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Mother–Child Interaction, Private Speech, and Task Performance in Preschool Children with Behavior Problems

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The purpose of the present study was to explore patterns of mother–child interaction, children's private speech use, and behavioral self-regulation among a sample of preschool children identified by their preschool teachers as evidencing behavior problems. Forty preschoolers were classified into two groups (behaviorally at-risk and a matched comparison group) on the basis of teacher ratings of impulsivity, inattention, and hyperactivity. Children completed a magnet board puzzle task once in collaboration with their mother and once individually, and maternal and child speech and behavior were coded from videotapes. Although there were no group differences in children's behavior or speech during the collaborative session, nor were there differences in children's individual task performance or on-task attention, mother–child interaction involving behaviorally at-risk children was characterized by more other-regulation, negative control, less praise, and less physical withdrawal over time, compared to interactions involving comparison children. Behaviorally at-risk children, compared to controls, used more overt, task-relevant private speech during individual problem solving. Partially internalized private speech use among at-risk preschoolers was positively associated with task performance. Group differences rather than similarities prevailed in terms of the relations between maternal behavior, child speech, and child performance.

Keywords: Behavior problems, emotion regulation, hyperactivity, parent–child interaction, preschool children, speech, private speech.

Abbreviations: PPVT-R; Peabody Picture Vocabulary Test-Revised.

Introduction

Major developments take place during the preschool years in children's ability to regulate their own behavior (Campbell, 1995; Diaz, Neal, & Amaya-Williams, 1990). Although impulsivity, hyperactivity, inattention, and noncompliance to some extent represent normative behavior for children aged 2 to 5, most children by age 6 develop sufficient self-regulatory skills to function well in a variety of contexts (Campbell, 1995). Several of what can be seen as particular components of children's behavioral self-regulation have been investigated (i.e. delay of gratification, inhibitory control, internalization, compliance) and there is consensus that much developmental change occurs in these abilities during the preschool years (Kochanska, Aksan, & Koenig, 1995; Kopp, 1982; Vaughn, Kopp, & Krakow, 1984), and behavioral self-control during the early childhood years is predictive of later positive developmental outcomes (Campbell, 1995; Campbell & Ewing, 1990; Shoda, Mischel, & Peake, 1990).

An important area of inquiry concerns the factors that contribute to the development of individual differences in children's behavioral control. Clearly, biological and temperamental factors are involved. Individual differences in infants' reactivity, inhibition, and emotion

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regulation appear early on and such variance has been linked to concurrent psychobiological processes such as vagal tone, heart-rate variability, adrenocortical hormone production, and frontal EEG asymmetries (Fox, 1994; Kagan, Reznick, & Snidman, 1987; Porges, Doussard-Roosevelt, & Maiti, 1994; Stansbury & Gunnar, 1994), as well as future self-regulatory competence at age 3 and beyond (Calkins, 1994; Fox, Schmidt, Calkins, Rubin, & Coplan, 1996; Porges, Doussard-Roosevelt, Portales, & Suess, 1994).

It is equally clear that early parent–child interaction, parenting style, attachment, and parental disciplinary strategies also play a role in the development of behavioral regulation in children. Whether the particular component of behavioral self-regulation under study is arousal regulation (Gable & Isabella, 1992), compliance (Crockenberg & Litman, 1990; Kuczynski & Kochanska, 1995), internalization (Kochanska et al., 1995), delay of gratification (Silverman & Ippolito, 1995), inhibitory control (Kochanska, Murray, Jacques, Koenig, & Vandergeest, 1996), externalizing behavior problems (Campbell, March, Pierce, Ewing, & Szumowski, 1991), impulsivity (Olson, Bates, & Bayles, 1990), or emotional regulation (Calkins, 1994), parenting variables have been shown to predict positive self-regulatory outcomes in children. In short, children's self-regulation is maximized under conditions of responsive and authoritative parenting in which reasonably high demands are placed on children's behavior in a non-controlling manner, and in which clear limits and consistent discipline are provided along with support for children's autonomy. Caregiver–child relationships that lack these qualities or that are characterized by excesses in an opposite direction such as over-intrusiveness, negativity, or harsh and punitive control, have been associated with increased problems of self-regulation such as impulsivity, noncompliance, attention deficit hyperactivity disorder (ADHD), and behavior problems (Greenberg, Speltz, & DeKlyen, 1993; Jacobvitz & Sroufe, 1987; Kochanska, 1993; Patterson, DeBaryshe, & Ramsey, 1989; Shaw, Keenan, & Vondra, 1994).

Recent progress has been made in exploring transactional models that include reciprocal and interwoven contributions from both biological and environmental factors in the development of self-regulation (Calkins, 1994; Campbell, 1995; Henderson & Rubin, 1997; Kochanska, 1997; Olson et al., 1990; Shaw & Bell, 1993). One important task for researchers is to tease out the direct contributions of early temperament to the development of self-regulation from the indirect effects that such individual style differences have on patterns of parent–child interaction and early socialization (Thompson, 1994). Another important task for research in this area is to identify the mechanisms through which such reciprocal transactions take place on the path toward self-regulation. The goal of the present study is to explore the role of one such potential mechanism in the development of children's self-regulation; namely, language—in the form of maternal speech to the child during joint problem solving, and in the form of children's spontaneous private speech during joint and individual problem solving.

