brief periods of time. A**s** in many other studies that have compared children with prenatal cocaine exposure to control groups of non-exposed children (Jacobson, Jacobson, Sokol, Martier, & Chiodo, 1996; Mayes, Bornstein, Chwarska, & Granger, 1995; Mentis & Lundgren, 1995), a wider range of performance was noted within the cocaine-exposed group than the non-exposed group, whose play appeared more homogeneous.

TABLE 1. Summary of Assessment Measures and Results from Play Studies

Study	***Assessment Tool***	***Finding for the Exposed Group***
Rodning, Beckwith, and Howard (1989)	• Bayley Scale of Infant Development • Measures adapted by Norris and Phillipson from a procedure developed by Ungerer and • colleagues.	• Low-average development quotients • Less frequent representational play events, disorganized
Beckwith, Kodning, Norris,	• Stranger Situation procedure	• Significantly more insecure

Phillipsen, Khandabi, and Howard (1994)	• Gesell Development Schedule • Measures adapted by Norris and Phillipson from a procedure developed by Ungerer and colleagues. • Stranger Situation procedure • Home observation for Measurement of the Environment Inventory	• Lower on development quotient • more immature play acts, decentralized play, decreased sustained attention • received less sensitive, responsive caregiving • disorganized attachment
Metosky and Vondra (1995)	• Modified version of Belsky and Most's play scale • Early Coping Inventory	• Decreased frequenc and duration of the play act • More negative affect displayed • immature play level, decreased play initiation, perseverative play acts
Lundgren and Mentis (1994)	• Multidimensional Play Analysis	• Decreased initiation of symbolic play episodes, decreased symbolic play acts, more single-object symbolic play acts
Lundgren and Mentis (1995)	• Multidimensional Play Analysis • Exploratory Play Analysis	• Decreased initiation of • exploratory acts, more single-object exploratory play acts

Overall studies of the play behavior of children with prenatal cocaine exposure have found a number of differences compared to that of normally developing children. These differences, which are summarized in Table 1, are evident in both the developmental level of play and the quality of play acts. If play is a reflection of certain aspects of a child's cognitive development (Hunt, 1976; Piaget, 1962), then findings of less mature play levels in children with prenatal cocaine exposure suggests that those aspects of cognition may be compromised.

BIOLOGICAL RISKS

The reason for these reported differences in play between children with cocaine exposure and those who were not exposed is uncertain. There are a number of biological risks to a fetus exposed to cocaine that may effect it directly or indirectly. Studies that have examined the indirect effects of cocaine indicate that prenatal exposure may result in fetal hypoxia and intrauterine growth retardation, both of which can affect brain structure and function. It has been suggested that these indirect effects could lead to depressed behavior in the neonate (Lester et al.,

1991). Studies that have examined the direct effects of cocaine exposure on the fetus suggest that cocaine could be responsible for alterations in synaptic transmission, resulting specifically in an elevation in plasma norepinephrine (Mirochnick et al., 1997), which could result in excitable behavior in the neonate. Many recent studies have focused on cocaine's effect on neurotransmitters and their potential effect on brain function. Neurotransmitters, including norepinephrine and dopamine, appear to be essential for frontal lobe functioning (Stuss & Benson, 1986). These direct and indirect effects of cocaine exposure on the fetal brain are consistent with findings of poor initiation and disorganization of play from a number of studies of cocaine-exposed children. Impairment of frontally mediated executive functions typically result in poor initiation and disorganization, rigidity, difficulty shifting attention, and deficits in carrying out sequences of activities that make up goal-oriented behavior (Lezak, 1976). In the Lundgren and Mentis studies, decreased initiation and disorganization were found in the cocaine-exposed groups' play. This finding is of particular concern in light of the view (Hecaen & Albert, 1975) that deficits in initiation and carry through on goal-oriented behavior are the most penalizing behavioral problems associated with frontal lobe dysfunction. Poor initiation and decreased elaboration in play are findings that warrant further investigation in light of their potential impact on exposed children's cognitive development.

In terms of finding decreased initiation of play activities, another function of neurotransmitters, specifically norepinephrine, is behavioral arousal and regulation (Moore, 1982). In a number of infant studies, regulatory behavior and arousal were adversely affected in newborns with prenatal cocaine exposure (Delaney-Black et al., 1996; Lester, Corwin, Sepkoski, Peucker, McLaughlin, & Golub, 1991; Tronick, Cabral, Lester, & Frank, 1993), leading to their disorganized and poorly regulated behavior. The differences found between groups in the quality of play acts may relate to early habituation and state organization and control difficulties found in neonates with prenatal cocaine exposure. At present, however, the precise effect of cocaine exposure on the developing fetal neurotransmitter system is unclear as are its effects on a child's neurobehavioral development.

