DOCUMENT RESUME

ED 447 935 PS 029 039

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TITLE Effects of Child and Teacher Characteristics on Children's Observed Engagement.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 2000-08-00
NOTE 14p.; Paper presented at the Annual Convention of the American Psychological Association (108th, Washington, DC, August 2000).
CONTRACT R307F70099
PUB TYPE Numerical/Quantitative Data (110) -- Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Attention; Child Behavior; Competence; Persistence; Personality; *Preschool Children; Preschool Education; *Preschool Teachers; *Student Characteristics; *Teacher Characteristics; *Teacher Student Relationship
IDENTIFIERS *Student Engagement

ABSTRACT

Noting that there is little information available about how child and teacher characteristics are related to child engagement behaviors, this study examined the effects of child characteristics on observed engagement in early childhood settings, and the interaction effects of child characteristics and teacher interaction behaviors on observed engagement. Participating in the study were 71 children and 40 lead teachers selected from 40 classrooms at 17 child care centers. Approximately half were female; half were racial or ethnic minorities. All the teachers were female. Of interest for this study were parent ratings of child engagement in two areas (competence and persistence) and personality and competence in three areas (attention, behavior modulation, and verbal/emotional expressiveness). Teachers were rated for their quality of redirective, elaborative, and nonelaborative interactive behaviors and the quality of their affect. Children's engagement level (sophisticated, differentiated, focused attention, unsophisticated, nonengagement) was based on observations during 15-minute observation sessions. The findings of the study suggest that nonelaboratives such as praising or introducing should not be used excessively with attentive and active children. Some engagement levels (sophisticated, differentiated, nonengagement) are susceptible to treatment-by-aptitude effects, others are not (differentiated, unsophisticated). Some teacher interaction behaviors are equally effective (affect) or ineffective (redirectives) regardless of child characteristics. Active and emotionally expressive children are likely to spend time in sophisticated engagement, regardless of teacher interaction. (Contains 12 references.) (KB)

Effects of Child and Teacher Characteristics on Children's Observed Engagement

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Poster session presented at the 108th Annual Convention of the American Psychological Association, Washington, DC, August 2000. Development of this manuscript was supported by a grant from the Office of Educational Research and Improvement, U. S. Department of Education (R307F70099). The contents do not necessarily represent the policy of the Department, however, and you should not assume endorsement by the federal government.

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Engagement has been defined as the amount of time children spend interacting with adults, peers, or materials in a developmentally and contextually appropriate manner (McWilliam & Bailey, 1995). Early research on children's engagement behavior examined teacher effectiveness and optimal environments. Teacher-effectiveness research confirmed that engaged time is positively related to student achievement (e.g., Berliner & Rosenshine, 1977; Fisher & Berliner, 1985). Ecological-behavioral research identified specific aspects of the environment (e.g., smooth transitions, accessible toys, modified open room arrangements) that contribute to higher levels of engagement (e.g., Montes & Risley, 1975; Twardosz, Cataldo, & Risley, 1974). More recent research has examined the effects of child care program quality on young children's engagement. Along with aspects of the physical and structural environment, teachers' affect (e.g., warmth, responsiveness) and sensitivity are positively related to levels of group engagement (Ridley, McWilliam, & Oates, 2000). Furthermore, Lussier, Crimmins, and Alberti (1994) found that caregivers are able to increase the quality of children's engagement through stimulating and contingently responsive behavior.

Although there is compelling evidence that environmental quality and teacher characteristics are associated with child engagement, there is little information available about how child characteristics are related to engagement behaviors and about the interaction effects of child and teacher characteristics. The purpose of this study is to examine (a) the effects of child characteristics on observed engagement and (b) the interaction effects of child characteristics and teacher interaction behaviors on observed engagement.

