Interaction of Social and Play Behaviors in Preschoolers With and Without Pervasive Developmental Disorder

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Although most children successfully develop and use social skills in the context of interactions with others, children with developmental disabilities have difficulty developing such skills (Brown & Whiten, 2000; Kopp, Baker, & Brown, 1992). They are delayed in the development of interactive skills, and they have difficulty with social interactions and social relationships (Sheridan, Hungelmann, & Maughan, 1999). These children typically do not initiate and maintain social interactions with their classmates (Kamps et al., 1992), and they are often characterized as having deficits in joint attention and social gaze (Charman et al., 1997; Sigman & Ruskin, 1999).

Because of such delays, social skills are among the primary concerns in working with young children with developmental disabilities, and interventions often have produced considerable improvements (Jahr, Eldevik, & Eikeseth, 2000; Mahoney & Perales, 2003; Odom, McConnell, & Chandler, 1994; Sigman & Ruskin, 1999; Strain & Kohler, 1988; Weiss & Harris, 2001). Moreover, many of these interventions were implemented in the context of play activities. Such studies capitalize on embedding social skills in the natural and inclusive settings that play provides (Chandler, Lubec, & Fowler, 1992; Garfinkle & Schwartz, 2002; Goldstein, Kaczmarek, Pennington, & Shafer, 1992; Kohler, Anthony, Steighner, & Hoyson, 2001; McGrath, Bosch, Sullivan, & Fuqua, 2003).

Despite the value of implementing social goals in play contexts, at least three concerns exist. First, the focus tends to be on the social behaviors, while the complexity of the underlying play activities is rarely considered. Research has shown, however, that children with developmental disabilities often have delays in play as well (Jarrod, Boucher, & Smith, 1993; Libby, Powell, Messer, & Jordan, 1998; Retting, 1994; Rogers, 1988; Rutherford & Rogers, 2003; Williams, Reddy, & Costall, 2001). These delays focus on limitations in frequency and variety of various play categories as well as lack of progression through the more advanced play categories that have been identified in children without disabilities. Symbolic play is usually limited, and functional play occurs with less frequency. Consequently, interventions designed for children with developmental disabilities may be impeded by the children's lack of understanding of the very play activities used to implement social skills interventions.

The second concern centers on the relationship between social interaction and play in development. Empirical studies have demonstrated that developments in
social behaviors are related to developments in play for children with and without disabilities (Fewell & Kaminiski, 1988; File, 1994; Odom & Ogawa, 1992). Coordination of social behavior with play in development is regarded as a critical component of social development (Eckerman, Davis, & Didow, 1989; Howes & Mathe son, 1992; Lieber & Beckman, 1991b). Various factors can affect the manifestation and coordination of social and play behaviors. For example, a child's level of social interaction is known to vary, depending on the competence of the play partner (Guralnick & Groom, 1987). Similarly, a child's play complexity may vary as a function of social/nonsocial contexts, with more complex play observed in contexts where the social demands are minimized (i.e., the home vs. the school; Malone, Stone man, & Langone, 1994). Finally, preschoolers have been observed to spend more time in manipulative play and more time planning before engaging in pretend play in dyadic situations than in solitary situations (Lieber & Beckman, 1991a).

Explanations of such variations in development include the "allocation of resources" construct (Kahneman, 1973). Both social and play behaviors require cognitive resources (Bloom & Tinker, 2001). Computation for the same resources makes it difficult for children to engage in both social and play actions at the same time, especially if these actions are difficult for them. It is not so much that the two tasks interfere specifically with each other; rather, it is that the tasks may require more resources than are available, which results in the interruption of one of the activities. As a result, social interventions implemented in a play context with a level of play that is too demanding for a child may be compromised.

The third concern is in regard to the very descriptions of play and social interaction that are used. In many studies where researchers have investigated the social behaviors of young children, these behaviors often were defined in the context of play activities. In her classic study, Parten (1932) used social categories of increasing complexity (unoccupied, solitary, onlooking, parallel, associative, cooperative), which were defined in terms of play activities. For example, Parten defined cooperative play as "one or two children direct the activities of the others and organize the group for some purpose, necessitating a division of labor and an organization of roles" (p. 251). In subsequent studies, researchers used or adapted Parten's definitions (Bailey, McWilliam, Ware, & Burchinal, 1993; Jahr et al., 2000; McGrath et al., 2003). For example, Bailey and his colleagues defined coordinated social play as "child is engaged in associative play but in an activity that requires both children to interact; the dyad or group has a common outcome, goal, or product" (p. 269). Unfortunately, these taxonomies confuse how behavior is attributed to the type of development—social versus play.

In the present study, we applied definitions of social behaviors and play behaviors that are independent of each other, and we examined the relationship in groups of preschoolers with and without pervasive developmental disorders (PDD). We measured social behavior using the Social Behavior Scale (SocBS), which we created for this study. We measured play behavior with the DPA Behavior Scale (DPA-BS), an adaptation of the Developmental Play Assessment (DPA) Instrument (Lifter, 2000).

**METHOD**

**Participants**

The participants consisted of 21 preschool children attending a private school that serves young children with and without developmental disabilities. This school is located in a mid-sized Northeastern U.S. city. The children shared certain characteristics: (a) current or past participation in the PROJECT PLAY Research Program (see a description in the section titled Data Sample); (b) attendance in one of the developmentally integrated classrooms; and (c) availability of evaluations on the following assessments: the cognitive domain of the Battelle Developmental Inventory (BDI; Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984); the Preschool Language Scale—Third Edition (PLS-3; Zimmerman, Steiner, & Pond, 1992); and the DPA.

Of the 21 children, 12 (10 boys, 2 girls) had a diagnosis of PDD, which had been determined by an independent evaluation team; the remaining 9 participants (5 boys, 4 girls) had no known disability. Two children were African American; the remaining 19 were Caucasian. All spoke English as their primary language. Informed consent had been obtained from the parents/guardians of all the children.

