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An inquiry into how parents of children with autism spectrum disorder interact with their children in a motor skill-based play setting

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ABSTRACT

Background: Most studies examining parental behaviors of parents of young children with autism spectrum disorder (ASD) and typically developing (TD) children have taken place in free play settings and have primarily focused on examining social behaviors. Motor skill-based play settings, which are distinctly different from free play settings, have not been explicitly studied as it relates to parental behaviors in these environments.

Aims: The purpose of this study was to examine parental behaviors of parents of children with and without ASD in two distinctly different play settings.

Methods: Parental behaviors of eighteen parents of children with (n = 9) and without ASD (n = 9) were examined by observation in different play settings (free play [a social-play/traditional play based setting] and a motor skill-based play setting). The examined parental behaviors included parental encouragement, negativity, sensitivity, detachment, and intrusiveness. A 2 × 2 (group × play setting) repeated measures of ANOVA was conducted to examine the main effect of group (TD vs ASD) and play setting (a social-play based setting and a motor skill-based setting) and the interaction effect between group and play setting on parental behaviors. Post-hoc independent t-tests between groups in each setting were conducted to follow-up on significant interactions indicated in the repeated measures of ANOVA

Results: The repeated measures ANOVA revealed that parental encouragement showed a significant interaction effect, suggesting that the effect of group on parental encouragement depended on play setting. A post-hoc analysis revealed that parents of children with ASD showed statistically significant lower parental encouragement in a motor skill-based play setting but not in a social-play based setting compared to parents of TD children. Moreover, there was a main effect of group (parents of children with ASD vs. parents of TD children) on parental intrusiveness indicating that the mean parental intrusiveness on children with ASD was significantly higher than parents of TD children across both play settings. There were no statistically significant main or interaction effects on the other parental behaviors (parental negativity, sensitivity, and detachment) between groups.

Conclusions and implications: The current study indicated parental encouragement differences between parents of children with ASD and parents of TD children varied based on the play

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setting. These results identify a need to examine parental behaviors, especially parental encouragement and parental intrusiveness across various types of play settings. Furthermore, as parents of children with ASD displayed lower parental encouragement in a motor skill-based play setting compared to parents of TD children, future studies are warranted to improve parental encouragement of parents of children with ASD in a motor skill-based play setting.

What this paper adds?

This study investigated similarities and differences between parental behaviors of parents of children with and without autism spectrum disorder (ASD) in a social-play based setting and a motor skill-based play setting. Various parental behaviors such as encouragement, negativity, sensitivity, detachment, and intrusiveness were examined in two distinctly different play settings. This study adds how parental behaviors of parents of children with ASD differ from parental behaviors of parents of typically developing children across distinctly different play settings. Further, to our knowledge, this study is the first study to examine parental behaviors of parents of children with ASD in a motor skill-based play setting. Thus, the results of this study add helpful information with respect to creating and designing ASD-related interventions that include parent involvement.

1. Introduction

It is well-known that parental behaviors have a significant impact on aspects of child development including but not limited to children's externalizing behavior, social behaviors, and general cognitive development (Henderson, 2013). The National Institute of Child Health and Human Development (NICHD Early Child Care Research Netwrok (2016) indicated that high levels of parental sensitivity, stimulation, and support were associated with higher language skills, better social skills, and fewer problem behaviors in children.

These findings are consistent across parents of children with and without ASD even though core characteristics of ASD such as difficulty in social communication, social interactions and a restricted pattern of behavior (APA, 2013) may impact the effects of parental behaviors on child development. In Siller and Sigman (2002a), 2002b) caregivers with higher levels of synchronization (the degree to which the parent displayed interest by mentioning or pointing to objects which the child was already engaged in) during play had children with ASD who displayed higher levels of joint attention and language skills over a period of 1, 10, and 16 years of age compared to caregivers with lower levels of initial synchronization. In addition, parents who were more responsive to their children's activity during playtime at a young age (3–4 years old) had children who showed higher levels of language skills during middle childhood (7–8 years old) compared to caregivers who were less responsive (Siller & Sigman, 2008). Thus, it is vital for parents of children with and without ASD to have effective parental behaviors, which have known implications for their child's development.

