Abstract Title Page
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Title: Guided versus Independent Play: Which Better Sustains Attention among Infants and Toddlers?

Authors and Affiliations: Nicole Gardner-Neblett, FPG Child Development Institute, The University of North Carolina at Chapel Hill; Steven J. Holochwost, Department of Psychology, The University of North Carolina at Chapel Hill; Kathleen Cranley Gallagher, FPG Child Development Institute, The University of North Carolina at Chapel Hill; Iheoma U. Iruka, FPG Child Development Institute, The University of North Carolina at Chapel Hill; Samuel L. Odom, FPG Child Development Institute, The University of North Carolina at Chapel Hill; Elizabeth P. Pungello, The University of North Carolina at Chapel Hill.

Abstract Body

Background / Context:

The extent to which children acquire knowledge and skills during development is, in part, dependent on how well they are able to sustain attention to the people, objects and events around them (Ruff & Rothbart, 1996). Sustained attention involves active engagement with a task for an extended period of time (e.g., Gaertner, Spinrad, & Eisenberg, 2008) and is an aspect of attention that is important in learning and performance (Ruff & Lawson, 1990), distinct from other forms of attention (Preston, Heaton, McCann, Watson, & Selke, 2009; Steele, Karmiloff-Smith, Cornish, & Scerif, 2012). Sustained attention has been linked to a number of developmental outcomes, including problem solving (e.g., Choudhury & Gorman, 2000), language skills (e.g., NICHD Early Child Care Research Network, 2003), and emotion regulation (e.g., Graziano, Calkins, & Keane, 2011), making it crucial for children's optimal development and functioning.

Rapid development of sustained attention occurs during infancy and toddlerhood, as neurological maturation allows children to increasingly attend to objects and events in the environment (Ruff & Rothbart, 1996).Play experiences during this period can serve as a context during which children's ability to attend can provide an opportunity for learning and development. However, there is limited empirical evidence for how independent play and play guided by an adult may be differentially associated with children's sustained attention.. Piagetian theory, with its emphasis on independent discovery, would suggest that play without adult guidance would be associated with the greatest levels of sustained attention; Vygotskian theory would suggest that children's interactions with an adult during guided play would be associated with the greatest sustained attention. Examining children's attention processes during play experiences with and without a teacher may provide information on which kinds of play activities are most useful for engaging children's attention during the first years of life within early child care and education settings.

Purpose / Objective / Research Question / Focus of Study:

In the current study we investigate how sustained attention among infants and toddlers differs during play activities guided by a teacher versus activities children engage on their own with the setting of a child care classroom. Our investigation was guided by two research questions: First, to what extent are guided play activities that teachers and children engage in together associated with greater levels of children's sustained attention compared to independent play activities in which children explore activities on their own? Given that adult behaviors that involve scaffolding, warmth, and responsivity have been associated with children's sustained attention (e.g., Graziano et al., 2011; Lawson, Parrinello, & Ruff, 1992), we hypothesized that guided play activities will be associated with higher levels of sustained attention compared to activities children engage on their own. Second, to what extent are there differences by children's age in the association between the type of activity and children's attention? We hypothesized that older children will be more likely to demonstrate sustained attention during play activities compared to younger children. This hypothesis is based on the research that shows that with age, children's sustained attention is increasingly dependent upon the social context and the research indicating that toddlers are better able to sustain attention due to greater neurological maturation (Ruff & Rothbart, 1996).

Setting:

The research was conducted at a high-quality, full-day child care program.

Population / Participants / Subjects:

Participants included 13 infants and toddlers and six teachers. Of the infants and toddlers,

three were between six and 12 months old, eight were 13 to 24 months old, and four were 25 to 36 months at the start of the study. The majority of the children were girls (N =10; 77%). Children were from racially and ethnically diverse backgrounds (six European American, three Hispanic/Latino, one African American, one Asian, and two biracial), and about half (N = 7; 54%) participated in the local Early Head Start program. Of the six teachers, two teachers worked with the 6 to 12 month olds, two worked with the 13 to 24 month olds, and two worked with 25 to 36 month olds. Teachers had five or more years of teaching experience, with three of the teachers holding a bachelors' degree in early childhood education/child development, two teachers with bachelors' degrees in other fields and one teacher with an associates' degree in early childhood education. All of the teachers met criteria for highly qualified teachers according to Early Head Start standards.