The descriptions of the ages and assessment evaluations of the children are presented in Table 1. Chronological ages of the children with PDD ranged from 3 years 10 months to 6 years 4 months; the ages for the children without PDD ranged from 3 years 9 months to 5 years 7 months. The children's developmental ages were calculated by combining the results of their scores on the BDI and the PLS-3. For the children with PDD, delays in developmental age ranged from 15 months to 42 months. For the children without PDD, developmental ages ranged from 0 months to 15 months above their chronological age.

The results of the DPA for the children are also presented in Table 1. Explanations of the play levels are provided in Table 2. We chose the DPA because of its usefulness for evaluating children's play activities. It is based on a 30-min sample of spontaneous play activities involving four groups of toys in the presence of a familiar adult. The child's activities are evaluated according to qualitatively different categories of play activities that follow.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Diagnosis</th>
<th>CA (yrs./mos.)</th>
<th>BDI (yrs./mos.)</th>
<th>PLS-3 (yrs./mos.)</th>
<th>DA (yrs./mos.)</th>
<th>DPA level&lt;sup&gt;a&lt;/sup&gt;</th>
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<tr>
<td>Jeff</td>
<td>PDD</td>
<td>4, 5</td>
<td>2, 6</td>
<td>1, 9</td>
<td>2, 1</td>
<td>V</td>
</tr>
<tr>
<td>Harry</td>
<td>PDD</td>
<td>4, 2</td>
<td>1, 9</td>
<td>2, 5</td>
<td>2, 2</td>
<td>V</td>
</tr>
<tr>
<td>Adam</td>
<td>PDD</td>
<td>4, 6</td>
<td>2, 7</td>
<td>1, 9</td>
<td>2, 2</td>
<td>IV–V</td>
</tr>
<tr>
<td>Nat</td>
<td>PDD</td>
<td>4, 8</td>
<td>2, 0</td>
<td>2, 4</td>
<td>2, 0</td>
<td>V–VI</td>
</tr>
<tr>
<td>Matt</td>
<td>PDD</td>
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<td>2, 8</td>
<td>2, 4</td>
<td>2, 6</td>
<td>IV</td>
</tr>
<tr>
<td>Alan</td>
<td>PDD</td>
<td>6, 1</td>
<td>2, 5</td>
<td>2, 10</td>
<td>2, 7</td>
<td>III–IV</td>
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<td>PDD</td>
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<td>2, 7</td>
<td>2, 6</td>
<td>2, 7</td>
<td>VI–VII</td>
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<td>Amy</td>
<td>PDD</td>
<td>4, 11</td>
<td>3, 8</td>
<td>3, 7</td>
<td>3, 7</td>
<td>V</td>
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<tr>
<td>James</td>
<td>PDD</td>
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<td>3, 10</td>
<td>3, 8</td>
<td>3, 9</td>
<td>V</td>
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<tr>
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<td>3, 9</td>
<td>3, 11</td>
<td>4, 1</td>
<td>V</td>
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<tr>
<td>Dan</td>
<td>PDD</td>
<td>5, 7</td>
<td>4, 5</td>
<td>4, 3</td>
<td>4, 4</td>
<td>VI</td>
</tr>
<tr>
<td>Francis</td>
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<td>5, 11</td>
<td>4, 5</td>
<td>4, 10</td>
<td>4, 7</td>
<td>VI</td>
</tr>
<tr>
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<td>4, 1</td>
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<td>4, 7</td>
<td>5, 0</td>
<td>4, 10</td>
<td>VI–VII</td>
</tr>
<tr>
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<td>None</td>
<td>4, 5</td>
<td>5, 4</td>
<td>5, 11</td>
<td>5, 8</td>
<td>VI–VII</td>
</tr>
<tr>
<td>Lisa</td>
<td>None</td>
<td>5, 1</td>
<td>5, 3</td>
<td>6, 9</td>
<td>6, 0</td>
<td>VII</td>
</tr>
<tr>
<td>Leslie</td>
<td>None</td>
<td>5, 7</td>
<td>5, 9</td>
<td>6, 4</td>
<td>6, 1</td>
<td>VI–VII</td>
</tr>
</tbody>
</table>

Note. CA = chronological age; BDI = Battelle Developmental Inventory (Newborg, Stock, Wnek, Gildubaldi, & Svinicki, 1984); PLS-3 = Preschool Language Scale–Third Edition (Zimmerman, Stein, & Pond, 1992); DA = developmental age (average of the BDI and PLS-3); DPA = Developmental Play Assessment (Lifter, 2000); PDD = pervasive developmental disorder.

<sup>a</sup>The play level depicted represents the level evaluated as Emerging in the child's play, with earlier levels mastered (see Table 2).

A developmental sequence (presented in part in Table 2). Several categories—Presentation Combinations, General Combinations, Specific Physical Combinations, Child-as-Agent, and Specific Conventional Combinations—represent the sequence reported in Lifter and Bloom's (1989) longitudinal study of children's play. The remaining categories were integrated into the foregoing sequence, based on reports from several other studies (Belsky & Most, 1981; Fenson, Kagan, Kearsley, & Zelazo, 1976; Fenson & Ramsay, 1980; Lowe, 1975; McCune, 1995; Nicolich, 1977; Watson & Fischer, 1977).