However, the characteristics of ASD (e.g., social interaction and communication deficits) often lead to parents adapting their parental behaviors (Blacher, Baker, & Kaladjian, 2013; Boonen et al., 2015; Freeman & Kasari, 2013). To understand how the characteristics of ASD influence parental behaviors a large body of literature has examined parental behaviors of parents of children with ASD by comparing to parental behaviors of parents of TD children. Commonly examined parenting dimensions have included parental support (Baker, Messinger, Lyons, & Grantz, 2010; Haven, Manangan, Sparrow, & Wilson, 2014; Kasari, Sigman, Mundy, & Yirmiya, 1988; Siller & Sigman, 2002a, 2002b) and control (Freeman & Kasari, 2013; Lambrechts et al., 2015; Strid, Heimann, & Tjus, 2013; Wan et al., 2012). Parental support includes parental behaviors such as parental responsiveness, engagement, and sensitivity. Kasari et al. (1988) compared parental responsiveness (the extent to which parents used nurturance, affection, involvement, and support in the child rearing process) in a free play setting in three groups of preschool aged children (ASD, developmental disability, and TD). The authors of this study concluded that there were no statistically significant differences in parental responsiveness across the three groups. More recently, Baker et al. (2010) compared maternal sensitivity (the quality with which mothers responded to their children's cues in a timely and appropriate manner) during free play of toddlers with emergent ASD and toddlers without ASD. They found no significant differences in maternal sensitivity between the two groups.

Other studies, however, have found that parents of children with ASD displayed different parental support-related behaviors compared to parents of TD children (Boonen et al., 2015; Lemanek, Stone, & Fishel, 1993). Boonen et al. (2015) found that mothers of school-aged children with ASD showed lower provision of structure (the degree to which the mother designed the tasks and offered information about an activity) and lower parental sensitivity compared to mothers of TD children in an unstructured free play setting. Lemanek et al. (1993) also indicated that parents of preschool-age children with ASD more frequently used verbal and nonverbal attention-getting behaviors, including closer physical proximity to their caregivers to get attention. Even though parental support-related behaviors have been widely studied, the results across studies are less consistent.

In addition to parental support, parental control has been an extensively studied parenting dimension. Parental control refers to the nature of parenting that reinforces or restricts a child's behavior, this construct includes parental behaviors such as parental intrusiveness, punishment and rule setting. Previous studies have found parental control differences between parents of children with ASD and parents of TD children. Lambrechts et al. (2015) found that mothers of children with ASD had lower levels of discipline (the degree to which the mother actively taught her child what they were supposed to do) when compared to mothers of children without ASD. Moreover, mothers of infant siblings at risk for ASD (infants at a higher risk of developing ASD based on the presence of an older

sibling diagnosed with ASD) displayed higher direct interaction styles in a free play setting compared to mothers of TD children (Wan et al., 2012).

Even though parental behavior differences between parents of children with ASD and parents of TD children have been empirically examined, most of the empirical literature to date does not consider the type of play setting, in fact majority of the work cited has used a more traditional "free play" based setting. Yet, parental behaviors can be affected by personal characteristics, child characteristics (e.g., common characteristics associated with ASD), and also environmental factors such as the type of play setting where parents engage with their children. Based on the transactional model of development (Sameroff, 1975), parental behaviors are affected by sociological, environmental, and behavioral perspectives. This model indicates that there are multiple factors such as the environment, characteristics of the child, and other factors such as parenting stress that may act as underlying mechanisms for the determinants of parental behavior.

Thus far, traditional parenting research has explored changes in parenting behavior across contexts of play and time (van den Boom, 1997). van den Boom (1997) suggested that parental behaviors were changeable and flexible to adjust to minute-by-minute demands of the situation. Specifically, maternal behaviors such as emotional involvement and the nature and amount of stimulation varied depending on the type of play tasks (O'Brien, Johnson, & Anderson-Goetz, 1989). Moreover, even maternal emotional regulation was impacted by different play tasks of children. Mothers of infants showed more negative parenting behaviors in high-challenge situations compared to when they were in low-challenge situation (Miller, McDonough, Rosenblum, & Sameroff, 2002). Kwon, Bingham, Lewsader, Jeon, and Elicker (2013), also found that parent-child interaction, play style, and language use varied by two different types of play settings. In this study, parents showed more cognitive scaffolding (the parental response toward child problem solving/ task involvement) and provided less negativity in a free play setting (child had a variety of toys and can play what he/she wants to with the toys) compared to a structured setting (child received one challenging toy such as a shape sorter or jigsaw puzzles at a time and was asked to complete the task). The results of these studies confirmed that parents were adapting their behaviors based on the type of play environment and play intensity.

These varying parental behaviors, by setting, were also displayed in parents of children with developmental delays (DDs). Parents of children with DDs displayed more approachable parenting behaviors and fewer positive verbalizations in a more challenging play setting than in a less challenging free play setting (Landry, Garner, Pirie, & Swank, 1994; Pino, 2000). Another study conducted by Ciciolla, Crnic, and West (2013) considered both the types of play settings and child characteristics by observing maternal sensitivity in both a challenging task (completing a multi-piece puzzle) and free play (less challenging task) for children with and without DDs at 3, 4, and 5 years of age. Mothers of children with DDs showed significantly lower levels of maternal sensitivity during the challenge task when their children were 3 years old compared to parents of typically developing children. In the free play setting, there were no statistically significant maternal sensitivity differences between the two groups. Moreover, maternal sensitivity in both groups improved significantly in the challenging-task setting as their child aged but remained the same in a free play setting even as their child aged. In a study specifically focused on children with ASD, Bentenuto, De Falco, and Venuti (2016) confirmed that mothers of children with ASD adapted their parental behaviors toward their child based on the types of play (i.e., exploratory and symbolic play) more than mothers of TD children. These results indicated that parental behaviors needed to be examined in various play settings to capture changeable and transferable parental behaviors.