The present work adopts a Vygotskian perspective on the development of self-regulation, which holds that (1) children's behavioral self-regulation is a collection of higher-order psychological functions that have social origins in that they emerge, in part, from the history of children's social interactions with caregivers during joint activity; (2) the development of self-regulation can be seen as reflecting a gradual shift in the transfer of regulatory responsibility from caregiver to child; that is, a movement from other-regulation, to shared or joint-regulation, to self-regulation; and (3) self-regulation is achieved, in large part, via children's constructive appropriation or internalization of language and other sociocultural tools from joint activity (Berk & Winsler, 1995; Diaz & Berk, 1992; Vygotsky, 1978). This sociocultural approach to the development of self-regulation focuses both on the nature of the other-regulation, scaffolding, and assistance given by adults when participating with children in collaborative activities, and on children's use of speech for self-regulation. One important feature of the responsive and authoritative parenting style associated with effective self-regulatory development in children is that such parents often engage their children in joint problem-solving situations and adopt a style of assisting children during these activities that is known as "scaffolding" (Berk & Winsler, 1995; Pratt, Kerig, Cowan, & Cowan, 1988). Scaffolding (Berk & Winsler, 1995) refers to a nondirective style of assisting children on collaborative problem-solving tasks, which provides a high degree of support for children's autonomy and self-regulation in which the adult (1) sensitively modulates task difficulty and the amount of adult assistance to keep the task at an appropriately challenging level for the child, (2) contingently withdraws adult control and assistance as soon as the child is able to take on more responsibility, and (3) uses verbal problem-solving strategies, such as leading questions, to assist the child with the task.

Children do use private speech during the preschool years as a tool for regulating their behavior (Berk, 1992; Winsler & Diaz, 1995), and children's use and internalization of such speech is facilitated under conditions of adult scaffolding during joint activity (Behrend, Rosengren, & Perlmutter, 1992; Berk & Spuhl, 1995; Diaz, Neal, & Vacchio, 1991; Winsler, Diaz, & Montero, 1997). Private speech follows a particular developmental course, with such speech shifting from overt, externalized, to more covert, internalized forms—both ontogenetically throughout the preschool years and microgenetically over the course of mastering a single task (Berk, 1992). Also, increased private speech at one moment in time has been found to be predictive of later task improvement (Gaskill & Diaz, 1991; Winsler et al., 1997), and the internalization of language has been associated with greater behavioral self-regulation in children (Berk & Potts, 1991; Diaz, Winsler, Atencio, & Harbers, 1992; Winsler, 1998).

Some children have difficulty regulating their behavior in the preschool classroom. Once thought to outgrow such difficulties, children identified during the preschool years by teachers as exhibiting troublesome levels of overactivity, inattention, impulsivity, and/or aggression are now known to be at significant risk for continuing behavior problems throughout the school years. More

than 50% of children who are seen as hard-to-manage by their preschool teacher show clinically significant levels of disruptive behavior problems during the school years, with at least 33% of such children receiving diagnoses of ADHD by age 6. Further, 67% of children demonstrating problems at age 6 receive diagnoses of a disruptive behavior disorder by age 9 (Campbell, Pierce, March, Ewing, & Szumowski, 1994; Egeland, Kalkoske, Gottesman, & Erickson, 1990). Interestingly, one of the risk factors for the emergence and maintenance of disruptive behavior disorders in this at-risk population is negative and conflictual parent–child relationships (Campbell, 1997).

Recent perspectives on ADHD view the disorder as one of behavioral self-regulation, that is, the child's metacognitive or executive ability to plan, guide, monitor, and/or delay behavior via rules and language in order to attain personal goals and meet situational demands (Barkley, 1997; Douglas, 1988; Schachar, Tannock, Marriot, & Logan, 1995). Consistent with this view is the fact that parent–child interaction among ADHD children is characterized by high parental control, negativity, and conflict, and low joint collaboration and adult responsiveness (Anderson, Hinshaw, & Simmel, 1994; Campbell, 1995; Danforth, Barkley, & Stokes, 1991; Gardner, 1994; Winsler, 1998). Relatedly, children diagnosed with ADHD appear to be delayed in their internalization of private speech (Berk & Potts, 1991; Winsler, 1998). Winsler, for example, found that although 6–8-year-old boys with ADHD use a variety of verbal self-regulatory strategies during problem-solving, their private speech is less internalized and less related to attention and behavior, compared to controls. Parents of ADHD boys, compared to parents of control children, used more negative verbal control strategies, engaged in poorer quality scaffolding, and withdrew adult control less during collaboration with their child, and the ADHD boys were more off-task and noncompliant during the collaborative session than control boys. Winsler concluded that research exploring the early origins of such patterns of private speech use and parent–child interaction needs to be conducted with preschool children behaviorally at risk for ADHD. Only a handful of studies have investigated the private speech of impulsive preschool children and these have found such children to use considerable amounts of private speech compared to nonimpulsive youngsters with a suggestion, albeit inconclusive, that the private speech of impulsive children may be less mature and less self-guiding than that of control children (Diaz & Lowe, 1987; Diaz et al., 1992). To date, however, no study has explored the relations between such children's parent–child interactions, private speech use, and task performance.