Progress through the sequence is determined based on the quantitative criteria applied to each category. These criteria, derived from Lifter and Bloom (1989), are based on the frequency of the category and the variety of different examples of the category that are expressed. They impose a relative degree of certainty regarding how well a child knows a category of play. Mastery requires a minimum frequency of 10 activities, with at least four examples of the category within the 10 activities (e.g., for the category Presentation, four examples could be "puts drivers in truck," "puts pieces in puzzle," and "puts beads in the bead bowl"). The criteria for Emergence are less stringent (i.e., frequency = 4, exemplars = 2); accordingly, there is less certainty, based on quantitative analysis, that the child knows the kind of activity represented by the category. Finally, Absence (i.e., frequency < 2, exemplars < 2) indicates even less certainty. The DPA play levels noted in Table 1 represent the levels that were evaluated as emerging in the child's play, with earlier levels mastered. For those instances in which two levels of play are noted, the child met the criteria for Emergence in a category in two different, but adjacent, play levels.
TABLE 2. DPA Levels of Play Displayed by the Study Participants

<table>
<thead>
<tr>
<th>Level</th>
<th>Categories and activities</th>
</tr>
</thead>
</table>
| III   | *Presentation Combinations*  
Child creates relationships between objects that have considerable perceptual support and puts objects together based on how they were presented (e.g., puts pieces into puzzle; nests nesting cups).  
*General Combinations*  
Child creates new relationships between objects, but these relationships are based on general properties of objects (e.g., puts a variety of different small objects into a container).  
*Pretend Self*  
Child relates a single object to the self, indicating a conventional/early pretend quality to the action (e.g., brings empty cup to mouth to drink). |
| IV    | *Specific Physical Combinations*  
Child creates relationships between objects that are based on particular physical characteristics of the objects in the relationships (e.g., stacks the nesting cups; strings the beads). |
| V     | *Child-as-Agent*  
Child creates relationships between objects where one object represents an animate figure, and the child is the agent of a conventional action (e.g., extends cup to doll’s mouth to give it a drink).  
*Specific Conventional*  
Child creates relationships between objects that are based on particular conventional characteristics of the objects in the relationships (e.g., “fixes” a car with a wrench; child stirs with a spoon in a cup). |
| VI    | *Single-Scheme Sequences*  
Child extends the same conventional action to a series of “animate” figures (e.g., extends cup to doll, to stuffed bear, and to the interactant for them all to drink).  
*Substitutions*  
Child uses an object to represent another object (e.g., puts bowl on head to represent a hat). |
| VII   | *Doll-as-Agent*  
Child creates conventional relationships between objects that include an “animate” figure; child attributes agency to the figure for the action (e.g., puts cup in doll’s hands for it to give itself a drink).  
*Multischeme Sequences*  
Child extends a series of different, ordered conventional actions to an “animate” figure (e.g., feeds doll with spoon, wipes it with cloth, then puts it to bed by covering it with a blanket). |

*Note.* DPA = Developmental Play Assessment (Lifter, 2000).

With the exception of Fred and Nancy, the play levels for the children with PDD revealed Emergence at Level V and not beyond. DPA Level V play centers on activities that represent early pretend play, where children begin to demonstrate understanding of conventional relationships among objects in their activities. The participating preschoolers without disabilities, in contrast (with the exception of Alice), engaged in levels of play that were at a minimum of Level V. These children demonstrated greater levels of developmental complexity in their play than did the PDD group. Children with PDD are known to have delays in play, and these delays are represented here by emerging play levels that topped out at Level V for most of the children in the PDD group. Two graduate students in school psychology transcribed and coded the children’s social and play behaviors and carried out tests of interobserver reliability. These graduate students were not informed about the hypotheses of the study.

**Setting**

The observations for this study were videotaped in developmentally integrated preschool classrooms. These were large rooms equipped with play areas, tables and chairs, and group activity areas.

**Data Sample**

The PROJECT PLAY videotape library consists of observations of preschool children with and without developmental disabilities in assessment, baseline, and intervention contexts, all centered on fostering development in play activities. For the present study, several baseline observation samples, which preceded group intervention studies, were available for each child. (Sample selection is described more fully in the Procedure section.) These observations were collected from small developmentally integrated groups of three to five children.
who played together—and had been playing together for months—in their classrooms. They occurred during scheduled playtimes in the classroom, usually before or after lunch. For each session, a set of toys that was thematically organized (e.g., cooking set; cars/trucks set) was presented to the children, and the sets varied from session to session. Although these toy sets were reserved specifically for these play sessions, they replicated the kinds of toys available in the children’s classrooms. During these observations, a teacher sat close by and was available for assistance. She was instructed not to suggest or direct any play activities but to respond to the children’s requests and comment on what they were doing.

**Measures**

As noted previously, two measures were developed for this study. The SocBS was used to measure social behavior, and the DPA-BS was used to measure play behavior. All of the categories on the SocBS represent behaviors that are defined independently of the categories on the DPA-BS. The SocBS focuses exclusively on the extent of a child’s interaction with others, whereas the DPA-BS focuses exclusively on the quality of the play activities in which the child engages.

The SocBS. The selection of the specific behaviors used to create this scale was informed by cognitive-developmental theory and related descriptive studies of children’s social behaviors (Bailey et al., 1993; Lieber & Beckman, 1991b; Odom & Ogawa, 1992; Parten, 1932). We began with an analysis of Parten’s Scale of Social Participation (1932), which is widely used in contemporary research to examine social or social communicative behavior in a play context (Bailey et al., 1993; Craig-Unkefer & Kaiser, 2003; Farver, Kim, & Lee, 1995). Although we were able to adopt Parten’s less complex social measures (e.g., Solitary, Onlooking) for this study, we needed to replace her more complex measures (e.g., Associative, Cooperative) to disentangle the quality of social interaction from the quality of play activity. We determined that the social behaviors that were more complex than Onlooking could be distinguished based on the presence or absence of social coordination (Lieber & Beckman, 1991b). We therefore added the new categories of Uncoordinated Social and Coordinated Social to Parten’s categories of Onlooking and Solitary activity. Coordinated Social consists of behaviors that are coordinated with a partner and are considered more complex than those social behaviors that are not coordinated with a social partner (i.e., Uncoordinated Social).