Even though clear evidence exists demonstrating that parental behaviors can be affected by the context of the play settings, much of the empirical research in this area has focused on parental behaviors in more traditional, free-play or challenge based settings. The way in which parents of children with and without ASD interact in different play based settings, such as those that are more focused on motor behaviors and physical activity, has not been extensively explored in the literature.

The context of a motor skill-based play setting is distinctly different from the context of a social-play based setting. For example, the social-play based setting typically includes various toys used in free-play such as cause and effect toys, construction/building toys, miniatures, toy cars, as well as objects that could be used for imaginative play (e.g., string, blocks; Kwon et al., 2013). A motor skill-based play setting might typically include various sized balls and targets, tricycles/ride-on toys, jump-ropes, and mats, all which target fundamental motor and physical activity behavior (Barbour, 1999; Valentini, Pierosan, Rudisill, & Hastie, 2016). Moreover, children can show different behaviors dependent on play settings. MacDonald, Hatfield, and Twardzik (2017) found that children with and without ASD had similar child behaviors in a social-play setting, but not in a motor-behavior-based play setting. Identifying how specific parental behaviors of parents of children with ASD differ from parental behaviors of parents of children without disabilities in various play settings may ultimately inform how to target parental behaviors for child development. Specifically, for families of children with ASD, it is important to examine parent-child interactions in a motor-skill based setting as children with ASD experience motor skill deficits, present at an early age (Lloyd, MacDonald, & Lord, 2013; Provost, Heimerl, & Lopez, 2007; Provost, Lopez, & Heimerl, 2007; Whyatt & Craig, 2012).

This study will examine the following research questions: 1) how do parental behaviors vary based on child characteristics (ASD vs. TD) and types of play settings (a social-play based setting and a motor skill-based play setting), and 2) how do parental behaviors of parents of children with ASD differ from parental behaviors of parents of TD children across both play settings (a social-play based setting and a motor skill-based play setting). It was hypothesized that there were parental behavior differences (especially parental support and control-related behaviors) between parents of children with ASD and parents of TD children and that differences would vary based on types of play settings (a social-play and a motor-skill based settings). Moreover, it was expected that parental behaviors of parents of children with ASD would be more similar to parental behaviors of parents of TD children in a social-play based setting than in a motor skill-based setting.

2. Method

18 parents/caregivers of children with and without ASD (ASD = 9 and TD = 9; children between the ages of 2 and 7 years) were recruited for this study. Descriptive information on participant characteristics is presented Table 1. All procedures for this study was approved by the University Institutional Review Board (IRB).

2.1. Design and procedures

Each dyad (parent and child) visited the research laboratory about one and half hours. Informed consent/assent (child) was obtained prior to any study activities taking place. Parents/caregivers completed a demographic survey, and when parents/caregivers reported that their child had ASD, children were administered the Autism Diagnosis Observation Schedule-2 (ADOS-2), to confirm ASD diagnosis (Lord et al., 2012). Finally, the dyad participated in two play sessions for 10-minutes. In one play session the parents were instructed to "play as you usually do" in a social-play based setting. The social-play based setting included various toys typically used in free- or social-play, such as cause and effect toys, construction/ building toys, miniatures, books, as well as toys for imaginative play (e.g., puzzles, blocks). Similarly, the parent/caregiver was instructed to "play as you usually do" in a motor-skill based play setting. The motor-skill based setting contained common objects used in young child movement rooms, such as miniature stairs, mats, wedge-mats, slides, a miniature teeter-totter, a tricycle, various sized balls and targets. After each dyad adapted to the play setting (after a few minutes), the play sessions were video-recorded for 10-minutes, by a trained research assistant. The research assistant was instructed to capture the dyad playing together, however in instances where the dyad was separated in the video frame, the research assistant was instructed to follow the child.