ENVIRONMENTAL FACTORS

Another consideration when examining the results of play studies is the impact of the environment. The potential contribution of psychosocial factors to results suggesting that children with prenatal exposure to cocaine may display neurobehavioral deficits cannot be ignored. The effects of prenatal cocaine exposure on play development cannot be understood clearly without considering a child's rearing environment. The environments in which children with prenatal cocaine exposure are raised present a major methodological dilemma (Lester, LaGrasse, Freier, & Brunner, 1996; 1995). Many theorists (Bretherton et al., 1979; O'Connor & Bretherton, 1984; Slade, 1987; Vygotsky, 1978; Werner & Kaplan, 1963) emphasize the importance of the environment, particularly interpersonal relationships and social contexts, for a child's development of cognition. The strength of mother-child relationships in fostering cognitive and social development has received strong support from a wide body of literature that has studied the relationship between mother-child attachment and security and the later social development of children (e.g., Ainsworth, et al., 1978; Slade, 1987). It has been suggested that

there is a relationship between mother-child shared meanings and the emergence of more mature cognitive functioning (Slade, 1987; Vygotsky, 1978; Werner & Kaplan, 1963), which can be interpreted to mean that mothers help to provide the cognitive structure and organization needed by children (Vygotsky, 1978) or that mothers provide children with a sense of security and the emotional support they need to explore and practice play. The implication is that this bond is an important factor in child development. There is a body of literature also that suggests that indifferent and insensitive caregiving may have a negative impact on children's development (e.g., Ainsworth et al., 1978; Sfroufe, 1979).

In the cocaine-exposed population, there are findings that indicate that the mother-child bond may be altered as a result of neglect and rejection (Rodning, Beckwith, & Howard, 1991). Rodning et al. (1989) report higher rates of disorganized attachment behavior and more disruptions of the parent-child relationship among children of substance abusers. In the Lundgren and Mentis studies (1994, 1996), the finding that the cocaine-exposed children initiated play less frequently than did non-exposed children may indicate that these children did not feel secure. If this were the case, then it would not be surprising that exposed children in a new environment would not play as maturely as non-exposed subjects. Environmental disorganization and parental psychopathology have also been reported in drug-abusing homes (Haller, Knisley, Dawson, & Schnoll, 1993; O'Connor, Sigman, & Brill, 1987; Rodning et al., 1990). The disorganization and disruption in parent-child relationship may help explain some of the differences in play skills observed in studies of cocaine-exposed and non-exposed children. Indeed, the childrearing environment may be a critical variable in accounting for differences between these groups.

MULTIPLE RISK FACTORS

Children who are exposed to multiple risk factors (biological and psychosocial) are at high risk for poor developmental outcome (Dunst, 1993; Zeanah, Boris, & Larrieu, 1997), and the developmental risks of children with prenatal cocaine-exposure frequently are quite complex. In fact, the total number of risk factors may be more predictive of a child's developmental outcome than the type of risk factor (Zeanah, Boris, & Larrieu, 1997). According to the Transactional Model of Development (Sameroff & Chandler, 1975), it is the interaction of biological and psychosocial risk factors that determine positive or negative developmental outcomes. Children with prenatal exposure to cocaine are exposed to a variety of biological and psychosocial risk factors, and it may be the number and variety of factors that account for the variability of performance within cocaine-exposed groups. The specific impact that individual and multiple risk factors have on the development of play is a topic that needs further study.

SENSITMTY OF TEST MEASURES

An important component of the play studies reviewed was the use of measures specifically designed to assess subtle differences in play. Lester and Tronick (1994) discussed the subtle deficits observed in children with cocaine exposure and the difficulty in quantifying these differences using global measures. Quantifying differences in very young children has been a long-standing problem (Ulvund, 1989). Many researchers have found that measures of specific abilities in young children are more revealing than single composite scores (Cameron, Livson, &

Bayley, 1967; Hunt, 1976; McCall, Hogarty, & Hurlburt, 1972). This has been substantiated in the literature on children with prenatal cocaine exposure as well. Early studies, which found no neurobehavioral differences between children with prenatal cocaine exposure and those without drug exposure, were using global measures of neurodevelopment that may have failed to assess affected areas. Additionally, standardized measures often may provide the structure and organization that children with cocaine exposure need to enhance their performance. In more recent studies, in which more sensitive outcome measures have been used, differences have been reported (Mayes et al., 1995; Mentis & Lundgren, 1995; Richardson, Conroy, & Day, 1996). The use of fine-grained analyses of play provided the means for identifying subtle deficits in development. If more global measures of play had been used, which did not evaluate such play dimensions as exploration and initiation, differences between groups would not have been identified.