Method

Participants

Seventy-one children and 40 lead teachers (i.e., caregivers) were recruited as participants. Using stratified sampling, the children were selected from 40 classrooms at 17 child care centers. The children were balanced across demographic variables so that approximately half were female and half were racial or ethnic minorities. The children ranged in age from 11 months to 34 months ($M = 23.76$ months) at the beginning of the study, and all of the children had attended their child care centers for at least three months prior to the onset of data collection. The teachers who participated in the study were identified by center directors as the lead teachers in the classrooms from which the children had been recruited. All of the teachers were female.

Measures

Two rating scales were used to gather information about child characteristics that might have an effect on children's engagement behavior. Parent ratings were used in order to avoid potential teacher bias and also because parents have the opportunity to view their children's behavior patterns across many situations. The Children's Engagement Questionnaire (CEQ; McWilliam, 1991) is a 32-item instrument designed to rate children's global engagement in four areas: competence, persistence, undifferentiated behavior, and attention (undifferentiated behavior and attention were not analysis variables). The Childhood Personality Scale (CPS; Dibble & Cohen, 1974) is a 48-item instrument that measures a child's general personality and competence in five areas: attention, behavior modulation, sociability, zestfulness, and verbal/emotional expressiveness (sociability and zestfulness were not analysis variables).

Information regarding teacher characteristics was gathered using the Teaching Styles Rating Scale (TSRS; McWilliam, Scarborough, Bagby, & Sweeney, 1996). The TSRS is a 20-

item instrument designed to measure the quality of specific interactional behaviors (i.e., redirective, elaborative, and nonelaborative) and affective characteristics (i.e., affect) of early childhood teachers.

The Engagement Quality Observation System III (E-Qual; McWilliam, 1998) is a momentary time-sampling device for coding children's observed engagement levels (i.e., sophisticated, differentiated, focused attention, unsophisticated, and nonengagement). Children's engagement behavior is coded at 15-second intervals during 15-minute observation sessions. The 15-minute duration of each observation session and the total number of observation sessions were determined by previous research (McWilliam & Ware, 1994).

Procedure

Parents completed questionnaire data (i.e., CPS and CEQ) at the onset of the study and research assistants collected all other data. Each classroom received an initial visit in which the TSRS was completed. Classroom observation sessions lasted approximately 3 to 4 hours and the TSRS was scored at the end of the observation session. E-Qual data were collected over the course of five months. Each child was observed on two separate occasions during four separate classroom visits, which equaled eight separate observation sessions. A stopwatch signaled observers to code the most recently observed behavior at the end of each 15-second interval. A total of 148 observation sessions (21%) were double-coded to monitor inter-rater agreement and to prevent coder drift. Kappa coefficients ranged from .38 to .96 ($M = .65$).

Data Analysis

Data screening prior to any analysis indicated collinearity among some of the independent variables. All independent variables were therefore centered. The general linear model (GLM) procedure was then used to build regression models investigating which child characteristics and which interactions between child characteristics and teacher interaction behaviors are central in explaining individual differences in young children's engagement. To reduce the number of independent and dependent variables, specific variables of interest were selected. Independent variables were five child characteristics (i.e., competence, persistence, attention, behavior modulation, and verbal/emotional expressiveness) and four teacher interaction behaviors (i.e., redirective, elaborative, nonelaborative, and affect). Dependent variables were five engagement outcomes: sophisticated engagement, differentiated engagement, focused attention, unsophisticated engagement, and nonengagement.

Because the engagement outcomes measured in this study were mutually exclusive, five separate engagement models were built: one model for each level of engagement. To further decrease the number of independent variables in each engagement model, we first tested four reduced models for each engagement outcome (i.e., a total of 20 models). Each of those four models consisted of a classroom variable, the five child characteristics, and only one of the teacher interaction behaviors at a time (see Table 1). Fifty-three children in the present study shared their teacher's scores on the teacher variables with at least one other child in the study. To control for this shared classroom variance, the variable *classroom* was entered first (as a covariate) in all models. This procedure allows for the analysis of nested designs. As a result all classroom-level variables were collinear, and unique estimates for the main effects of these variables could not be reported. Because our research question concerned the interaction of child and teacher variables, noteworthy interactions between child characteristics and teacher interaction behaviors in each model were then selected and entered into a final model, along with the main effects for each child characteristic. Noteworthy interactions were plotted to aid interpretation.