2.2. Measures/Instruments

Parent-child interaction. Five scales adapted from the Early Head Start (EHS) 24-Month 3-Bag Scales (Brady-Smith, O'Brien, Berlin, & Ware, 1999) were used for coding parental behaviors in the social-play and motor-skill based play settings. Scales were collapsed from a 7-point Likert scale to a 5-point scale and examples from the manual were included in coding descriptions to increase clarity and precision. Previous work scaling 7-point scales to 5-point scales has not found differences in scale effectiveness (Dawes, 2008). Five scales, including parental encouragement, negativity, sensitivity, detachment, intrusiveness were adapted for this study. *Parental encouragement* measures the degree to which the parent facilitates play to foster the child's interest, learning, understanding, and development (e.g., a parent asks his/her child learning related-questions or provides well-organized description of their activity). *Parent Negativity* measures the degree to which the parent displays expressions of anger or rejects/discounts the child (e.g., a parent says "no" when his/her child asks to play with a ball). *Parental Sensitivity* measures the degree to which the parent observes and responds to the child's cues (gestures, expressions, and signals) during times of distress as well as non-distress (e.g., a parent brings water to his/her child when they notice the child feels thirsty during play). *Parental detachment* measures the degree of the parent's awareness of, attention to, and engagement with the child (e.g., a parent spends time on his/her smartphone when the

Table 1
Descriptive Characteristics of the Participants, parents of children with and without ASD.

	ASD (n = 9)		TD (n = 9)	
	M(SD) or n	Range	M(SD) or n	Range
Parent Age (years)[a]	34.8 (2.1)	32–39	32.7 (3.3)	28–37
Parent gender				
Female	6		9	
Male	3		0	
Parental education				
no degree	2		0	
GED	1		2	
Associate's	1		0	
Bachelor's	5		2	
Master's	0		3	
PhD or MD	0		2	
Child age (months)	62.1 (16.8)	44–91	51.9 (18.9)	30–94
Child gender (male)				
Female	2		0	
Male	7		9	
Children's ADOS CSS	7.7 (1.7)	5–10		
Children's PDMS-2* TMQ[b]	72.2 (14.8)	49–98	96.7 (9.4)	88–115
Nonverbal IQ*	76.4 (26.7)	31–108	110.3 (19.9)	88–150

Note. ADOS = Autism Diagnostic Observation Schedule; CSS =.
Calibrated Severity Score; PDMS-2 = Peabody Developmental Motor Scales – Second Edition; TMG = Total Motor Quotient scores.
* T here is statistically significant difference between groups ($p < 0.05$).

child plays). *Parent Intrusiveness* measures the degree of the parent's control of a child's behavior and play (e.g., a parent provides his/her child a ball when the child is actively playing with a puzzle). This coding scheme is largely focused on parental behaviors, however child behavior does influence parent behavior. For example, if a parent suggests a new toy when a child appears disengaged with an old toy, it is coded within parental sensitivity. However, if a parent shows this same behavior when a child is actively engaged in an old toy, this is considered within parental intrusiveness.

All items were coded on a 5-point scale ranging from 1 = "very low" to 5 = "very high". After two research assistants were trained by the last two authors, the research assistants coded all videos which were randomized at the setting level. Coders were blind to child diagnosis (ASD or TD). The assistants coded 5 min of the play session, beginning at minute three. This strategy was implemented to support a more natural setting after parent and child acclimation to the video camera occurred. The research assistants scored the videos independently, then met and discussed their scores, and finally arrived at consensus scores, which were used in the analyses. To calculate interrater reliability between the two coders, intra-class correlations (ICC's) were used in this study. For the social-play based setting, ICC's were .90 for parental encouragement, .94 for parental negativity, .80 for parental sensitivity and .75 for parental detachment and .73 for parental intrusiveness. For the motor-skill based play setting, ICC's were .80 for parental encouragement, .79 for parental negativity, .82 for parental sensitivity and .74 for parental detachment and .70 for parental intrusiveness (see Table 2). All scales in both the social-play setting and the motor-skill based play setting arrived at 'good' criteria (above .60) cutoff (Cicchetti, 1994).

Autism symptomology. The Autism Diagnostic Observation Schedule-2 (Lord et al., 2012) was used to confirm the diagnosis of ASD in children. The ADOS-2 is widely accepted and used in clinical and research settings (Akshoomoff, Corsello, & Schmidt, 2006; Molloy, Murray, Akers, Mitchell, & Manning-Courtney, 2011). Since calibrated autism severity scores are optimal indicator of describing samples in research (Gotham, Pickles, & Lord, 2009), the severity scores were used in this study (see Table 1).

Motor skill assessment. Children's motor skills were assessed using the Peabody Developmental Movement Scales-2 (PDMS-2; Folio & Fewell, 2000). The PDMS-2 is a commonly used tool for assessing young children's motor skills between the ages of (Ortega et al., 2015). The PDMS-2 consists of six different subtests: reflexes (0–11 months), stationary, locomotion, grasping, visual-motor skills. In the current study, reflexes were not measured because our participants did not fall into the age range. Raw scores for each subtest were converted to standard scores and all of the standard scores was summed to create a total standard motor score. The summed standard scores were converted into quotient scores, which provide the most reliable score among other scores of PDMS-2 (Folio & Fewell, 2000). The quotients scores were reported in the current study.