The resulting SocBS is a continuum of measures from least to most complex and consists of four mutually exclusive, exhaustive categories (i.e., all observable behaviors in a continuous stream can be categorized into one—and only one—of the four categories): Solitary, Onlooking, Uncoordinated Social, and Coordinated Social. Of these four, Solitary is the only nonsocial category, whereas the Onlooking, Uncoordinated Social, and Coordinated Social categories represent social behavior, in that they account for acknowledgment of other persons in the context. The operational definitions are as follows:

1. **Solitary**: child sits, plays, or engages by him- or herself in some type of activity; child gazes at the toys in front of him or her or gazes away from the play area (e.g., around the room) without looking at or interacting with others

2. **Onlooking**: child gazes at another person or at a person’s actions; child’s social status is that of observer, not participant (e.g., child watches another child build a block tower)

3. **Uncoordinated Social**: child’s verbal and nonverbal behaviors are socially focused, including talking, sharing objects (e.g., gives object to another child), eye contact, or making physical contact (e.g., touch), but the social behavior is not coordinated with the verbal and nonverbal behaviors of others (e.g., child states, “Look at my tower” and tips block tower over before waiting for anyone to look)

4. **Coordinated Social**: child’s verbal and nonverbal behaviors are socially focused, including talking, sharing objects (e.g., gives object to another child), or making eye contact or physical contact (e.g., touch), and the behavior is coordinated with the verbal and nonverbal behaviors of others; that is, the child coordinates his or her focus of attention and timing of language or actions with the focus of attention and timing of language or action of others (e.g., child states, “Look at my tower” and tips block tower over after obtaining someone’s attention)

The DPA-BS. This scale is an adaptation and extension of the DPA. We collapsed the child’s individual DPA profile of Mastered, Emerging, and Absent categories into one of three categories: those that were evaluated as mastered (Mastered Play) and those that were evaluated as Emerging and Absent (Emerging Play). We added two new categories—Object Focus and Unoccupied—to account for play activities that occurred between events of Mastered Play and Emerging Play. The resulting DPA-BS is a continuum of measures from least...
to most complex and consists of four mutually exclusive, exhaustive categories:

1. **Unoccupied**: child does not look at, hold, or touch any object(s); child may watch or interact with other(s) or may focus on other aspects of the environment situation (e.g., look around room as if searching for something to do)

2. **Object-Focus**: child looks at, holds, or touches object(s) but does not engage in a specific play action as specified by the play categories defined later in the article (e.g., child touches several objects on the table but does not use any object in a play action)

3. **Mastered Play**: child engages in those categories of play activities that according to his or her performance on the DPA, he or she has learned or mastered

4. **Emerging Play**: child engages in those categories of play activities that, according to his or her performance on the DPA, he or she has demonstrated to be in the process of learning; these actions are defined as emerging and therefore relatively more difficult for the child because they are not yet occurring with enough frequency and variety to be considered mastered

**Scale Validity.** Support for the content validity was established by examining how well each scale represented categories of behavior that have varying levels of complexity. Twenty certified special education teachers and 20 certified school psychologists participated in establishing the scales' validity. We gave these individuals two sets of forms that listed the definitions, but not the names, of the categories in random order of complexity. We instructed them to complete the two forms by ordering the four listed categories on each scale from least to most complex, based on their understanding of the category definitions. They had the option to rank categories at the same level of complexity if they thought that any of the categories were at a similar level. There was 100% agreement with the expected order of complexity for each scale.

**Study Design**

In this study, we used a descriptive research design to examine the relationship between the social behavior and play behavior of young children. The primary categorical variables were social behaviors of varying levels of complexity and play behaviors of varying levels of complexity. We performed log-linear analyses to examine how the level of complexity of a social behavior at any given 1-s interval was related to the level of complexity of a play behavior at that same 1-s interval. In addition, we included diagnosis (with or without PDD) as a variable to examine its association with the relationship between social behaviors and play behaviors.

**Procedure**

**Sample Selection From PROJECT PLAY Videotape Library.** Four different 5-min observational samples of each child were selected from a series of baseline observations that preceded group intervention studies in the PROJECT PLAY videotape library. This selection resulted in a total observation sample of 20 min for each child. We determined that four different samples in close succession would provide more representative data than one sample. In addition, four samples help to minimize the effects of any atypical events. The four observations occurred within 4 to 6 weeks of each other. They were subsequent to the initial two sessions of a baseline series to allow for general acclimation to the observation framework. The particular 5-min samples were taken from the second 5-min segment of each 15-min sample. It was determined that this "middle segment" afforded the best observation of a child immersed in the ongoing activities, as opposed to acclimating to the observations at the beginning of the session or getting tired toward the end of it.

**Transcription and Coding Procedures.** The first author used a combination of instruction, modeling, rehearsal, and feedback to train the research assistants in the transcription and coding procedures (Best & Kahn, 1998). Event-recording procedures were used to transcribe and code the social behaviors and the play behaviors from the videorecordings during separate passes through the observations.

For each instance of social or play behavior according to SocBS and DPA-BS categories, the following information was recorded on the transcription/coding sheet: the onset time of the behavior using hours, minutes, and seconds; a description of the behavior; the code; and whether the behavior was prompted. When the specific category of behavior ended and the child's actions met the criteria for another code, the onset time of the new behavior was recorded and the process of transcription continued. **Onset time** was defined as the time that a behavior initially met the criteria for a code that was different from the code of a preceding behavior. The onset time of the next behavior was the offset time of the previous behavior. This resulted in the documentation of a child's stream of behavior.

