Predicting Cognitive Development through Play Behavior in Adopted Children

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The data from fifty-four children who were internationally adopted from institutional care settings between 18-36 months of age were analyzed in respect to their quality of play during a parent-child play setting. A coding scheme developed by Belsky and Most (1981) was used to evaluate the quality of play the child engaged in during two play segments taken place 6-8 months apart. A rate of change was found and used to determine whether children's cognitive recovery from deprivation can be predicted by their quality of play soon after adoption. In addition to play quality, the child's engagement during the play segments was also evaluated in respect to their overall play ability. In analyzing these play scales with the child's cognitive ability at 12-months post adoption taken from the Mullen Scales of Early Learning (Mullen, 1995), no significant correlations were found.

Children who experience deprivation early in life, such as in settings of orphanage care, tend to fall behind in their later development including the physical, cognitive, social and emotional domains. When these children are adopted into their new families, they tend to rebound and meet their proximal development (Wilson & Weaver, 2009), but some do not fully recover. It is important to understand which of these children will need the help of intervention services when they are first adopted into their new families to help them rebound and meet their ideal development (Gunnar, Bruce, & Grotevant, 2000). Soon after adoption, when these intervention services could be of the most benefit, it is difficult to know which children will need the extra help. Researchers in the field are trying to determine factors that can be used to assess children after adoption to tell which ones will have more difficulty recovering from their early deprived situations.

Many standard tests are not particularly effective soon after adoption because they require children to have an understanding of the English language and many children reared in institutional care settings are language delayed. Therefore, it is important to find non-verbal tasks that could be successfully measured in recently adopted children and that can be used to predict their later development. Evaluation of play behavior is one task that could be used for this purpose. In addition to the use of medical testing and standardized assessments, free play and social interactive behaviors could also be observed as a measure of developmental attainment in adopted children (Diamond et. al., 2003).

As the play behavior that a child engages in develops over time, it is possible to determine the stages of play behavior that a child should partake in at certain ages. At lower stages of development, children engage in lower levels of play behavior, but as development progresses the frequency of these lower level behaviors declines as children explore higher levels of play behavior more often (Belsky & Most, 1981). For example, low level manipulation of toys will progress into pretense play behavior as children reach higher stages of development. This developmental progression is not dependent on language ability, which makes play behavior a useful measure in examining development across cultures. By using a nonverbal measure such as play behavior, there are fewer limitations than verbally based developmental assessments as these children are often times beginning to learn a new language. Because play behavior is an indicator of cognitive development (Fein & Apfel, 1979), it could potentially be used as a predictor as to which children would benefit from receiving additional services soon after adoption and would in turn help to increase their cognitive ability later in life.

The goal of this research was to determine if the cognitive ability of internationally adopted children could be predicted through the play behavior in which the child engages. It was

hypothesized that the children who partake in higher quality of play behavior will have higher scores on an assessment of cognitive ability, whereas children engaging in lower quality play will have lower scores for cognition.

Methods

Participants

The participants are fifty-nine children who took part in a larger study being conducted. These children were seen at 3 different lab assessments which included participation in parent-child play segments and an assessment of cognitive ability. Children were adopted between the ages of 18-36 months from institutional care settings and began assessments 1-2 months post adoption. The first two session visits took place 6-8 months apart and consisted of the parent and child partaking in a free play segment that lasted a total of 8 minutes. The participants were also seen at 12 months post adoption for an assessment on cognitive ability through the Mullen Scales of Early Learning (Mullen, 1995). Two of these children were excluded from the data as they met the exclusionary criteria for certain developmental disorders, one was excluded because of missing video for which to code the play segment, and two were excluded because the cognitive assessment was unable to be completed. Thus, there were fifty-four participants (24 male, 30 female) whose data were analyzed here in respect to predicting cognitive ability through the quality of play being engaged in.

Materials

As part of the larger study being conducted, the children were filmed engaging in a free play segment with their parent. These free play segments were filmed and the videos of these segments were analyzed in this study in regard to the quality of play being engaged in. The play segments lasted for 8 minutes and the parent and child were instructed to play as they normally

would at home. The toys available during these segments were an alphabet puzzle, a basketball, building blocks, a school bus with people, an Etch-A-Sketch, a hammer and ball set, letter blocks, a Mr. Potato Head, a soccer ball, and a textile ball.

At 12 months post adoption, the participants came back into the lab as part of a cognitive assessment. At this assessment the children were given an IQ test developed by the Mullen Scales of Early Learning (Mullen, 1995) and scores were obtained on the child's cognitive ability. These scores included measures on visual reception, fine motor, receptive language, and expressive language which were compiled into an overall composite score for IQ.