Developmental assessment. Children's cognitive development was assessed by the Mullen Scales of Early Learning (MSEL), which provides reliable and valid scores for young children aged from birth to 68 months (Mullen, 1995). The MSEL consists of five subsets: gross motors, fine motor, visual reception, receptive language, and expressive language. For participants above 68 months, cognitive development was assessed by the Differential Ability Scales, 2nd ed (DAS- II; Elliott, 2007), which is a valid and reliable measure of cognitive development for children aged 2 years 6 months to 17 years 11 months. The DAS- II provides standardized developmental information of cognitive abilities (Elliott, 2007). This assessment includes 20 subsets that examine conceptual and reasoning abilities. Standard cognitive developmental scores across these two assessments were reported using ratio nonverbal IQ scores, which were calculated by dividing the average age equivalent scores on nonverbal-subtest scales from both assessments (MSEL ad DAS-II), by the participants' chronological age in months, then multiplied by 100.

2.3. Data analysis

Descriptive statistics were reviewed for all parental behaviors in each play setting respectively. Independent *t*-test was conducted to calculate age, motor skills, and developmental ability differences between the two groups. A chi-square test was also conducted to identify parent and child gender differences between groups. To address the purpose of this study, A 2 × 2 (group × play setting)

Table 2
Interrater Reliability and Descriptive by Play Settings.

	ICC	*M* Coder1	*M* Coder2	*M* Consensus	Range Consensus
Social play					
Parental encouragement	0.90	3.38	3.5	3.38	2 – 5
Parental Negativity	0.94	1.66	1.88	1.88	1 - 5
Parental Sensitivity	0.80	3.33	3.5	3.16	2–5
Parental Detachment	0.75	1.61	1.88	1.94	1–4
Parental Intrusiveness	0.73	2	2	1.94	1–3
Motor-skill play					
Parental encouragement	0.80	3.61	3.61	3.55	2–5
Parental Negativity	0.79	1.77	1.83	2.05	1–3
Parental Sensitivity	0.82	3.33	3.72	3.27	1–3
Parental Detachment	0.74	1.44	1.5	1.61	1–3
Parental Intrusiveness	0.70	1.72	1.72	1.77	1–3

repeated measures of ANOVA was conducted to examine the main effects of groups (TD vs. ASD) and play setting (a social-play based setting and a motor skill-based setting) and the interaction effect between groups and play settings on parental behaviors. Post-hoc independent t-tests between groups in each setting were conducted to follow up on significant interactions found in the 2 × 2 (group × play setting) repeated measures of ANOVA.

3. Results

Descriptive information about the play settings can be found in Table 2. There were statistically significant correlations within and between settings in respect to parental behaviors. Significant correlations of parental behaviors ranged from −.58 to −.76 in the social-play setting and -.68 to 0.82 in the motor skill based play setting. Parental encouragement was correlated at 0.47 and parental detachment was correlated at - 0.60 between settings. None of the other behaviors between settings were significant. See Tables 3 and 4.

A 2 × 2 (group × play setting) repeated measures of ANOVA revealed a main effect of group on parental intrusiveness, $F(1, 16) = 6.48$, $p = 0.02$, indicating that the mean parental intrusiveness of parents of children with ASD was significantly higher ($M = 2.11$, $SD = 0.58$) than parents of TD children ($M = 1.61$, $SD = 0.61$) across both settings. There was no significant main effect of group on the other variables. Furthermore, there was no main effect of play setting on parental behavior variables. However, parental encouragement showed a significant interaction effect, $F(1, 16) = 16.84$, $p = 0.001$, suggesting that the effects of group on parental encouragement depended on play setting (Fig. 1).

Post-hoc independent t-tests between groups in each setting were conducted to follow up significant interactions of parental encouragement. Independent t-tests between groups in each setting indicated that parental encouragement for children with ASD ($M = 3.66$, $SD = 1.12$) was similar with TD children in a social play-based setting, (M = 3.11, S.D = 1.05), $t(16) = -1.08$, $p = 0.29$. However, in a motor-skill based play setting, there was a significant difference between groups on the variable of parental encouragement, $t(16) = 2.29$, $p = 0.04$, indicating that parental encouragement for children with ASD was lower, (M = 3.11, S.D = 0.78) compared to parental encouragement of TD children (M = 4, S.D = 0.87) (Table 5).