Intervention / Program / Practice:

The activities for the study were chosen and adapted from a set of developmentally appropriate activities to maximize infant/toddler engagement (Sparling & Lewis, 2006a; Sparling & Lewis, 2006b; Sparling & Lewis, 2006c). Guided play and independent play activities were developed for each of the three age groups: "infants" (6-12 months old), "younger toddlers" (13-24 month olds), and "older toddlers" (25-36 month olds). The guided play activities involved one-on-one teacher-child activities where the teacher scaffolded the child's involvement with the activity through open-ended questioning and commenting within a context of warmth and responsivity. The independent play activity consisted of an opportunity for children to explore materials or objects on his/her own without facilitation by an adult. Both guided play and independent play activities were conducted in four domains: social-emotional, music, book reading, and sensory (see Table 1). For the guided play activities, teachers followed a written protocol that featured responsive teaching practices, including asking open-ended questions, acknowledging children's efforts, providing any needed scaffolding, allowing conversational turn-taking, and responding to children's verbal and nonverbal cues (Landry et al., 2014). In the independent play activities, children were given a set of toys or books appropriate to the domain type and were free to engage with the objects without adult facilitation. Researchers instructed teachers to minimize interaction with the child while the child was playing independently.

Research Design:

For each activity domain, activities took place in three separate sessions on different days over the course of a week in an infant/toddler classroom setting. Each session consisted of two guided play activities and one independent play activity, with the order of activities being randomly assigned for each session. Children's eye gaze during the activities was used as a behavioral indicator of sustained attention (cf., Gianvecchio & French, 2002; Ruff, Capozzoli, & Weissberg, 1998). Eye gaze was defined as the child looking at the teacher or objects associated with the activity for at least two seconds. Trained research assistants observed and coded the presence of children's eye gaze from video recordings of sessions using the Observer Noldus software (Grieco, Loijens, Zimmerman, & Spink, 2010). The duration of each occurrence of eye gaze during the session was recorded and summed for each activity over the course of the three sessions. The proportion of the total time spent on eye gaze during a session was calculated for each guided play and independent play activity (i.e., the time of all instances of on-task eye gaze were summed for each session and then divided by the total time of the session to calculate the proportion of eye gaze for that activity). Higher proportions of eye gaze during an activity was used to indicate greater sustained attention. To determine inter-observer agreement, 25% of the videos were coded by two trained coders and calculated as a percentage of agreement on the

occurrence of the behavior and found to be 80%.

Data Collection and Analysis:

A single-case, alternating treatment design (SCD) was used to compare the performances of individual children in guided play (i.e., the treatment condition) activities and in independent play (i.e., the contrasting condition) activities (Kazdin, 2011). Data collected using this design can be displayed graphically (see Figure 1 for an example), and experimental control (which infers a causal relationship) is inferred when the participant's performances (in this case sustained attention) is consistently and clearly different for the different experimental conditions (i.e., guided play activities and independent play activities). This difference was tested using the Tau-U statistic (Parker, Vannest, Davis, & Sauber, 2011), which is calculated by comparing all the unique pairs of data points between activities within a session.

Findings / Results:

To address the research questions, comparisons of the guided play and independent play activities were conducted by age group for the four activity domains. Consistent with our first hypothesis, there were some differences in children's sustained attention as evident from children's eye gaze, with the guided play activities associated with a greater level of sustained attention than independent play for many of the activities. Our second hypothesis was also supported: or some activity domains there are differences by age in sustained attention, but not for other domains.