Procedure

For this study, the free play segments that the child engaged in were analyzed using a coding scheme developed by Belsky & Most (1981) that categorized the child's play into 12 different categories of quality of play. For this project, an additional category was added for when the child didn't engage in play. For this coding scheme, a 15 second time sampling method was used in which the child's most mature level of play was coded for within each time period. Each category of play is attached to a number and was coded as having that value attached to it, with higher levels of play having a higher number associated with it. For segments that were coded as having no play being explored, the time period was labeled as missing. An aggregated quality of play score was computed in two ways. First, the sum of scores across the 32 available segments was made, using the mean of scores for any missing segments. Second, a mean of available segments was computed. As statistical results for these two metrics did not differ, results are reported below using the sum of the scores.

In addition to quality of play, play engagement was also assessed for the measure of play behavior. Engagement in play was calculated by measuring 2 different aspects of the play

segments. The first measure was a measure of play duration, or the total amount of time, measured in seconds, which the child played with any toy across the 8 minute period. The second measure, frequency of play, was the number of play bouts that the child engaged in across the 8 minutes of play which takes into account the child switching between toys, or pausing for a period of time before beginning play with the same object. Duration and frequency of play were the two measures of engagement that were analyzed in respect to cognitive ability.

Thus, a total of three measures of play behavior were coded within the free play segments. These include the quality of play, the duration of play, and the frequency of play. After computing variables for time 1 and time 2 for each of these measures of play behavior, a change score between the two sessions was compiled. Each of these measures were analyzed separately in respect to the child's cognitive score from the Mullen. In addition to the separate analyses of each of these variables, an overall index of play was computed as the average of the three play codes at each session visit and once again finding a rate of change between the two. This overall play ability score was then analyzed in respect to the child's cognitive ability.

A total of 18.5% of the free play segments being coded were subject to reliability testing. A second rater scored a total of 20 tapes in order to get a composite inter-rater reliability score. A kappa score of .75 was given for the overall reliability of quality of play between the two coders. Reliability was also analyzed in respect to engagement in play. Reliability for engagement was established if the amount of time each toy was played with was within 10 seconds between the two raters. A reliability score of 90.1% was found for the duration of play between the two raters at this standard. A score of 91.25% was given for the reliability between the coders on the frequency of play portion of the engagement coding scheme.

Results

Analyses of the data consisted of correlational scores between the measures of play behavior and the cognitive scores derived from the Mullen. Here, descriptive statistics are presented for the raw and aggregated play measures. Next, in order to examine development of play over time, a within subject t-test was conducted. Finally, correlations were run between play variables and the Mullen with and without controlling for sex and age at adoption. Quality of play could range in value from 0 to 384. The quality of play was measured at session 1 ($M = 125.45$, $SD = 19.01$) and session 2 ($M = 129.11$, $SD = 17.24$) and their correlation was $r(54) = -.075$, ns. The frequency of play, which could range from 0 to 23, was found at session 1 ($M = 13.11$, $SD = 3.91$) and at session 2 ($M = 11.13$, $SD = 2.62$); these were non-significantly correlated at .211. The duration of play, which could range from 0 to 480, was analyzed at session 1 ($M = 416.84$, $SD = 65.34$) and at session 2 ($M = 441.36$, $SD = 29.08$) and correlated at .111, which is also non-significant. Each play metric was normally distributed.

Because play was thought to change over the course of the child's development during the 6-8 months between sessions, the three play metrics were tested for rate of change. Change scores for play quality, frequency of play, and duration of play were measured by finding the difference between session 2 and session 1 scores. Each of the three change scores were tested against zero in using t-tests; no play measure showed significant change over time.

Pearson Correlations were then computed between the session 1 scores and the different subsets of the Mullen cognitive scores. Quality of play showed a range of correlations with the Mullen measures between -.189 and .106 ($p > .05$). Frequency of play and Mullen correlations ranged between -.048 and .086 ($p > .05$). The correlations for duration of play and Mullen were seen to be within -.061 and .166 ($p > .05$). These correlations are displayed within Table 1. The Pearson correlations displayed for these three measures of play did not show any significant

interactions with any of the subsets of cognitive ability derived from the Mullen. Note that findings were comparable when either the session 2 or change score play metrics were used, rather than the session 1 scores.

As the individual measures of play behavior did not have any interaction with cognitive ability, the relationship between the measures of play as a whole was analyzed. Pearson correlations were used to understand how quality of play, frequency of play, and duration of play interact together at each session. These results can be seen in Table 2. The relationship between the three different aspects of play behavior for each session visit was significantly correlated ($p < .001$) and the correlations ranged between -.559 and .626. This relationship between the measures of play behavior makes it possible to create a combined score for overall play that the child engages in. This was done by computing the mean of play quality, frequency of play, and duration of play at each session and creating a change score between the two visits. The change score for overall play was then analyzed within a Pearson Correlation for the cognitive ability found from the Mullen. The correlations with the Mullen were found to be within -.170 and .026, but were not significantly related. This is shown within Table 3.