4. Discussion

The current study extends previous findings of parental behaviors of children with ASD by including a motor skill-based play setting which is distinctly different from a social-play based setting. In this study, various parental behaviors (i.e., parental encouragement, negativity, sensitivity, detachment, and intrusiveness) of parents of children with ASD and parental behaviors of parents of TD children were compared both in a social-play based setting and in a motor skill-based play setting. This study hypothesized that the parental-support dimension (parental encouragement and sensitivity) would vary depending on group (ASD vs. TD) and play setting (a social-play based and a motor skill-based play setting). A significant cross-over interaction effect was found on parental encouragement (a parental support-related behavior). There was no other statistically significant main effects or interaction effect on parental sensitivity, the other parental support-related behavior.

The current study found that the effects of group on parental encouragement in a social-play based setting was statistically significantly different than encouragement in a motor skill-based play setting. This result offers support that parental behaviors can be affected by multiple factors including the environment and child characteristics such as those that might differentiate children with ASD from those without (Sameroff, 1975). Previous empirical studies have also suggested that parental behaviors can vary depending on different contexts, especially individual variabilities of parental behaviors are increased in challenging parenting contexts (Isabella, 1998; Miller et al., 2002). Thus, the result of the current study suggests a need to examine supportive dimensions of parental behaviors of children with ASD across different types of play settings.

Post-hoc analysis (independent *t*-test between groups in each setting) of the interaction effect revealed that, parents of children

Table 3
Correlation for the Parental Behavior Rating Scales.

	1	2	3	4	5	6	7	8	9
Social Play									
1 Parental encouragement	–								
2 Parental negativity	0.10	–							
3 Parental sensitivity	0.20	−0.58*	–						
4 Parental detachment	−0.53*	0.27	−0.76**	–					
5 Parental intrusiveness	−0.05	0.45	−0.53*	0.37	–				
Motor-skill play									
6 Parental encouragement	0.47*	−0.15	0.33	−0.40	−0.30	–			
7 Parental negativity	−0.13	0.44	0.05	−0.20	0.09	−0.10	–		
8 Parental sensitivity	0.37	−0.11	0.45	−0.31	−0.22	0.82**	−0.13	–	
9 Parental detachment	−0.60*	0.24	−0.32	0.37	−0.04	−0.68**	0.17	−0.68*	–
10 Parental intrusiveness	0.15	0.13	−0.14	−0.15	0.12	−0.09	0.34	−0.20	−0.07

* $p < .05$.
** $p < .01$.

Table 4
The Main Effects of Groups (TD vs. ASD) and Play Settings (Social and Motor-Skill Play) on Parental Behaviors.

	Parental Encouragement		Parental Negativity		Parental Sensitivity		Parental Detachment		Parental Intrusiveness	
	F	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Groups	0.16	0.70	0.75	0.40	4.19	0.06	0.00	1.00	6.48	0.02*
Play Settings	0.87	0.36	0.33	0.58	0.19	0.67	2.03	0.17	0.64	0.43
Groups * Play Settings	16.84	0.00*	0.04	0.85	0.75	0.40	0.23	0.64	0.07	0.80

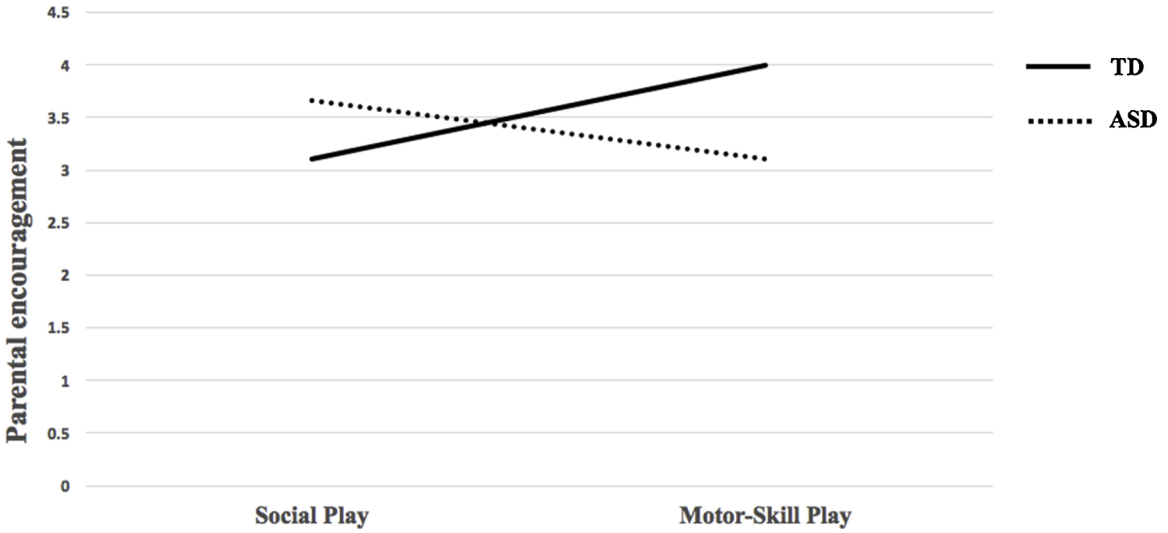

Fig. 1. The Interaction Effects of Groups and Play Settings on Parental Encouragement.