For the **social-emotional** domain, children of all age groups demonstrated greater attention when engaged in guided play activities than during independent play, as evident by the greater proportion of eye gaze in both types of socio-emotional guided play activities (Table 2). When examining the data by age group, results suggest that there were no differences by age, with both infants and toddlers showing greater sustained attention during the guided play activities than in the independent play activities. Children showed similar levels of sustained attention in both the guided play **musical activities** and the independent play activity (Table 3). While there were no differences in eye gaze between the activities for infants, some differences for toddlers were evident. For the younger toddlers, there were no differences in attention levels between the independent play activity and guided play activity 1 (Ten Little Bunnies) as evident by similarities in the eye gaze. There was a difference in children's attention between the independent activity and guided play activity 2 (Old MacDonald), such that children participating in Activity 2 showed greater eye gaze than during independent play. The older toddlers showed some evidence of the guided play musical activities being more engaging for them than independent play, as demonstrated in the statistical trend of guided play activity 1 (Monkey in a Tree) having a greater proportion of eye gaze than independent play and the statistically significant difference in eye gaze between independent play and guided play activity 2 (Shape Song). Younger toddlers demonstrated similar levels of sustained attention for both the guided play activities and independent **book reading** activities (Table 4), while older toddlers showed more sustained attention during the guided play activities than during the independent play activities as evident from children displaying a greater proportion of eye gaze during both guided play activities compared to the independent play. Finally, results show children's greater eye gaze during the guided play **sensory** activities compared to the independent play activity (Table 5). Results were similar for both groups of toddlers, suggesting no age differences in sustained attention. A statistical trend was found for guided play activity 1 (Musical Mystery) having a greater proportion of eye gaze than independent play for older toddlers.

Conclusions:

The overall goal of the study was to investigate how types of guided play and independent play activities engaged in an infant/toddler child care classroom were associated with differences in children's sustained attention. Results provide some support for our hypothesis that guided play activities would be associated with higher levels of sustained attention compared to independent play activities. When comparing these two types of activities, we found that the majority of activities that children engaged with teacher within the context of teacher scaffolding, warmth and responsivity were associated with greater displays of sustained attention than activities in which children engaged on their own. This finding aligns with previous research showing adult behaviors that scaffold children's involvement in activities within a context of warmth and responsiveness are linked to children engaging in activities for a longer period of time (e.g., Bono & Stifter, 2003), but also extends this line of research by showing that not all guided play activities were associated with greater sustained attention compared to independent play activities. In particular, guided play activities in the social-emotional and sensory domains were consistently more likely to be associated with greater levels of sustained attention than independent play activities in those same domains, while children's sustained attention in the activities in the music and book reading domains varied depending on their age and the activity type. Both younger and older toddlers showed greater sustained attention for the guided play activities than the independent play activities in the music domains, but infants showed equal levels of sustained attention in both types of musical activities. However, unlike the musical activities, there were differences between the two toddler groups in their sustained attention during book reading activities, such that older toddlers were more likely than younger toddlers to sustain attention when book reading was guided by a teacher than when exploring books on their own.

While this study contributes to the literature on how teachers may use classroom activities to support children's development of sustained attention, one important limitation is that the study did not include examination of other factors that are likely to contribute to the extent to which children sustain attention during play activities. Children respond to activities differently based on their own characteristics (e.g., age, gender, temperament; Graziano et al., 2011), as well as their families' cultural background, socioeconomic status, and experiences (Smith, Wolff, Koschel, & Vallarelli, 2014). Therefore future studies examining sustained attention during play activities by children's backgrounds and characteristics may inform understanding about the activities that are most likely to sustain children's attention.

Nevertheless, the current study contributes to the understanding of how guide play and independent play activities are associated with sustained attention among infants and toddlers in a child care setting. While children can benefit from independent exploration, they may also benefit from engaging in one-on-one activities with a teacher, a possibility that may be most feasible in settings with low adult-child ratios. In addition, teachers may need support in the form of professional development opportunities to identify ways that they can intentionally interact with young children in play activities that will support children's development of sustained attention. In providing children with experiences that are geared toward maximizing their sustained attention during play activities, teachers can promote children's early capacity to regulate their attention and thus, foster in children the skills needed for later school readiness and success.

Appendices

Appendix A. References

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Appendix B. Tables and Figures

Table 1
Descriptions of Activities by Domain and Children's Age

Domain	Age group	Guided Play Activity 1	Guided Play Activity 2	Independent Play Activity
Social-Emotional	6-12 months	"Let it go": Shaking and dropping toy keys while adult describes actions	"Pictures of Babies": Using photos of babies with various facial expressions to discuss emotions	Explore a set of books with photos of children (e.g., "All about me" and body books)
	13-24 months	"Give Me More": Building towers of blocks with opportunity to practice asking for "more" blocks	"Mirror Play": Making facial expressions and discussing emotions using mirrors	Explore a set of books with photos of children (e.g., "All about me" and body books)
	25-36 months	"I Feel": Pretend play of matching feelings with appropriate actions (e.g., feeling cold and getting a sweater)	"Feelings in Pictures": Using photos of children to discuss various emotions (e.g., happy, sad, surprised)	Explore a set of books with photos of children (e.g., "All about me" and body books)
Music	6-12 months	"Shake It": Singing a song while shaking a rattle	"Patty Cake": Singing while acting out movements	Play with basket of music instruments (e.g., shakers, jingle bells)
	13-24 months	"Ten Little Bunnies": Singing a song while acting out finger play	"Old MacDonald": Singing song with puppets and animal sounds	Play with basket of music instruments (e.g., shakers, jingle bells)
	25-36 months	"Monkey in a Tree": Singing a song while acting out finger play	"Shape Song": Singing song with shape identification	Play with basket of music instruments (e.g., shakers, jingle bells)