Results

Means and standard deviations of the child characteristics, teacher interaction behaviors, and child engagement behaviors are presented in Table 2. Whereas the mean score for children's competence, persistence, and verbal emotional expressiveness scores fell towards the higher end of the scale on which each was measured, the mean score for attention and behavior modulation fell at the midpoint of the scale. The mean scores on teachers' interaction behaviors indicated that teachers occasionally used elaborative and nonelaborative interaction behaviors, they regularly issued redirectives, and were moderately warm in their interactions with children. The most frequently occurring child engagement behaviors were differentiated engagement and focused attention, whereas nonengagement was the behavior least frequently observed.

Main effects of child characteristics and interaction effects of child characteristics and teacher interaction behaviors are presented in Tables 3 through 7. After controlling for all other variables including classroom, children's persistence accounted for 3% of the variance and behavior modulation accounted for 5% of the variance in sophisticated engagement (see Table 3). The unstandardized regression weight for these variables indicated that children with higher persistence scores spent *less* time engaged in sophisticated behaviors, whereas children with higher behavior modulation scores were *more* likely to engage in sophisticated behaviors. In addition to these two main effects, the interaction between teachers' nonelaboratives and children's attention accounted for an additional 7% of the variance in children's sophisticated engagement (see Table 3). Inspection of the unstandardized beta weight and the plot for this interaction revealed that when teachers' use of nonelaboratives increased, every 1-point increase on the attention scale was related to a 5.5% decrease in the amount of time spent in sophisticated engagement.

After controlling for all other variables including classroom, only children's competence and behavior modulation accounted for the amount of time children were engaged in differentiated behaviors (see Table 4). Ratings of competence were negatively related to differentiated engagement: The higher children's competence ratings, the *less* time they spent in differentiated engagement. In contrast, the unstandardized regression weight for behavior modulation suggested that children with higher activity ratings, spent *more* time engaged in differentiated behaviors. No noteworthy interactions were found.

After controlling for all other variables including classroom, four interactions (involving teachers' use of elaboratives with child competence, persistence, behavior modulation, and verbal/emotional expressiveness) accounted for 18% of the variance in the amount of time children spent in focused attention (see Table 5). Although competence and verbal/emotional expressiveness seemed to be important main effects, they actually affected variance in the outcome when computed in interaction with other variables, so only the interaction effects were interpreted. The interactions showed two patterns resulting in an overall increase in focused attention and two resulting in an overall decrease in focused attention. When teachers' use of elaboratives increased, a 1-point increase on the competence and behavior modulation scales were related to, respectively, almost a 17% increase and almost a 4% increase in the amount of time spent in focused attention. In contrast, when teachers' use of elaboratives increased, a 1-point change on the persistence and verbal/emotional expressiveness scales were related to, respectively, a 15% decrease and a 5.5% decrease in time engaged in focused attention.

After controlling for all other variables including classroom, three noteworthy main effects could be reported accounting for 8% of the variance in unsophisticated engagement (see Table 6). More competent children were *more* likely to be engaged in unsophisticated behaviors, and more active children and more verbally/emotionally expressive children were *less* likely to

be so engaged. The interactions in the model did not explain a noteworthy amount of the variance in children's unsophisticated engagement behaviors.

After controlling for all other variables including classroom, the interaction between children's behavior modulation and teachers' nonelaborative behaviors accounted for 7% of the variance in the time children spent nonengaged (see Table 7). When teachers' use of nonelaboratives increased, a 1-point increase on the behavior modulation scale was related to approximately a 3% increase in nonengagement.