This report is the first of a 3-year longitudinal investigation into the development of verbal self-regulation in behaviorally at-risk preschoolers. The present investigation explores verbal and nonverbal components of early mother–child interaction and scaffolding among behavior problem preschoolers, with special attention paid to their use of private speech. Eighteen preschoolers identified by their preschool teachers as evidencing behavior problems and 22 children not so identified were videotaped as they collaborated with their mother on a problem-solving task and as they subsequently completed the same task individually. Three main research questions were addressed: (1) How does the quantity and quality of the private speech of behaviorally at-risk preschool children compare to that of same-age comparison children? (2) How do patterns of parent–child interaction and maternal speech involving hard-to-manage preschool children compare to parent–child interaction and maternal speech among comparison children? and (3) What are the relations between adult–child interaction, children's private speech, and individual task performance for at-risk and comparison children?

Method

Participants

In the context of a larger longitudinal study, 566 3- and 4-year-old children attending 11 preschools in a large metropolitan area in northern California were independently rated by 2 preschool teachers on a behavior rating scale of impulsivity, inattention, and hyperactivity, based on DSM-III-R (American Psychiatric Association, 1987) diagnostic criteria for ADD-H. Items from the scale include: "Child has difficulty following verbal directions," "Child interrupts or disrupts activities of peers," "Child shifts activities quickly before completion," "Child fidgets and appears restless," "Child is disruptive during organized group activities," and "Child has difficulty playing alone." This 6-item, 5-point Likert scale in previous work has been reported to have an inter-preschool teacher correlation of .64 (Diaz et al., 1992). Ratings from the 2 teachers on each child were averaged and children who scored in the top 10% of this scale for this sample were selected as potential members of the behaviorally at-risk group. The final sample of families participating in this report consisted of 18 such behaviorally at-risk children and their mothers. By design, and according to random assignment, the other behaviorally at-risk children from the original 10% participated in other data collection sessions that did not involve a mother–child session. Twenty-two comparison children were randomly selected (matched on gender) from the remaining group of children (in the classrooms attended by the impulsive children) that did not score among the top 10% in the teacher ratings. Means (and standard deviations) on the teacher ratings for the overall sample were mean = 2.74 (SD = 1.05), for the at-risk group they were mean = 3.78 (SD = 0.39), and for the comparison group they were mean = 1.92 (SD = 0.56). The ethnic breakdown of the final sample of children, as determined by parental written report, was as follows: 65% Caucasian, 8% Asian-American, 5% Hispanic/Latino, 5% African-American, and 17% "Other." The sample as a whole (mean age = 46 months) was 78% male and many socioeconomic levels were represented. Table 1 shows how the two groups compared in terms of the family demographic and background variables. Results from relevant ANOVA and chi-square analyses revealed that the two groups (at-risk, comparison) did not differ significantly on any of the background variables, nor did they differ on a cumulative risk factor index, which was calculated by standardizing the relevant demographic variables (mother and father age and education, father employment status, marital status, homeowner status, child PPVT, and number of children in home), and then obtaining a sum (with reverse coding used as needed to maintain directional scale).

Procedure

The task. In either a conference room in the preschool center or a corner of the child's classroom designed for such activities,

Table 1
Group Comparisons on Background Variables

Variable	At-risk group ($N = 18$)	Comparison group ($N = 22$)
Age (Months)		
Mean	45.5	46.7
(*SD*)	(6.5)	(5.1)
Gender		
Male	78%	78%
Female	22%	22%
No. of children in home		
Mean	1.94	2.27
(*SD*)	(1.0)	(.88)
Mother's education (Years)		
Mean	≈ 15	≈ 16
(*SD*)	(2.4)	(1.7)
Father's education (Years)		
Mean	≈ 15	≈ 17
(*SD*)	(2.7)	(2.1)
Age of mother		
Mean	36.1	34.7
(*SD*)	(6.2)	(4.5)
Age of father		
Mean	37.3	36.6
(*SD*)	(6.5)	(5.3)
Other language in home	11%	26%
Ethnicity		
Caucasian	67%	64%
African/American	11%	0%
Latino/Hispanic	0%	9%
Asian-American	5%	9%
Other	17%	18%
Marital Status		
Married	89%	100%
Father's employment		
Unemployed	11%	0%
Unskilled	0%	5%
Skilled	28%	18%
Professional	61%	77%
Mother's employment		
Unemployed	22%	41%
Unskilled	6%	5%
Skilled	22%	18%
Professional	50%	36%
Home owner's status		
Home owner	61%	81%
PPVT vocabulary		
Mean	42.31	41.55
(*SD*)	(17.33)	(17.32)

children were videotaped while they completed a magnet board puzzle task, first in collaboration with their mother, and then individually. The magnet board task consisted of an 8.5″ by 11″ metal frame, 50 pieces of different magnetic geometric shapes of different colors, and an 8.5″ by 11″ laminated color picture of a face of a clown that was completed with 24 of the magnetic shapes (the model). Mothers were instructed to help their child make an exact copy of the clown picture with the magnetic shapes provided "so that the child can do it on her/his own afterward." After the dyad finished working on the task together, the magnetic pieces were taken off the frame, mixed with the remaining pieces, and the child was asked to make the clown one more time all by himself, while the mother and experimenter were busy in another part of the room filling out forms. The magnet board task was chosen after extensive pilot testing on the basis of it being at an appropriate level of difficulty for this age group.

Measures

Task performance. Children's individual task performance during the clown construction task was assessed by assigning 3 points (1 for the correct piece, 1 for the correct location, and 1 for the correct orientation in space) to each of the 24 pieces in the model that was placed on the frame by the child. Children's final performance score therefore could range from 0 to 72 (the total number of pieces in the puzzle times 3).