PLAY ASSESSMENT

There are a number of direct implications for assessing children exposed to cocaine prenatally based on findings that global measures may not capture subtle developmental differences in this population. First, the use of standardized assessment tools for measuring play development in these children appear to provide the structure and support they require to adequately perform. Thus, an assessment protocol for children with prenatal cocaine exposure should include less structured means of measuring play and a more challenging testing environment. For example, assessing a child's spontaneous play affords a clinician the opportunity to observe and quantify how the child responds to an unstructured environment.

Second, most traditional play scales in assessment protocols provide information on developmental play levels. Developmental play levels are important to establish, whether a child's play is at the exploratory or symbolic stage of development. The level of exploratory and symbolic play can be determined by the number of objects used, the use of others in play, and the variety of the play event. Although the play level of a child yields some important developmental information, the results of studies on children with cocaine exposure indicate that their assessment needs to go beyond their developmental level. Results of play studies (Beckwith et al., 1994; Lundgren & Mentis, 1994, 1996; Metosky & Vondra, 1995; Rodning et al., 1989) indicate that some children with prenatal cocaine exposure evidence a variety of disruptions in their play behavior. For this reason, observation of their behaviors during a play act, including initiation of play and repetition and duration of the play activity, are important components of play analysis. More sensitive measures of play are likely to yield more meaningful and informative data, and Table 2 provides an outline of play skills that should be addressed. A child's developmental play level, the behaviors manifest during the child's play interactions, and the parent-child relationship should be considered. Specific behaviors to observe include initiation of play, length of play activity, perseveration in play, and the frequency and quality of interactions with others during the play period. Both exploratory and symbolic play levels should be considered in terms of the number of objects used during a play act, others involved in it, and the variety of play activity.

TABLE 2. Components to Include in a comprehensive Play Assessment

Assessment
Obtain spontaneous play sample
Identify which components of play are disrupted
Play level
exploratory play
symbolic play
Play behaviors
initiation of play
duration of play
variety of play acts
perseverative play acts
Evaluate the contributions of the parent-child relationship

Third, it is critical to evaluate the parent-child relationship in light of the strong support for the importance of the mother-child relationship in fostering a child's cognitive and social development (Ainsworth et al., 1978; Slade, 1987). Results of studies that have examined the mother-child relationship have found that children with prenatal cocaine exposure have a higher percentage of insecure attachments to their biological mothers (Rodning et al., 1989) and are reported by their mothers to have less effective self-regulation and coping abilities than are children who have not been exposed to cocaine (Metosky & Vondra, 1995). Such findings suggest that this is an important area to assess, however, it is not addressed typically in traditional developmental assessments.

Finally, it is important to remember that all children with prenatal cocaine exposure may not exhibit difficulties. The variability in this clinical population suggests that prenatal cocaine exposure places a child at risk for play disruption, and results from play studies indicate that if such disruptions exist, they can be detected at an early age. Early identification of difficulties and early treatment may prevent or mitigate poor developmental outcome for those children with such difficulties.

CONCLUDING COMMENTS

A number of studies have found that some children with prenatal cocaine exposure demonstrate disruptions in play skills. The results of these play studies, though preliminary and based on small groups of children with cocaine exposure, indicate that the best way to assess these differences is through the use of sensitive outcome measures. In addition, it is clear that these results cannot be linked directly to cocaine exposure because there are a number of environmental and psychosocial risks also associated with cocaine exposure. Further investigation is needed to validate these preliminary findings, to identify the proportion of children affected and the range of behaviors that are disrupted, and to determine the functional implications of these developmental disruptions. Future research could take a number of directions. First, it is important to control for confounding variables in this population. With a large number of subjects, such confounding variables as the timing and quantity of cocaine use, polysubstance use, and prenatal care can be better controlled. One or more of these variables could account for the differences observed within the cocaine-exposed group. Second, more

research is needed to elucidate the functional implications of the disrupted play of toddlers exposed to cocaine prenatally. According to Piagetian theory, there could be important cognitive implications for disruptions in a child's play skills. If so, early detection of these disruptions in development could lead to early treatment of children who are at risk for a poor developmental outcome. Future research should identify more clearly the impact of psychosocial factors through observations of mother-child interactions in play, assessments of the child-rearing environment, and completion of parent inventories to better examine the mother-child relationship. If a child's play is disrupted, then a breakdown in the parent-child social relationship may have occurred. Finally, it would be interesting to investigate some of the behavioral findings, such as decreased initiation in play, across a number of tasks. A study designed to look specifically at initiation across a variety of cognitive tasks and developmental domains would indicate whether this is a global o r a n isolated behavioral difficulty.

The implications of the findings of disrupted play in children with prenatal cocaine exposure remain unclear. Despite the growing number of published studies on children with prenatal cocaine exposure, longitudinal studies are needed to determine more accurately the impact of early developmental differences in play on later child development and to analyze the relationship between current findings and other aspects of child development.

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