When coding play actions into Mastered Play or Emerging Play, the actions first were coded into a cate-
gory of play specified by the DPA and then assigned the Mastered or Emerging status based on the child’s DPA results (see Table 1). A play action began when one of the following occurred: (a) attention to an object led to the play action (e.g., the child looked at/talked about object and then used it in play); (b) there was behavioral evidence of a plan leading to the play action (e.g., the child searched for specific object and then used object in play); or (c) the specific play action began.

When a teacher-prompted behavior occurred, the child’s corresponding behavior in response to the prompt was not coded or included in the data analyses. Out of the 84 samples, 8 samples contained a total of 15 teacher-prompted behaviors. Each teacher-prompted behavior was a social behavior; no play behaviors were prompted by a teacher.

**Reliability.** We randomly selected 25% of each child’s 20-min observational sample (i.e., a 5-min sample) for interobserver reliability of the social codes, play codes, and measurement codes (i.e., teacher-prompted behavior). The second research assistant transcribed and coded the entire 5-min sample in the same manner as for the original transcription and coding. Percentage of interobserver agreement was calculated by dividing the number of intervals of agreement that a specific behavior occurred by the sum of agreements and disagreements and multiplying by 100% (Best & Kahn, 1998). Cohen’s Kappa coefficient was calculated to provide a measure of reliability correcting for chance agreement (Cohen, 1960).

For the SocBS, mean percentages of agreement and ranges by category were as follows: Solitary (89.2%, range = 87.4–91.1); Onlooking (73.5%, range = 71.4–75.3); Uncoordinated Social (82.1%, range = 80.3–84.6); and Coordinated Social (84.1%, range = 81.6–86.4). The mean Kappa coefficient was .81 (range = .78–.84). For the DPA-BS, mean percentages of agreement and ranges by category were as follows: Unoccupied (81.3%, range = 78.2–84.4); Object-Focus (83.3%, range = 80.2–88.8); Mastered Play (85.8%, range = 82.6–87.1); and Emerging Play (83.3%, range = 82.6–85.2). The mean Kappa coefficient was .80 (range = .78–.81). In addition, 100% agreement was reached for the identification of teacher-prompted behavior.

**Data Analyses.** For each of the 21 participants, there were four 5-min observation samples, organized into 1-s intervals, which resulted in a total of 1,200 1-s intervals per participant. Each 1-s interval was tagged with a social code as a result of one pass through the data and then was tagged with a play code as a result of a second pass through the data. These procedures yielded a total of 25,200 data points (25,200 play codes) for the entire sample. Chi-square and log-linear analyses were used to study association patterns between and among the social and play variables. Log-linear analysis is a nonparametric statistical procedure that can be used to examine relationships among several categorical variables (i.e., social, play, diagnosis) simultaneously. The classification variables are the independent variables (i.e., social, play, diagnosis), and the natural logarithm of the frequency of cases in each table cell is the dependent variable. Log-linear analysis builds a model that predicts the frequencies in the cells of a multidimensional cross-tabulation table. The value of lambda (λ) represents the effects of the cross-tabulated variables on the expected logs of the cell frequencies. The farther a lambda is from zero, the more unevenly the cases are divided, which indicates the strength of difference between the observed and expected frequencies and, therefore, the strength of association between the identified categories.

Log-linear also provides an odds ratio (i.e., ratio of two odds), where the term odds is defined as the ratio of the frequency that an event occurs to the frequency that it does not occur. If the variables are independent, the odds ratio is 1, which corresponds to a log-odds ratio equal to 0. Therefore, the strengths of the relationships between variables increase with odds ratios that are greater than 1, expressed by the power that the exponent (e) is raised to give it that number, and with log-odds ratios, expressed in l, greater than 0. Finally, z values for the parameters provide information about statistically significant relationships (Bohrnstedt & Knoke, 1994; George & Mallery, 1999; SPSS Inc., 1997; Tabachnick & Fidell, 1989).

**Results**

**Distribution of Children’s Social Behaviors and Play Behaviors**

The social behavior data and the play behavior data were each examined separately to see how the behaviors were distributed across the categories for each scale. These distributions are presented (a) for the group as a whole and (b) according to the presence of PDD.

**Social Behavior.** The distribution of social behaviors across the study categories is presented in Table 3. For the group as a whole, most of the behaviors (68%) fell into the Solitary category, whereas the least amount (7%) fell into the Onlooking category. The remaining behaviors were equally distributed between Uncoordinated Social (11%) and Coordinated Social (14%).

In Table 3, the distribution of social behavior across the four categories is broken down further according to diagnosis. Similar distribution patterns were apparent for both groups. The majority of the behaviors for both
groups of children were in the nonsocial Solitary category of the SocBS. The distribution patterns for the children without PDD, however, indicated somewhat more time (37%) in the social categories (Onlooking, Uncoordinated Social, Coordinated Social) than for the children with PDD (28%). We tested the similarity of the distributions, and the resulting chi-square value was extremely small, $\chi^2(3, N = 25,200) = 2.18$. These results indicated a similar distribution pattern for both groups of children.

**Play Behavior.** The distribution of play behaviors across the study categories is presented in Table 4. For the group as a whole, most of the behaviors (62%) fell into the Object-Focus category, whereas the least amount (6%) fell into the Unoccupied category. The remaining behaviors were equally distributed between Mastered Play (17%) and Emerging Play (15%). Thus, most of the children's play behaviors were accounted for by actions that indicated attention to objects, with 32% of time actively engaged in play actions (Mastered and Emerging Play combined) and little time spent unoccupied.

In Table 4, the distribution of the play behaviors across the four categories is broken down further to reflect children with and without PDD. The distribution patterns for both groups of children were essentially the same across the four play categories. The similarity of the distributions was tested with chi-square analysis, and the resulting chi-square value was extremely small, $\chi^2(3, N = 25,200) = 9.16$. These results indicated a similar distribution pattern for both groups of children.