Discussion

Two main implications can be derived from this study. First, the impact of using various teaching behaviors over time has been documented. For example, although nonelaboratives (e.g., praising, introducing) clearly have their place, they should probably not be used excessively with attentive and active children. On the other hand, whereas some engagement levels (sophisticated, focused attention, nonengagement) are susceptible to "treatment-by-aptitude" effects, others (differentiated, unsophisticated) are not. Similarly, some teacher interaction behaviors are equally effective (affect) or ineffective (redirectives) regardless of child characteristics. Teachers can use this information to provide individualized instruction in early childhood education.

Second, some types of children have a proclivity towards certain engagement levels strongly enough that teaching behaviors have little impact. For example, active and emotionally expressive children are likely to spend time in sophisticated engagement, regardless of teacher interaction behaviors. Knowing that such children have this disposition, families and teachers can ensure they have opportunities to express their sophisticated engagement (e.g., present them with fun challenges in their play).

This is the first study of its kind to account for classroom as a true covariate. We are interpreting a small amount of variance so we have to be cautious, but not more cautious than studies that do not account for classroom variance at all. The relatively low r^2s for the predictors, therefore, should be understood to be mitigated by the classroom effect that is typically not reported.

Conclusion

Different types of children respond to different teaching styles, as revealed by differences in their engagement behavior in child care classrooms. The effects revealed in this study highlight the characteristics most likely to influence child engagement (e.g., behavior modulation, verbal/emotional expressiveness) as well as the interactions most likely to benefit child engagement. Given that engagement plays a critical role in learning and development, it is important to understand the effects of child and teacher characteristics on child engagement. Awareness of interaction effects is particularly useful for teachers as it can assist them in accommodating their own behavior to the individual differences of the children in their classrooms.

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Table 1

Example of Model-Building Strategy Used in Building Five Engagement Models

Dependent variable	Model	Independent variables
Engagement level	1	Classroom, 5 child characteristics, each child characteristic X teachers' score for use of elaboratives
	2	Classroom, 5 child characteristics, each child characteristic X teachers' score for use of nonelaboratives
	3	Classroom, 5 child characteristics, each child characteristic X teachers' score for use of redirectives
	4	Classroom, 5 child characteristics, each child characteristic X teachers' score for affect
	Final	Classroom, 5 child characteristics, all noteworthy interactions from the previous four models

Note. Main effects for teacher interaction behaviors were unestimable because classroom was used as a covariate.

Table 2

Means and Standard Deviations of the Independent and Dependent Variables

Variables	Scale	*M*	*SD*
Child Characteristics			
CEQ-Competence	1- to 4-point	3.15	.45
CEQ-Persistence	"	3.28	.42
CPS-Attention	0- to 6-point	3.81	.73
CPS-Behavior Modulation	"	3.80	.87
CPS-Verbal/Emotional Expressiveness	"	4.97	.73
Teacher Interaction Behaviors			
Redirective	1- to 7-point	4.30	1.15
Elaborative	"	3.38	1.32
Nonelaborative	"	3.11	.76
Affect	1- to 5-point	3.75	.62
Child Engagement Behaviors			
Sophisticated	% Time	14	9
Differentiated	"	39	10
Focused Attention	"	31	10
Unsophisticated	"	11	5
Nonengagement	"	5	3

Table 3

Regression Analysis Summary for Child Characteristics and Teacher Interaction Behaviors Predicting Children's Sophisticated Engagement

Variable	*B*	*SEB*	β	r^{2a}
Covariate				
Classroom				.66
Child Characteristic				
Competence	2.20	5.15	.11	.00
Persistence	-9.88	4.44	-.46	.03
Attention	-.79	1.95	-.06	.00
Behavior Modulation	3.84	1.40	.37	.05
Verbal/Emotional Expressiveness	3.04	1.96	.25	.02
Teacher Behavior X Child Characteristic				
Elaborative X Persistence	1.82	2.25	.12	.00
Nonelaborative X Attention	-5.49	2.94	-.67	.07
Affect X Competence	4.93	4.94	.17	.01

Note. $R^2 = .85$ ($n = 71, p = .003$), Adjusted $R^2 = .56$

[a] r^2 = sum of squares independent variable / sum of squares total

Table 4

Regression Analysis Summary for Child characteristics and Teacher Interaction Behaviors Predicting Children's Differentiated Engagement