Maternal speech. All maternal speech to the child during the

Table 2
Maternal Speech Categories

Other-regulation and negative control—Maternal statements or questions that function to direct the child's behavior and statements that are negative in valence. Includes the following five types of utterances:		
(1) Commands	Directives with an explicit imperative verb	"Put this one here" "Look"
(2) Implied directives	Softer directives without an explicit imperative verb	"This one next" "[Get] the red one"
(3) Directive questions	Directives in the form of a question	"Can you put that one here?" "Why don't you do the hat first"
(4) Instructions	Direct explanations/instructions for the task	"The green one goes here" "The mouth goes under the nose"
(5) Negative corrections	Negative evaluations about the child's performance	"No!" "That's not right" "You did that wrong"
Teaching—Maternal statements or questions intended to lead the child to a better understanding of the task either through requesting a verbal response or by verbalizing task-relevant features or strategies. Includes the following four types of utterances:		
(1) Perceptual questions	Questions that can be answered from the immediate perceptual information	"What color is this?" "How many are here?" "Where is the blue one?"
(2) Conceptual questions	Questions that invoke a mental representation, plan, or abstract thought	'Which part goes next?" "Is this right?" "Are these two the same?"
(3) Labeling	Statements about the task	"Two red ones" "There's the head"
(4) Broadcasting	Descriptive statements about the child's actions or thoughts	"You're getting the ears first?" "You put the clown's hat on"
Praise—Maternal statements that positively evaluate the child, the child's actions, or the task. Includes the following four types of utterances:		
(1) Praise of the task	Positive statements about the task or activity in general	"That looks great!" "The clown is cute"
(2) Praise of the child's character	Positive statements about the child's ability or nature	"You are good at this" "You're smart"
(3) Praise of the child's actions	Positive statements about the child's actions or behavior	"You chose the right one" "That's right" "Good job"
(4) Unqualified praise	Positive statements directed to nothing in particular	"Great" "Good" "All right"
Modeling—Maternal statements about her own actions or plans. Includes the following two types of utterances:		
(1) Self-evaluations	Maternal comments about her own actions or person	"I dropped it" "I don't know where it is"
(2) Maternal plans	Maternal plans about the task	"I want to start with the hat" "I'm gonna get these ready"
Other—Other maternal statements that could not be classified above. Included task-irrelevant statements to the child and task-irrelevant responses to child's speech, word play, exclamations, and singing/humming.		

collaborative sessions was transcribed from the videotapes and divided into utterances. An utterance was defined as either a complete sentence, a sentence fragment or clause with intonational markers of termination, a conversational turn, or any string of speech that is temporally separated from another by at least 3 seconds (Diaz & Lowe, 1987). Transcription of the videos took place in three steps: an original transcript was created by a well-trained transcriber, then a verification step took place whereby another individual checked the transcript with the video, and finally a third pass occurred by another person during the speech coding. Disagreements regarding the presence and/or number of utterances were resolved by reaching consensus in discussion. A coding system, similar to that used in previous research (Diaz et al., 1990, 1991) and based on the literature on scaffolding and other adult strategies for promoting cognitive competence in children (Berk & Winsler, 1995; Sigel, 1982) and on the literature on parent–child interaction in children with behavior problems (Danforth et al., 1991), was used to categorize each maternal utterance according to its function and semantic content. Each adult utterance was classified into one of the five categories, which are listed, defined, and exemplified in Table 2. Reliability for the maternal speech coding system was assessed by having two research assistants, naive to both group membership and the specific

hypotheses of the study, independently code a random sample (36%) of the same transcripts. Percentage agreement[1] for the coding system was 86%. Because the amount of time dyads spent on the task varied somewhat from child to child, the proportion of mother's total speech made up of each of the categories was calculated and used in the analyses.

Child speech during the dyad. Child speech during the dyad session was also transcribed from the videotapes, divided into utterances, and classified into one of the following five, mutually exclusive categories: (1) imitations/repetitions of adult speech; (2) responses/answers to adult questions; (3) questions to adult; (4) independent verbalizations (social speech that did not fit into one of the above categories); and (5) private speech. Independent verbalizations were defined as child-initiated speech, unrelated to the adult's previous utterance, and social in nature. Utterances were considered social if they were explicitly directed toward another person as evidenced by either a pronoun reference, a gaze to the other person, argumentation, or physical contact. Independent verbalizations that did not fit the criteria above to be classified as social were classified as private speech. Private speech typically consisted of (a) speech that had a lower nonsocial volume or change of tone, (b) whispers or inaudible lip movements, (c) task-irrelevant wordplay or noises, or (d) regular task-directed speech by the child after the adult had withdrawn from the verbal interaction for some time. As with maternal speech, percentage of total child speech during the dyad session made up of each of the speech categories was used for the analyses. Reliability for this system of classifying child speech during the dyad session was assessed by having two research assistants independently and naively code child utterances from a randomly selected subset (20%) of the transcripts. Inter-rater agreement was 86%.