Table 5
Mean Difference in Parental Encouragement between groups in a social-play setting and a motor skill-based play setting ($df = 16$).

	TD (SD)	ASD (SD)	t	*p*	d^t
Social-play based play					
Parental encouragement	3.11 (1.12)	3.66 (1.05)	−1.08	0.29	0.51
Motor skill- based play					
Parental encouragement	4.00 (0.87)	3.11 (0.78)	2.29	0.04*	1.07

Note. TD = typically developing; ASD = autism spectrum disorder; d^t = Cohen's *d*.
* $p < 0.05$; ** $p <$ .01.

with ASD displayed significantly lower parental encouragement than parents of TD children in a motor skill-based play setting but not in a social-play based setting. This result was contrary to our hypothesis (parental encouragement of parents of children with ASD would be higher in a social-play based setting than parents of TD children but be similar in a motor skill setting). Even though some studies found that parents of children with ASD facilitate their child's play more by using more physical contact and initiate prompts compared to parents of TD children in free play settings (Doussard, Joe, Bazhaenova, & Porges, 2003; Lambrechts et al., 2015; Rutgers et al., 2007), the context of the environment may change some of these outcomes. It could be that the unfamiliarity of a motor skill-based play setting for parents of children with ASD ultimately impacted parenting skills within the setting. Abidin (1992) suggested that parenting skill competency is one of the factors that determines parental behaviors. When parents have low parenting skill competency, they may not actively provide scaffolding to their children. For example, if parents do not have experience participating in physical activities with their child (i.e., parents are not confident to play with their child in physical activity-based settings), they may be less effective in facilitating their child's play in a motor skill-based play setting compared to parents who do not have these prior experiences in physical activity-based setting.

Some research found that parents of children with ASD exhibited lower levels of physical activity than parents of TD children (Ayvazoglu, Kozub, Butera, & Murray, 2015; Haegele, Lee, & Chang, 2017). This gap is more apparent when children are younger, indicating physical activity participation of parents of children with ASD may be influenced by child independence and parental responsibilities (Haegele et al., 2017). In other words, if children are not independent and parents have other family-related responsibilities, physical activity opportunities for parents of children with ASD are less. In addition, the average age of the children with ASD in the current study was 5.2 years old, thus the parents which we were studying were more likely to provide a lot of parent

support to their children based on the age range. It is likely that parents of children with ASD may not have enough experience participating in motor skill-related activities.

Must, Phillips, Curtin, and Bandini (2015) found that parents of children with ASD reported significantly more barriers to participation in physical activity programs (e.g., too much supervision, behavioral problems, and poor motor skills) compared to parents of TD children. Moreover, most of interventions for children with ASD focused on their social skills which typically implemented in a free play setting (Wang & Spillane, 2009; Wang, Parrila, & Cui, 2013). Since motor skill deficits in children with ASD are relatively new research findings (Fournier, Hass, Naik, Lodha, & Cauraugh, 2010), participating in a motor skill-based setting may be new to parents of children with ASD. Based on these research findings, it is possible that parents of children with ASD may be less familiar with playing with their children than parents of TD children in a motor skill-based/physical activity play setting, thus resulting in parental encouragement differences between parents of children with ASD and parents of TD children in this type of setting.

However, the unfamiliarity of a motor-skill based play setting for parents of children with ASD is not enough to fully explain the parental encouragement difference between these groups. Another possible explanation is that the behaviors of children with ASD in a motor skill-based play setting. As parental behaviors are bidirectional (i.e., parental behaviors influence on child's behaviors and a child's behavior also influences parental behaviors), parents adapt their behaviors based on their child's behaviors (Sameroff, 1975). In addition to core characteristics of ASD, children with ASD also experience motor skill deficits in locomotor skills (Liu, Zhu, Ziegler, & Shi, 2015) object control skills (Ament et al., 2015), and core balance abilities (Whyatt & Craig, 2012), which may impact their motor behaviors. In the current study, children with ASD showed lower scores of motor skills compared to TD children, $t(16) = -4.18$, $p = 0.001$. The motor skill deficits in children with ASD may be challenging for parents trying to facilitate play which in settings which require motor skills of children with ASD. For example, if a child is easily tempered by the difficulty of riding a bicycle, it is hard for the parent to continue encouraging their child to ride it. Thus, it is possible that the motor skill deficits of children with ASD may allow their parents to show lower parental encouragement than parents of TD children.