### TABLE 3. Distribution of Social Behaviors Across SocBS categories

<table>
<thead>
<tr>
<th>Participant</th>
<th>Solitary (%)</th>
<th>Onlooking (%)</th>
<th>Uncoordinated Social (%)</th>
<th>Coordinated Social (%)</th>
<th>Data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>With PDD</td>
<td>72</td>
<td>6</td>
<td>11</td>
<td>11</td>
<td>14,400</td>
</tr>
<tr>
<td>No diagnosis</td>
<td>63</td>
<td>8</td>
<td>12</td>
<td>18</td>
<td>10,800</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>7</td>
<td>11</td>
<td>14</td>
<td>25,200</td>
</tr>
</tbody>
</table>

*Note. SocBS = Social Behavior Scale; PDD = pervasive developmental disorder. The percentages represent the amount of data points within each category. There were 1,200 data points for each child, resulting in 25,200 data points for all 21 children.*

### TABLE 4. Distribution of Play Behaviors Across DPA-BS Categories

<table>
<thead>
<tr>
<th>Participant</th>
<th>Unoccupied (%)</th>
<th>Object-Focus (%)</th>
<th>Mastered Play (%)</th>
<th>Emerging Play (%)</th>
<th>Data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>With PDD</td>
<td>6</td>
<td>64</td>
<td>15</td>
<td>15</td>
<td>14,400</td>
</tr>
<tr>
<td>No diagnosis</td>
<td>6</td>
<td>61</td>
<td>18</td>
<td>15</td>
<td>10,800</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>62</td>
<td>17</td>
<td>15</td>
<td>25,200</td>
</tr>
</tbody>
</table>

*Note. DPA-BS = Developmental Play Assessment Behavior Scale; PDD = pervasive developmental disorder. The percentages represent the amount of data points within each category.*

**Interaction Between Social Behaviors and Play Complexity**

The relationship between social behaviors and play complexity is presented for the participants as a group and by PDD diagnosis in Table 5. For Social Interaction, the social behaviors involved Onlooking, Uncoordinated Social, and Coordinated Social; nonsocial behaviors encompassed the Solitary category. The distinctions of play complexity consisted of Emerging Play compared to the other three play categories (i.e., Mastered Play combined with the Non-Play behaviors of Object-Focus and Unoccupied).

For the group as a whole (see bottom of Table 5), when children were engaged in play that was considered difficult (Emerging Play), there was a decreased likelihood of social interaction (12%), compared to an increased likelihood of nonsocial activities (88%). In contrast, when children were engaged in relatively easy play activities or Non-Play activities (e.g., Mastered Play, Non-Play), the likelihood of social interaction increased (35%).

We examined the relationship between social behaviors and play complexity using log-linear analysis. The odds of social to nonsocial behavior during Mastered Play or Non-Play were approximately three times the corresponding odds during Emerging Play ($e^{1.04} = 2.83$). The asymptotic odds ratio ($\lambda = 1.04$) were .92 and 1.17, corresponding to an odds ratio between 2.51 and 3.22 (absolute $z$ value = 15.94). In sum, when a child was engaged in Emerging
Play actions during a free-play session with peers, there was a decreased likelihood of social interaction. When the child was engaged in Mastered/Non-Play activities, the likelihood of social interaction increased.

The contribution of diagnosis to the relationship between social interaction and play complexity is also presented in Table 5. Here differences were observed between the groups of children. The children with PDD spent only 7% of their time engaged in social interaction during Emerging Play and 31% of their time engaged in social interactions during Mastered Play/Non-Play activities. Children without PDD, in contrast, spent 19% of their time engaged in social interaction during Emerging Play and 40% of their time engaged in social interaction during Mastered Play/Non-Play activities. Overall, children with PDD were less likely than their peers without PDD to engage in social interaction during Emerging Play, although they did engage in social behaviors to a certain extent.

The odds of social behavior during Mastered Play/Non-Play for a child with PDD were twice the corresponding odds for a child without PDD \((e^{0.76} = 2.14)\), thereby demonstrating an association of PDD with the likelihood of decreased social behavior during play activities that were considered difficult for the child. The asymptotic 95% confidence limits for the log-odds ratio \((\lambda = .76)\) were .54 and .97, corresponding to an odds ratio between 1.72 and 2.64 (absolute \(z\) value = 6.99).

### Interaction Between Social Complexity and Play Complexity

The relationship between social complexity and play complexity—given that a child is simultaneously engaged in both social and play actions—is presented in Table 6. Social complexity is distinguished as Onlooking/Uncoordinated Social compared to Coordinated Social. Engagement in play activities is distinguished as Mastered Play compared to Emerging Play; the nonactivity categories of Object-Focus and Unoccupied have been removed. For the group as a whole (bottom of Table 6), when the children were engaged in social interaction during Mastered Play, time spent in behaviors that lacked social coordination (Onlooking/Uncoordinated Social) was somewhat greater (55%) than those that included social coordination (Coordinated Social, 45%). However, when the children were engaged in social interaction during Emerging Play, there was a significant likelihood that the child's social behavior lacked social coordination (Onlooking/Uncoordinated Social, 97%), with minimal time spent in socially coordinated interactions (Coordinated Social, 3%).

The odds of Uncoordinated Social behavior to Coordinated Social behavior during Emerging Play were between 19.67 and 64.72 times the corresponding odds during Mastered Play \((e^{3.57} = 35.52)\). The asymptotic 95% confidence limits for the log-odds ratio \((\lambda = 3.57)\) were 2.98 and 4.17, corresponding to an odds ratio between 19.67 and 64.72 (absolute \(z\) value = 11.77). Thus, if children were engaged in play activities that they were in the process of learning (i.e., Emerging), it was far more likely that their corresponding social behaviors were either Onlooking or Uncoordinated; the likelihood of corresponding Coordinated Social behaviors, given Emerging Play, was essentially nonexistent.