Child and maternal physical control of the task during the dyad session. The degree to which the child and the mother were physically responsible for completing the clown task was coded from the videotapes of the mother–child sessions according to an equal-interval time-sampling method. Coders froze the video frame in 10-second intervals and recorded whether or not the adult and the child (during that frame of the videotape) were physically touching the task materials (puzzle pieces, frame, or model) with at least one of their hands. The number of times children and mothers were found to be touching the task materials during the paused moments of the videotape was then summed. Because the amount of time dyads spent on the task varied somewhat from child to child, the percentage of the 10-second pauses in which children and adults (separately) were touching the task was calculated and used in the analyses. Also, to explore change in maternal and child physical involvement with the task over the course of the collaborative session, the dyad session was divided into three equal-interval thirds and the above percentage-of-observations-in-which-the-participants-touched-the-task measure was recorded for the beginning (first 3rd), middle (2nd third), and end (3rd third) of the collaboration. Reliability for the above coding system was assessed by having two research assistants, naive to group membership, independently code a randomly selected subset (14%) of the videos. Percentage agreement for these ratings (0 = no touch/1 = touch) was 98% for the mothers and 94% for the children. A single continuous and proportional measure of maternal physical withdrawal was then calculated by dividing the percentage of time mothers physically touched the task materials during the first third of the task by that of the last third.

Child speech during the individual session. Children's speech utterances during their individual attempt at the task were transcribed from the videotapes and classified as either social or private. Private speech during the individual condition was defined as any verbalization by the child that was not explicitly addressed to another person, as indicated by either a pronoun reference, a gaze to another person, or physical contact. The rest of the utterances were classified as social speech. Private speech was further classified according to the following coding system previously used in research with both normally developing children (Berk & Spuhl, 1995) and children with ADHD (Berk & Potts, 1991; Winsler, 1998). This hierarchical and mutually exclusive coding system, originally developed by Berk (1986), has three broad categories or "levels" roughly representing different developmental stages in the private speech internalization process. Level 1, *Task-irrelevant Private Speech*, consists of nonwords, word play, affect expressions, and comments to absent, imaginary, or nonhuman others that are not related to the task at hand. Level 2, *Task-relevant Private Speech*, consists of all regular-volume utterances that relate to the task or to the child's problem-solving activity, such as descriptions of the task, plans, questions/answers, and self-guiding comments. Level 3, *Partially Internalized Manifestations of Inner Speech*, includes inaudible muttering, whispers, and silent verbal lip movements. Reliability for the distinction between social and private speech, assessed by having two research assistants naive to group membership independently code a randomly selected subset (17%) of the videos, was 89%. Reliability for the private speech coding system, assessed in the same way with a sample of 20% of the videos, was also 89%. Number of utterances per minute in each of the above speech categories was calculated and used in the analyses.

Children's individual on-task attention. The quality of children's visual attention to the task during the individual session was measured in a manner similar to that of Berk and Potts (1991) and Diaz et al. (1992), and identical to that of Winsler (1998). Children's attention to the task was determined by observing eye gazes during the session. Every 10-second interval of the child's behavior during the individual condition was monitored from the videos and with the aid of a stopwatch, children's attention to the task was coded as one of the following: 1 = Unfocused: Child's visual attention is on the task (pieces, model, or frame) for less than 3 of the 10 seconds in the observation interval; 2 = Moderately Focused: Child's visual attention is on the task for at least 3, but less than 7, seconds during the observation interval; 3 = Focused: Child's visual attention is on the task for at least 7 of the 10 seconds in the observation interval. An overall attention score was then calculated by taking the sum of these ratings and dividing it by the maximum attention score possible (number of 10-second intervals × 3). To test the reliability of this coding system, a random subset (14%) of the transcripts was again coded independently by two research assistants. Percentage agreement was 93%.

PPVT. Finally, on a separate day at the preschool center, children were individually administered the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) to obtain a general measure of verbal ability.

Results

Preliminary Analyses

Preliminary analyses were conducted to explore whether the major dependent variables of this investigation varied as a function of gender, age, and PPVT

[1] Kappa coefficients, clearly the preferred estimate of reliability for most of the coding systems used in this study, were not able to be calculated due to loss of the relevant raw data sheets in a flood. It is our experience that Kappas are typically 3 to 5 points lower than percentage agreements for these speech coding systems.

Table 3
Children's Speech (Utterances per Minute), Task Performance, and On-task Attention During the Individual Session, by Group

	At-risk	Comparison
Private speech		
Level I—Overt task-irrelevant		
Mean	0.348	0.250
(*SD*)	(0.440)	(0.527)
Level II—Overt task-relevant		
Mean	1.778*	0.581*
(*SD*)	(2.002)	(0.909)
Level III—Partially internalized		
Mean	0.750	0.378
(*SD*)	(1.156)	(0.492)
Social speech		
Mean	2.762*	1.509*
(*SD*)	(1.794)	(1.936)
Task performance		
Mean	38.13	45.04
(*SD*)	(32.81)	(38.64)
On-task attention		
Mean	0.856	0.891
(*SD*)	(0.177)	(0.136)

* $p < .05$.

performance. The only gender effect observed was increased use of private speech during the dyad session by boys [$\bar{x} = 1.6$ utterances per minute ($SD = 1.2$)], as compared to girls [$\bar{x} = 0.75$ ($SD = 0.43$), $t(39) = 2.27$, $p < .05$]. Age was positively related to children's individual attention to task ($r = .33$, $p < .05$) and task performance ($r = .44$, $p < .01$). PPVT scores were positively related to children's individual task performance ($r = .41$, $p < .01$). These relationships will be taken into account in subsequent analyses involving these variables.