Book reading	6-12 months	n/a	n/a	n/a
	13-24 months	"Read Through": Child selected a book and teacher read the book as written	"Interactive Reading": Child selected a book and teacher read interactively (e.g., open-ended questions, sentence completion, vocabulary instruction, expressive voices)	Explore a basket of books
	25-36 months	"Read Through": Child selected a book and teacher read the book as written	"Interactive Reading": Child selected a book and teacher read interactively (e.g., open-ended questions, sentence completion, vocabulary instruction, expressive voices)	Explore a basket of books
Sensory	6-12 months	n/a	n/a	n/a
	13-24 months	"Sensory exploration bottles": Using clear plastic bottles filled with water and small objects to discuss objects and senses (e.g., "What do you see? What do you hear?")	"Textured Cards": Using cards with attached materials of different textures (e.g., smooth, scratchy, fluffy) discuss textures with child	Explore a basket of "Touch and Feel" books
	25-36 months	"Musical Mystery": Using musical instruments hidden in an opaque box to discuss the sounds while child guessing mystery item	"What's in the Sock?": Using a textured object hidden in a sock to discuss the object and texture	Explore a basket of "Touch and Feel" books

Table 2

Weighted Tau-U Statistics for Comparisons of Eye Gaze during Social-Emotional Activities

6-12 Month Olds										
	Guided Play Activity 1 ("Let It Go") vs. Independent Play					Guided Play Activity 2 ("Pictures of Babies") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*P*	*T*	VAR_T	90% CI	*z*	*P*
Eye Gaze	1**	.38	.43, 1.57	2.87	.004	1**	.38	.43, 1.57	2.87	.004
13-24 Month Olds										
	Guided Play Activity 1 ("Give Me More") vs. Independent Play					Guided Play Activity 2 ("Mirror Play") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*P*	*T*	VAR_T	90% CI	*z*	*P*
Eye Gaze	.78**	.29	.29, 1.26	2.65	.008	1***	.29	.52, 1.48	3.40	.001
25-36 Month Olds										
	Guided Play Activity 1 ("I Feel") vs. Independent Play					Guided Play Activity 2 ("Feelings in Pictures") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*z*	*p*
Eye Gaze	.78**	.29	.29, 1.26	2.65	.008	.85**	.29	.37, 1.34	2.90	.004

NOTE: + p<.10, * p<.05, ** p< .01, *** p<.001

Table 3

Weighted Tau-U Statistics for Comparisons of Eye Gaze during Music Activities

6-12 Month Olds										
	Guided Play Activity 1 ("Shake It") vs. Independent Play					Guided Play Activity 2 ("Patty Cake") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*P*	*T*	VAR_T	90% CI	*z*	*p*
Eye Gaze	.05	.31	-.45, .56	.17	.87	.15	.31	-.35, .66	.50	.62
12-24 Month Olds										
	Guided Play Activity 1 ("Ten Little Bunnies") vs. Independent Play					Guided Play Activity 2 ("Old MacDonald") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*P*	*T*	VAR_T	90% CI	*z*	*P*
Eye Gaze	.41	.29	-.08, .89	1.39	.16	.63*	.29	.15, 1.11	2.14	.032
24-36 Month Olds										
	Guided Play Activity 1 ("Monkey in a Tree") vs. Independent Play					Guided Play Activity 2 ("Shape Song") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*z*	*p*
Eye Gaze	.56+	.29	.07, 1.04	1.89	.06	.85**	.29	.37, 1.34	2.90	.004

NOTE: + p<.10, * p<.05, ** p< .01, *** p<.001

Table 4

Weighted Tau-U Statistics for Comparisons of Eye Gaze during Book Reading Activities