The contribution of diagnosis to the relationship of social complexity to play complexity is also included in Table 6. Presence of a PDD did not contribute signifi-
TABLE 6. Percentage of Data Points for the Intersection of Social Complexity by Play Complexity and by Diagnosis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Play complexity</th>
<th>Social complexity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Onlooking/Uncoordinated (%)</td>
<td>Coordinated (%)</td>
<td>Data points</td>
<td></td>
</tr>
<tr>
<td>PDD</td>
<td>Mastered&lt;sup&gt;a&lt;/sup&gt;</td>
<td>67</td>
<td>33</td>
<td>456</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emerging&lt;sup&gt;b&lt;/sup&gt;</td>
<td>98</td>
<td>2</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>75</td>
<td>25</td>
<td>609</td>
<td></td>
</tr>
<tr>
<td>No diagnosis</td>
<td>Mastered</td>
<td>43</td>
<td>57</td>
<td>501</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emerging</td>
<td>97</td>
<td>3</td>
<td>322</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>65</td>
<td>35</td>
<td>823</td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>Mastered</td>
<td>55</td>
<td>45</td>
<td>957</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emerging</td>
<td>97</td>
<td>3</td>
<td>475</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>69</td>
<td>31</td>
<td>1,432</td>
<td></td>
</tr>
</tbody>
</table>

Note: PDD = pervasive developmental disorder.<sup>a</sup> Mastered = Mastered Play only, with no Non-Play categories. <sup>b</sup> Emerging = Emerging Play only, with no Non-Play categories.

significantly to this relationship. The odds of Onlooking/Uncoordinated Social to Coordinated Social behavior during Emerging Play for a child with PDD were not significantly different from the corresponding odds for a child without PDD ($\lambda = .16$; absolute z value = 1.15). If children engaged in play activities that were difficult for them, the likelihood of corresponding Coordinated Social behavior was next to nothing, regardless of diagnosis.

**Discussion**

The results of this study provided evidence of a systematic relationship between the social behaviors and play behaviors of a group of preschool children with and without PDD. When a child was engaged in what was considered to be developmentally difficult (Emerging Play) for him or her, the likelihood of social interaction decreased. When a child was engaged in social interaction during Emerging Play for that child, the likelihood that the child's social behavior lacked social coordination was significant. These results were similar for all children, regardless of diagnosis.

We will discuss our results in terms of (a) methodological issues for measuring social interaction and play complexity, (b) the quality of behaviors observed, (c) the relationship between social interaction and play complexity—and potential explanations for it, and (d) the implications for interventions focused on social goals implemented in play contexts.

**Advances in Measurement**

Several procedures were implemented to afford an examination of these two developmental domains. First, in this study we defined social behavior and play behavior independently. The creation of the SocBS allowed for the coding of a continuous stream of behavior with respect to social engagement, without any reference to play activities. Similarly, the DPA-BS allowed for the coding of a continuous stream of behavior with respect to actions on objects and play complexity, without any reference to social activities. The use of these scales provided independent information about the distribution of behaviors within each domain.

Second, the two scales differed in that the SocBS was an absolute scale and the DPA-BS was an individualized scale. The SocBS measured the occurrence/nonoccurrence of social coordination with social behaviors such as talking, sharing objects, and making physical contact. Because socially coordinated behaviors emerge in the toddler years (Lieber & Beckman, 1991b; Ecker et al., 1989), their occurrence was expected, given the children's minimum developmental levels. Thus, the children were evaluated on the occurrence/nonoccurrence of essentially the same behaviors, independent of their developmental levels.

The DPA-BS, in contrast, was an individualized scale. Play continues to develop in the preschool years (Fein, 1981; Garvey, 1977). Children with PDD who participated in this study demonstrated delays in play. The children without PDD also differed in the play levels they had mastered. The DPA-BS allowed us to determine what each child knew (i.e., Mastered Play) compared to what that child was in the process of learning (i.e., Emerging Play) on a child-by-child basis, thus rendering it specific to each child. As a result, the constraints imposed by developmental complexity (i.e., Emerging Play) on the occurrence of social coordination (i.e., Coordinated Social)
could be examined for all of the children on an individualized basis, which strengthens the results of the study. In addition, use of the DPA-BS allowed us to determine the nature of play complexity in relation to several categories of play (i.e., those presented in Table 2), in contrast to the global distinctions of manipulative and pretend play that have been used in a number of other studies.

Third, this study examined the children's behavior continuously. This approach differs from an interval data collection system, in which a child may make several shifts in social or play behaviors within the interval. The coding of a continuous stream of behaviors, in combination with the log-linear analyses, allowed for the examination of how the complexity of a child's social behavior related concurrently to the level of complexity of the child's play (Bohnstedt & Knoke, 1994; Tabachnick & Fidell, 1989).

**Quality of Behaviors Observed**

The four categories of behavior that could be measured by each of the scales were observed in all of the children. The distribution of the categories of the SoeBS revealed that Solitary behaviors predominated for both groups of children (overall, 68%). These results were a bit surprising, given that the children in this study had been in the same preschool class for months and were playing with the same toys. These children also had received considerable attention regarding their social engagement as part of the programming offered by the preschool. Nevertheless, the study results suggest that in these group play settings the children spent the bulk of their time disengaged from their peers.

The distribution of the categories in the DPA-BS revealed that (a) the Object-Focus category represented the bulk of the children's play-related activities and (b) the children spent limited amounts of time in Unoccupied Play. The remaining time was divided between Mastered Play and Emerging Play. That children divide their play activities between known and emerging activities was not a surprise; other studies of play behaviors have revealed similar distributions (e.g., Lifer & Bloom, 1989). As children learn qualitatively new and different categories of play, they still "drop back" to engage in relatively simple play activities.