Group Differences in Children's Individual Performance

Private and social speech. Means (and standard deviations) of children's speech utterances per minute while working individually on the clown task are given in Table 3, by group, for each of the three private speech categories and social speech. A significant multivariate group effect [$S = 1$, $M = 1$, $N = 16.5$—Pillai's exact $F(4, 35) = 2.52$, $p < .05$] was obtained in a MANOVA with the four speech categories as dependent variables. Follow-up univariate ANOVAs indicated that the at-risk children used significantly more overt, task-relevant (Level II) private speech [$F(1, 38) = 6.47$, $p < .05$, $d = .76$][2], and more social speech ($F(1, 38) = 4.36$, $p < .05$, $d = .64$] than comparison children. There were no significant group differences in children's task-irrelevant or partially internalized private speech.

Task performance and on-task attention. Table 3 also lists group means (and standard deviations) for children's individual task performance and on-task attention. An ANCOVA was conducted on the task performance measure with group as the between-subjects variable and PPVT and age as covariates. No significant difference was found between the at-risk children's individual task performance and that of comparison children. A similar analysis was conducted on children's on-task attention with age as a covariate. No difference was found in the quality of on-task attention among the behavior problem children and comparison children[3].

Table 4
Proportion of Total Maternal and Child Speech of the Maternal and Child Speech Categories During the Collaborative Session, by Group

	At-risk	Comparison
Maternal speech		
Other-regulation/Negative control		
Median	.434*	.335*
Teaching		
Median	.324	.364
Modelling		
Median	.024	.027
Praise		
Median	.055*	.130*
Other		
Median	.029	.444
Child speech		
Imitations of maternal speech		
Mean	.022	.036
(*SD*)	(.023)	(.051)
Responses to maternal questions		
Mean	.311	.304
(*SD*)	(.172)	(.144)
Questions to mother		
Mean	.140	.122
(*SD*)	(.119)	(.115)
Other social speech to mother		
Mean	.302	.217
(*SD*)	(.140)	(.177)
Private speech		
Mean	.225	.227
(*SD*)	(.173)	(.190)

*$p < .05$.

Group Differences in Mother–Child Collaboration/Scaffolding

Maternal speech. A series of Wilcoxon tests was conducted with group as the independent variable and each of the five maternal speech measures as the dependent variable. Nonparametric analyses were indicated with these data given rather skewed distributions. The median proportion of total maternal speech made up of each of the five categories of maternal utterances is listed in Table 4. The speech of mothers of the behaviorally at-

[2] Hedges and Olkin's (1985, p. 78) effect size estimate, g, which is the difference between the two sample means divided by their pooled standard deviation, is denoted here as "d."

[3] An anonymous reviewer suggested that additional analyses be conducted exploring group differences in task performance and attention while covarying the maternal assistance variables, in order to check for the possibility that maternal assistance might have normalized the task behavior of the at-risk children. No support for this interpretation was found, however, as the result of these analyses were the same—no group differences in task performance or attention.

Table 5
Zero-order Correlations between PPVT, Age, and Individual Task Performance and On-Task Attention, and Partial Correlations (PPVT and Age) between Children's Concurrent Private Speech and Individual Task Performance and On-task Attention, by Group

	At Risk ($N = 18$)		Comparison ($N = 22$)	
	Performance	Attention	Performance	Attention
PPVT	.58*	.26	.32	.17
Age	.37	.19	.51*	.49*
Level I private speech (Irrelevant)	−.29	.08	−.20	−.25
Level II private speech (Overt, relevant)	−.36	−.16	−.27	.13
Level III private speech (Partially internalized)	.64*	.48**	−.03	.02

*$p < .05$; **$p < .10$.

risk children was characterized by a significantly higher proportion of other-regulation and negative control than was the maternal speech involving comparison children [$Z = 1.98$, $p < .05$]. Also, at-risk children received significantly less praise from their mothers compared to comparison children [$Z = -2.08$, $p < .05$]. No group differences were found in the other three categories of maternal verbal assistance during the collaborative session.

Child speech during the dyad. Means (and standard deviations) of the proportion of total child speech during the collaborative session made up of each of the five child speech categories are also listed in Table 4. No group differences emerged in the frequency of children's verbal imitations, questions to mother, responses to maternal questions, independent social verbalizations, or private speech utterances as indicated by nonsignificant group effects in a series of one-way ANOVAs.

Mother and child physical involvement with the task. Mothers of the impulsive children withdrew significantly less of their physical involvement in the task from the beginning to the end of the collaborative session, compared to mothers of comparison children, as indicated by a Welch T-test on the continuous measure of maternal physical withdrawal [at-risk: $\bar{x} = 1.31$ (0.97); comparison: $\bar{x} = 2.33$ (2.16); Welch t $(1, 32.15) = 2.02$, $p < .05$, $d = .57$]. For a closer look at change over time, group differences in the median percentage of time mothers physically touched the task materials in the beginning, the middle, and end of the collaborative session were assessed. Parents of behaviorally at-risk children were directly involved physically with the task materials 58% of the time at the beginning of the joint session, 49% during the middle, and 42% during the final third of the task [Friedman $\chi^2 = 0.89$, n.s.]. Comparison parents started off with similar levels of physical task manipulation (50%) at the beginning of the joint session, but then reduced their physical participation in the task significantly to 37% for the middle third, and to 25% by the end of the collaboration [Friedman $\chi^2 = 8.80$, $p < .05$]. Although group differences in the median level of maternal physical involvement were nonsignificant at the beginning and middle of the task, the difference in parental involvement for the at-risk and comparison children during the final third of the task was significant (Median test $Z = 2.00$, $p < .05$).