12-24 Month Olds										
	Guided Play Activity 1 ("Read Through") vs. Independent Play					Guided Play Activity 2 ("Interactive Reading") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*Z*	*p*
Eye Gaze	-.11	.29	-.60, .37	-.38	.71	.11	.29	-.37, .60	.38	.71
24-36 Month Olds										
	Guided Play Activity 1 ("Read Through") vs. Independent Play					Guided Play Activity 2 ("Interactive Reading") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*Z*	*p*
Eye Gaze	.82**	.31	.32, 1.33	2.67	.008	.92**	.31	.42, 1.43	3.00	.003

NOTE: + p<.10, * p<.05, ** p< .01, *** p<.001; Data for 6-12 month olds were not available for book reading activities

Table 5

Weighted Tau-U Statistics for Comparisons of Eye Gaze during Sensory Activities

12-24 Month Olds										
	Guided Play Activity 1 ("Sensory Exploration Bottles") vs. Independent Play					Guided Play Activity 2 ("Textured Cards") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*z*	*P*
Eye Gaze	1***	.29	.52, 1.48	3.40	.001	1***	.29	.52, 1.48	3.40	.001
24-36 Month Olds										
	Guided Play Activity 1 ("Musical Mystery") vs. Independent Play					Guided Play Activity 2 ("What's in the Sock?") vs. Independent Play				
	T	VAR_T	90% CI	*z*	*p*	*T*	VAR_T	90% CI	*z*	*p*
Eye Gaze	.58+	.32	.06, 1.09	1.83	.07	.82**	.32	.31, 1.35	2.64	.008

NOTE: + p<.10, * p<.05, ** p< .01, *** p<.001; Data for 6-12 month olds were not available for sensory activities

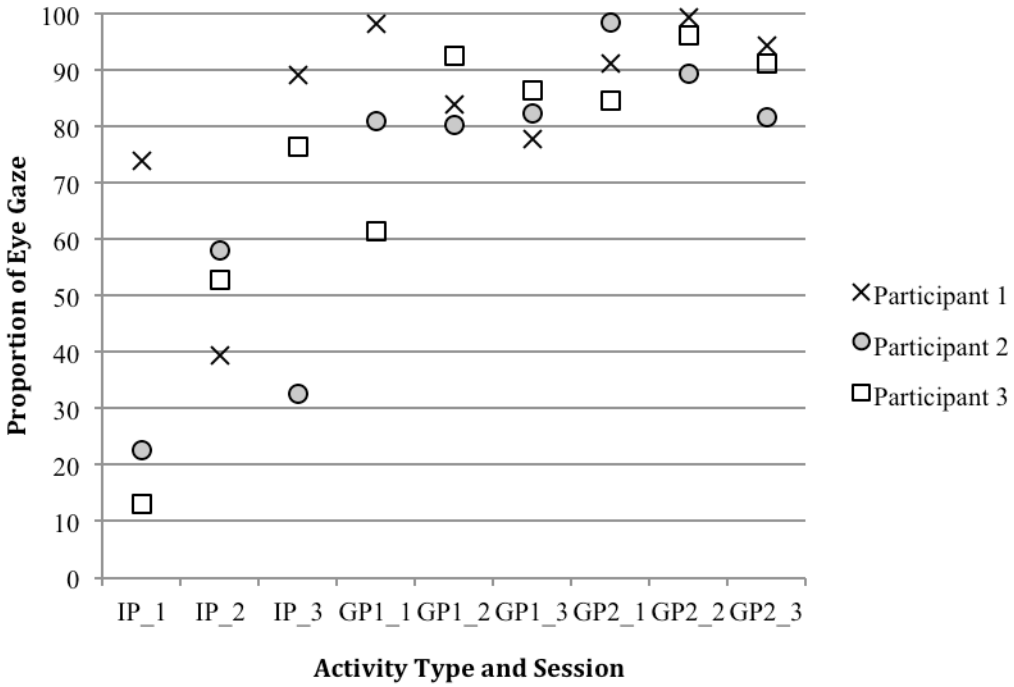

Figure 1. Example of graphed proportion of eye gaze during independent play and guided play social-emotional activities for three younger toddler participants. IP_X = independent play for session X and GPX_X = guided play activity X for session X.