It was somewhat surprising that both groups of children spent relatively large amounts of time dedicated to focusing on objects. It was also the case that object-focused activities, as well as Unoccupied Play and Mastered Play, occurred during social interaction. It may be that children need time to think about and plan their actions with toys. Similarly, Lieber and Beckman (1991a) found that preschoolers spent more time planning before engaging in pretend play when they were alone, as compared to greater levels of manipulative play when they were in dyads.

**Potential Explanations of the Relationship**

The results provide support for results from other studies of preschoolers' integration of social coordination with language (Yoder & Warren, 2002) and cognitive development (Carpenter, Pennington, & Rogers, 2002). The children in both groups were learning to integrate social behaviors with emerging play complexity. Despite the delays in play that were observed in the children with PDD, social coordination with play activities could be identified for those play activities that were relatively easy for them.

In the present study, the children with PDD were even less likely than their peers to engage in social interaction during Emerging Play activities; instead, they remained in Solitary activity more often. Children with PDD have difficulty with social gaze and attention (Carpenter et al., 2002) and increased difficulty with interpreting multiple cues (Pierce, Glad, & Schreibman, 1997). These deficits in both play and social skills seem to affect the children's ability to integrate social coordination with play activities they are in the process of learning.

The inverse relationship between social complexity and play complexity was not surprising. From a cognitive/developmental perspective, both social behavior and play behavior use cognitive resources, and when these behaviors occur at the same time, they compete for these cognitive resources. Findings of studies examining both social behavior and play behavior (Howes & Matheson, 1992; Thorp, Stahmer, & Schreibman, 1995) have suggested that there is a cognitive requirement to interactive play. Other researchers have observed that play activities at the leading edge of children's learning constrains the expression of emotion (Bloom & Tinker, 2001). According to the concept of an "allocation of resources," less complex tasks require fewer cognitive resources than do demanding tasks (Kahneman, 1973). A competition for resources may make it difficult for children to engage in social actions and play actions at the same time, especially if the actions are difficult for the child. Research in dual task performance has demonstrated that performance on a task goes down when attention transfers to another task (Bjorklund & Harnishfeger, 1990). Our findings thus are consistent with the construct of an allocation of resources.

**Implications for Practice**

This descriptive study has potential implications for assessment and intervention procedures in early childhood.
special education. We found that children were involved in play activities that were both easy and challenging for them. When they played at the challenging activities, however, a cost to their social interaction became apparent. These results provide particular support for a recommendation made by Wolery (2000): “Practices are individualized for each child based on: (a) the child’s current behavior and abilities across relevant domains instead of the child’s diagnostic classification; . . . and (d) the demands, expectations, and requirements of the child’s current environments” (p. 35). Consequently, in addition to other developmental domains, children’s play activities should be evaluated when implementing goals in play contexts. Our results suggest that a child with PDD may be less likely to engage in and attend to social behaviors that are frequently encouraged in the classroom setting when he or she is involved in challenging play activities. In contrast, the likelihood of social behaviors increases when the child is involved in play activities that are easy for him or her or even when involved in object-focused activities. Because play continues to develop through the preschool years, we suggest that the complexity of play matters when selecting and implementing intervention goals in play contexts. Instruments such as the DPA and the DPA-BS can be useful for determining which play skills a child has mastered and which skills he or she appears to be learning. This information will be helpful in setting play goals or integrating play with goals from other domains.

Limitations

This study has at least three potential limitations. First, the observations for analyses were taken from the baseline of intervention studies. This sample of convenience resulted in uneven groups of children in terms of gender and diagnosis. Nevertheless, these observations of children playing in developmentally integrated groups in the natural setting of their everyday preschool classroom provided useful samples for our central questions.

Second, the success of the children with PDD in demonstrating complex social behaviors may have been due to their experience in the integrated setting or may have had something to do with their abilities in being selected for that setting. A number of the children with PDD who participated in those classrooms had prior experience in the setting’s transitional classroom, where preparation for the integrated setting is emphasized. In both settings, the teachers focus on social skills. In addition, although socially coordinated behaviors were expected, their occurrence may have been related to the competence of the children’s peers (Guralnick & Groom, 1987).

Third, although the toys that we used in the observations were similar to the toys with which the children played in their classrooms and homes, they were still different. It may be the case that the introduction of different toys captivated the children’s interest more than usual, resulting in the high levels of object-focus behavior we observed.

Future Directions

Future research directions should include systematic intervention studies in which social goals are implemented in play contexts of varying levels of individualized play complexity and of object-focus. Such investigations are needed to confirm whether Mastereed Play contexts are more likely to optimize the effects of social skills interventions. Likewise, it would be interesting to investigate the differentiation of the functions of the socially coordinated behaviors. These social functions (e.g., initiating, responding) may differ in difficulty, imposing variable constraints on performance of play and other behaviors. The descriptions of social and play behaviors that are offered here contribute information about what a group of preschoolers with and without PDD do with toys in developmentally integrated social groups. The analyses of their intersections at different levels of complexity shed light on the developmental tasks of the preschool period and the constraints imposed by development. Finally, descriptions of behaviors and their intersections provide insight into the design of interventions for preschoolers for whom learning is especially difficult.

AUTHORS’ NOTES

1. This work is the outcome of a doctoral dissertation in the School and Counseling Psychology Doctoral Program at Northeastern University.

2. The authors express their gratitude to Ashley Badger and Edward Velazquez, who participated in coding the data for the study; to Emanuel Mason, who advised on the statistical analyses; to Louis Kruger, who served on the committee with Professor Mason; and to Catherine Mulroy, who assisted with manuscript preparation.

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