Median percentage of time that the children were physically manipulating the task materials throughout the dyad session was analyzed in the same way as above. No significant group differences nor significant patterns of change over the course of the session were observed for children's physical participation. Behaviorally at-risk children's physical task manipulation went from 70% to 84%, to 62% from the beginning to the end of the dyad session, whereas comparison children's physical involvement went from 82% to 75%, to 71%.

Relationships between Dyadic Interaction, Private Speech, and Individual Performance

The strategy used for assessing the relations between dyadic variables and individual performance variables in this study, given the small sample sizes and its exploratory nature, consisted of three steps. First, zero-order correlations between relevant background variables (child age and child PPVT score) and children's outcome variables (individual task performance and on-task attention) were calculated separately for both groups of children. These correlations are found in Table 5. Second, partial correlations, controlling for age and PPVT, were calculated between the three concurrent individual private speech variables and children's individual task performance and attention, again separately by group. These correlations are also found in Table 5. Finally, each of the major variables from the collaborative session (degree of maternal withdrawal, overall amount of adult and child task manipulation, children's private speech usage during the dyad session, and the five maternal speech categories) were correlated (separately by group) with children's individual variables (private speech, performance, and attention), partialling-out age and PPVT. These correlations are found in Table 6. It is important to note here, given the large number of correlations calculated, the relatively small sample sizes, and the relatively small number of significant associations, that the correlational patterns reported below need to be interpreted

Table 6
Partial Correlations (Age and PPVT) between Dyad Measures, and Children's Individual Private Speech (PS), On-task Attention, and Task Performance, by Group

	At-risk ($N = 18$)					Comparison ($N = 22$)				
	Task Performance	Attention	Level I PS	Level II PS	Level III PS	Task Performance	Attention	Level I PS	Level II PS	Level III PS
Maternal withdrawal	−.27	−.07	.09	−.08	−.32	.21	.15	−.02	0.1	.79*
Maternal task manipulation (overall)	−.33	−.30	−.15	−.17	.08	−.18	−.02	.28	−.24	−.07
Child task manipulation (overall)	.08	−.04	−.35	.41	.37	−.01	.32	−.25	−.24	.31
Child private speech use in collaboration	.03	.07	−.02	.59*	.48**	−.12	.20	−.34	−.23	.09
Maternal speech categories										
Other-regulation/ Negative control	.11	−.21	−.19	−.29	−.20	−.52*	.07	.06	.17	−.10
Teaching	.16	.51+	.15	.06	.03	.39**	−.02	.27	−.07	.24
Modelling	−.30	−.66*	.36	.26	.00	−.28	−.08	−.24	−.13	−.40**
Praise	.23	.19	−.01	.08	.27	.13	.24	.04	−.03	.07
Other	−.75*	−.46**	.08	.41	−.27	−.29	−.46*	−.24	.02	.01

*$p < .05$; **$p < .10$.

with considerable caution until they are replicated in future studies.

Table 5 reveals that although both task performance and attention are significantly and positively related with age for comparison children, only PPVT was significantly associated with performance for the behaviorally at-risk children. Although significantly different from zero within one group and not the other, the between-group differences in these correlations are not statistically significant. Also of note in Table 5 is that although none of the private speech variables was associated significantly with task performance and attention for the comparison group, partially internalized private speech in the form of whispers and inaudible muttering was positively associated with performance for the at-risk children (and significantly different from that of the comparison group: $Z = 2.29$, $p < .05$). Several interesting patterns emerged from the correlations listed in Table 6. Maternal physical withdrawal from the beginning to the end of the task was significantly and positively associated with partially internalized private speech among dyads involving comparison children but not those involving at-risk children, a significant difference between the two correlations ($Z = 4.05$, $p < .0001$). At-risk children's task manipulation and use of private speech during the collaborative session were positive correlated with these children's individual Level II private speech use during the alone session. However, a very different pattern was observed for the comparison youngsters. These differences in correlations were significant ($Z = 1.97$, $p < .05$; $Z = 2.64$, $p < .01$, respectively).

Regarding maternal speech categories, other-regulatory/negative control utterances were significantly and negatively associated with comparison children's later individual task performance, but not associated with performance for the at-risk children, a statistically significant difference ($Z = 1.99$, $p < .05$). Maternal verbal modeling/discussion of her own actions during collaboration was significantly and negatively associated with behavior problem children's later individual on-task attention, and not particularly related to attention for the comparison children, a difference that is significant ($Z = 2.06$, $p < .05$). Finally, maternal utterances that fell into the "other" category were negatively and significantly associated with at-risk children's later individual task performance, and less associated with individual task performance for the comparison children, a difference that is significant ($Z = 1.96$, $p < .05$).

Discussion

The purpose of this investigation was to explore processes of parent–child scaffolding and verbal self-regulation in a sample of behaviorally at-risk preschool children. Results indicate that 3- to 5-year-old children, identified by their preschool teachers as evidencing behavior problems in the classroom, already show different patterns of mother–child interaction during collaborative activities, different patterns of private speech use compared to same-age, nonidentified children, and different relationships between mother–child interaction variables, private speech, and performance. This investigation replicates and extends previous work in the area, provides new data specific to children's private speech use and related processes of mother–child scaffolding for this at-risk population, and offers a number of suggestions for future research.