Unlike the motor skill-based play setting, post-hoc analysis also revealed that parental encouragement of parents of children with ASD were not statistically different from parental encouragement of parents of TD children in a social-play based setting. It was expected that parents of children with ASD would more frequently and/or more strongly encourage their child to engage in activities in a social-play based setting compared to parents of TD children, because parents may already recognize their child's social and communication deficits (Frantzen et al., 2016). With this recognition, parents may try to reinforce or intervene their child's behaviors to improve their child's social interaction (Maljaars, Boonen, Lambrechts, Leeuwen, & Noens, 2014) but this trend did not occur in this study.

It is important to note that although both social and motor skill deficits of children with ASD may influence parental behaviors across both play settings, parental encouragement differences between parents of children with ASD and parents of TD children were found only in a motor skill-based setting, not in a social-play setting. This may be because parents of children with ASD may not recognize motor skill deficits of their child. When parents have appropriate knowledge about their children's abilities, they provide age and developmental matched teaching efforts to the children (Hunt & Paraskevopoulos, 1980). Compared to social skill deficits of children with ASD, motor skill deficits of them are relatively new research findings (Fournier et al., 2010; Hilton, Zhang, Whilte, Klohr, & Constantino, 2012) so the deficits may be new to parents of children with ASD. If parents of children with ASD recognized the motor skill deficits of their child, they might actively facilitate the behaviors of their child in a motor skill setting as they did in a social skill setting.

Unlike parental encouragement, the result of this study found that parental sensitivity of parents of children with ASD was not different from parental sensitivity of parents of TD children in both play settings. This result is not consistent with a previous study indicating that there was a significant interaction effect between groups (parents of children with and without developmental disabilities) and play context (free play versus a challenging task) (Ciciolla et al., 2013). The researchers found that there was no significant difference in parental sensitivity between mothers of children with DD and mothers of TD children in a free play setting but mothers of children with DD were significantly less sensitive to their child compared to mothers of TD children during the challenging task. However, the interaction effect of parental sensitivity was not found in the current ASD-focused study which includes a motor skill-based play setting. The result of the current study is consistent with other previous studies indicating that parental sensitivity of parents of children with ASD was not statistically significantly different from parents of TD children during playtime (Boonen et al., 2015; Wan et al., 2012).

The current study also found the main effect of group on parental intrusiveness between the two groups across both play settings, which aligns with our hypothesis. Parents of children with ASD displayed significantly higher parental intrusiveness (the degree of the parent's control of the child's behavior) across both play settings compared to parents of TD children. These findings are consistent with previous research indicating parents of children with ASD tend to display more directives toward their child such as high physical proximity and non-verbal prompts (Doussard et al., 2003; El-Ghoroury & Romanczyk, 1999; Lemanek et al., 1993). Facilitating child play without knowing the child's interests may lead the child to reject the parent's suggestions, which will ultimately increase parental intrusiveness. For example, parental intrusiveness would be indicated if a child rejects a parent idea about playing with a new toy, on the contrary if the child accepts the idea, parental encouragement would be coded because the child's play is extended by a parent. It is sometimes difficult for parents of children with ASD to realize their child's cues and signs because of social and communication deficits in children with ASD (Dabrowska & Pisula, 2010; Davis & Carter, 2008).

Unlike parental intrusiveness, there were no statistically significant differences on other parental behaviors (parental negativity and parental detachment) between parents of children with ASD and parents of TD child across both play settings. As regulatory and externalizing behavior problems of children with ASD may influence on their parent's stress level (Davis & Carter, 2008), parents of children with ASD may display higher negativity than parents of TD children (Reed & Osborne, 2014; Weitlauf, Vehorn, Taylor, &

Warren, 2014). Parenting stress is related with their emotion dysregulation which may impact on parenting (Crandall, Ghazarian, Day, & Riley, 2016). Given that, it is likely that parents of children with ASD would display higher negativity in both play settings than parents of TD children. However, this was not the case in the current study. One possible explanation as to why results differed from previous studies is that parents of children with ASD have less strict parenting rules and adapt their parenting environment more compared to parents of TD children (Maljaars et al., 2014). For parental detachment, the results of this study are consistent with previous studies, indicating that parents of children with ASD were engaged in natural play as much as parents of TD children (Kasari et al., 1988).

Limitations of the current study are not withstanding. It is possible that children and parents were aware of the video recording which may have influenced their natural behaviors. To minimize the effect of the camera the coding occurred between 3–8 min in each play session, allowing for the dyad to become familiar with the video camera. In addition, this study had a relatively small sample size, thus potential covariates such as child age, parent age, parent gender, income, and education were not included in statistical analysis. It is important to acknowledge that variability of child age can influence parental behaviors when considering child development. In this current study, there is a within group variability in regarding child and parent age, however, no statistically significant age differences (both child and parents) were indicated between the two groups. Moreover, there was no statistically significant gender difference between groups.

Declaration of Competing Interest

None.

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