A subsequent exploration of partial correlations between overall play behavior and cognitive ability controlling for sex and age at adoption were analyzed. Partial correlations were found for sex at -.073 and age at adoption at -.097 between overall play behavior and the Mullen Composite score, but these were not statistically significant. Table 3 shows the results of the partial correlations between play behavior and cognitive ability scores.

Discussion

This study was designed to assess whether the outcome of cognitive development can be predicted by the quality of play that a child engages in soon after adoption. The results did not

support the hypothesis made that a higher quality of play being engaged in by the child would reflect a higher level of cognitive ability. Several explanations for these results can be made. First, there could be other measures of adversity that control for the quality of play in comparison to the child's cognitive ability. For this study we considered the child's sex and the age at adoption as potential covariates which clarify the correlation between play and cognition, however this was not seen. Other measures of adversity could control for these variables and result in the outcomes that were hoped for within this study.

Second, the child's temperament could play a role on the type of play that they engage in during these play segments. Children who are bold or shy may show differences in the type of behavior that they engage in and this could relate to the types of play in which they partake. A measure of temperament may produce more significant correlations in respect to the child's quality of play as it may influence the choice of engaging in certain behaviors. The play behavior that is chosen may be a factor of temperament in this set of participants rather than a direct link to cognitive development.

In addition to both of these potential explanations for the non-significant correlations that were found between play and cognition, the parent's role during the play segment could also have been a factor. As the parent assisted the child during these free play segments, it is possible that we are coding for a combined score of play for the child and their parent. As the parent may influence the child's choice of what to play with or how to play, the child's true measure of play may not be factored into the analyses. Parents can influence the play behavior by picking toys for their child that support certain types of play over others. This could result in children taking part in either higher or lower levels of play behavior than they would typically engage in on their own.

Certain limitations should be considered when interpreting the results of this study. First, this was a relatively small sample of children whose data was analyzed for this study. As part of the larger study, more children have participated. However, for this aspect of research, only those children who had completed sessions 1, 2, and were given a score on the Mullen were analyzed. Children who were late enrolled and didn't begin the larger study until session 2 were excluded in this data analysis. From those participants whose data was used here, there were a few additional participants whose data could not be used. This resulted in a smaller number of participants whose free play data was analyzed and could have an influence on the results that were found. However, this lack of power would have contributed to the lack of statistical significance more than it would to the small size of the correlations.

Another limitation of this study is the reliability score for the quality of play that was engaged in. The overall kappa score for reliability cases was .75 with a range of individual kappa scores of .48 through .92. This range of reliability cases brings into question the relationship between play quality and cognition. A higher inter-rater reliability score could potentially have resulted in a more significant relationship between play behavior and cognition. However, only the quality of play score was plagued by a lower kappa reliability. Frequency and duration of play had high reliability metrics, yet did not reveal relations with the cognitive measures.

In conclusion, the results from this data analysis do not show any significant relationship among this group of participants between their play behavior and cognitive ability. From these results, it seems that using play behavior as an evaluative factor for better understanding which children will need additional services soon after development would not be an effective measure. However, it should be taken into account the possible explanations for the results that were found and the limitations of this data analysis. It is possible that evaluation of play behavior may still

be an effective measure for understanding which children would benefit from additional services soon after adoption to reach their proximal development, but other research would need to be analyzed in respect to child free play behavior.

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Table 1
Correlations between Play Quality, Frequency of Play, Duration of Play, and Mullen Scores at Session 1

	Mullen Score				
Variable	Visual-Reception	Fine-Motor	Receptive-Language	Expressive-Language	Composite-Score
Play Quality	.106	-.048	-.189	-.152	-.058
Frequency of Play	-.048	-.008	.086	.006	.016
Duration of Play	.166	-.061	.059	.037	.075

Note. None of these correlations were significant at $p < .05$.

Table 2

Correlations between Play Quality, Frequency of Play, and Duration of Play

	Play Quality		Frequency of Play		Duration of Play	
Variable	T1	T2	T1	T2	T1	T2
Play Quality						
T1	---	.171	-.479**	-.288*	.626**	.171
T2	-.075	---	.028	-.429**	-.059	.495**
Frequency of Play						
T1	-.479**	.028	---	.211	-.546**	-.168
T2	-.288*	-.429**	.211	---	-.239	-.559**
Duration of Play						
T1	.626**	-.059	-.546**	-.239	---	.111
T2	.171	.495**	-.168	-.559**	.111	---

Note. T1=Time 1; T2=Time 2.

*p < .05, **p < .01

Table 3

Correlations between Overall Play Behavior and Mullen Composite Score; Partial Correlations for Sex and Age at Adoption and Mullen Composite Score

Variable	Mullen Composite
Overall Play Behavior	-.059
Sex	-.073
Age at Adoption	-.097

Note. Correlations are not significant at $p < .05$.