Variable	*B*	*SEB*	β	r^{2a}
Covariate				
Classroom				.72
Child Characteristic				
Competence	-7.49	5.92	-.34	.01
Persistence	-1.62	5.24	-.07	.00
Attention	1.78	1.85	.13	.00
Behavior Modulation	2.97	1.47	.26	.02
Verbal/Emotional Expressiveness	2.76	1.96	.20	.01
Teacher Behavior X Child Characteristic				
Elaborative X Persistence	2.57	2.47	.15	.01
Elaborative X Behavior Modulation	-.46	1.22	-.05	.00
Nonelaborative X Persistence	-8.41	5.07	-.22	.01
Redirective X Competence	-3.24	5.70	-.16	.00
Redirective X Verbal/Emotional Expressiveness	-.19	3.41	-.01	.00
Affect X Competence	1.37	9.66	.04	.00
Affect X Verbal/Emotional Expressiveness	-7.16	5.62	-.29	.01

Note. $R^2 = .91$ ($n = 71, p = .001$), Adjusted $R^2 = .69$

[a] r^2 = sum of squares independent variable / sum of squares total

Table 5

Regression Analysis Summary for Child characteristics and Teacher Interaction Behaviors Predicting Children's Focused Attention

Variable	*B*	*SEB*	β	r^{2a}
Covariate				
Classroom				.72
Child Characteristic				
Competence	10.66	5.98	.48	.02
Persistence	-4.83	6.71	-.20	.00
Attention	-1.89	2.73	-.14	.00
Behavior Modulation	-.90	2.16	-.08	.00
Verbal/Emotional Expressiveness	-7.70	2.90	-.56	.05
Teachers Behavior X Child Characteristic				
Elaborative X Competence	16.58	6.24	.98	.05
Elaborative X Persistence	-15.27	4.99	-.90	.07
Elaborative X Behavior Modulation	3.85	1.87	.37	.03
Elaborative X Verbal/Emotional Expressiveness	-5.54	2.88	-.53	.03

Note. $R^2 = .82$ ($n = 71$, $p = .018$), Adjusted $R^2 = .45$

[a] r^2 = sum of squares independent variable / sum of squares total

Table 6

Regression Analysis Summary for Child characteristics and Teacher Interaction Behaviors Predicting Children's Unsophisticated Engagement

Variable	*B*	*SEB*	β	r^{2a}
Covariate				
Classroom				.79
Child Characteristic				
Competence	4.49	2.75	.40	.02
Persistence	.91	2.17	.08	.00
Attention	.01	.95	.00	.00
Behavior Modulation	-1.59	.80	-.28	.03
Verbal/Emotional Expressiveness	-2.36	1.03	-.34	.03
Teacher Behavior X Child Characteristic				
Elaborative X Competence	-1.34	1.72	-.16	.00
Redirective X Competence	.99	2.14	.10	.00
Affect X Competence	-2.56	4.51	-.16	.00

Note. $R^2 = .84$ ($n = 71$, $p = .004$), Adjusted $R^2 = .53$

[a] r^2 = sum of squares independent variable / sum of squares total

Table 7

Regression Analysis Summary for Child characteristics and Teacher Interaction Behaviors Predicting Children's Nonengagement

Variable	*B*	*SEB*	β	r^{2a}
Covariate				
Classroom				.69
Child Characteristic				
Competence	-.12	1.53	.02	.00
Persistence	.52	1.49	.07	.00
Attention	-.56	.79	.14	.00
Behavior Modulation	-.43	.64	.12	.00
Verbal/Emotional Expressiveness	.68	.85	.17	.01
Teacher Behavior X Child Characteristic				
Nonelaborative X Behavior Modulation	2.74	1.00	.28	.07

Note. $R^2 = .74$ ($n = 71$, $p = .081$), Adjusted $R^2 = .30$

[a] r^2 = sum of squares independent variable / sum of squares total

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