One goal of this study was to explore group differences in children's use of private speech. The behaviorally at-risk preschoolers in this study were observed to use more overt, task-relevant private speech while working individually on the problem-solving task, compared to comparison children. No significant group differences were observed in the amount of task-irrelevant private speech and partially internalized speech used by the children. This finding resonates with that of earlier research with impulsive preschoolers (Diaz et al., 1992; Zentall, Gohs, & Culatta, 1983). The fact that young children with behavioral problems do not show a deficit in their spontaneous production of self-regulatory speech, but rather show increased use of such speech relative to controls, is interesting as it suggests that their difficulties in behavioral regulation do not stem from a simple lack of using self-guiding speech. This finding is important for interventions designed to help young impulsive children through self-instructional training procedures, as it suggests that the goal of intervention, rather than getting children to talk to themselves, might be to get them to internalize their existing private speech or to use such speech more effectively for guiding behavior (Diaz & Berk, 1995).

It is interesting to note that increased use of overt task-relevant private speech is also found among slightly older, clinically diagnosed boys with ADHD; however, such children also show increased use of irrelevant speech and decreased use of partially internalized forms of private speech while working on tasks, relative to same-age controls (Berk & Potts, 1991; Winsler, 1998). Such patterns of private speech use in these studies have been interpreted as evidence that children with self-regulatory difficulties are delayed in the process of internalizing private speech. Such a delay-in-internalization hypothesis, though plausible, must await future longitudinal study for verification. Also unclear at this time are the developmental pathways that might lead to such a speech internalization delay. An important task for future research will be determining the extent to which endogenous factors are responsible for these observed behavioral and private speech patterns, and to what extent these represent direct pathways or indirect pathways (i.e. mediated through children's social interactions). Given that the origin of a developmental risk factor can be separate from the way in which the risk factor is mediated (Rutter, 1997), one possibility is that biologically based temperamental dispositions early on in difficult-to-manage toddlers elicit particularly negative and controlling patterns of parent–child interaction, which then reduce opportunities for such children to participate in scaffolded, verbally mediated joint problem solving, and ultimately constrain/delay the development of self-regulation.

Findings on the quality of parent–child interaction observed in this study are consistent with the above transactional model. Compared to mothers of comparison children, mothers of the behaviorally at-risk preschool children showed increased other-regulation and

negative control, decreased use of praise, and decreased withdrawal of adult physical control over time as they worked together with their child on the problem-solving task. Similar qualities of parent–child interaction have been observed in other work with behavior problem preschoolers (Campbell et al., 1994; Gardner, 1994), as well as with children diagnosed with ADHD (Anderson et al., 1994; Winsler, 1998). Such patterns of parent–child interaction are theoretically linked with poorer self-regulatory outcomes for normal children (Berk & Winsler, 1995; Campbell, 1995; Sroufe, 1996), and have been shown to be associated with poorer long-term prognoses for both difficult-to-manage preschoolers and children diagnosed with ADHD (Campbell, 1997; Hinshaw, 1994). Typically, studies that demonstrate highly negative and controlling patterns of parent behavior toward behavior problem children also show that the concurrent behavior of the child during joint problem solving is more off-task, noncompliant, and negative. It is important to note in this regard, however, that in the present investigation, no group differences were found in children's on-task behavior during the dyad session nor in children's on-task attention or task performance during the individual session. Group differences within this sample were more often found in maternal behavior than in child behavior. Of course, given the effect that shared social history and parental expectations have on parent–child interaction (Gauvain & Fagot, 1995; Grusec, Hastings, & Mammone, 1994), concurrent negative child behavior is not necessarily required in order for increased other-regulation to be elicited.

An alternate interpretation of the lack of group differences in child behavior and performance in the presence of previous and concurrent group differences in maternal behavior is that the increased maternal assistance and control was actually responsible for normalizing the on-task behavior of the at-risk children. Although the present study is not able to rule out this interpretation, the fact that the maternal variables found to vary by group were not associated with children's individual task performance or attention among the at-risk group argues against this formulation. Another possible reason for the lack of group differences in child behavior observed in this study has to do with the fact that children with behavior problems typically do better in novel, one-on-one situations. The novelty of the experimental situation may have been enough to bring the behavior of this subclinical group of at-risk children temporarily under control.

Another question addressed in this study concerned the relationships between mother–child scaffolding during collaborative problem solving, children's individual private speech use, and task performance. Vygotskian theory would predict that parent–child interaction characterized by negativity, conflict, low maternal withdrawal, and ineffective scaffolding would be associated with children's delayed use and internalization of private speech for self-regulation and decreased task competence, due to decreased opportunities for such children to use appropriate self-regulatory language during joint activity (Berk & Winsler, 1995). Interestingly, the overall correlational patterns observed in this study, although preliminary and in need of replication, revealed more differences than similarities across groups. For the comparison children, individual attention and task performance was significantly associated with age of child and not related to verbal ability or the private speech variables. For the at-risk children, however, task performance was correlated with children's verbal ability and use of partially internalized private speech. The fact that Level III private speech was positively associated with performance for the behaviorally at-risk group is encouraging, as it suggests that this type of private speech may indeed be useful to this population as a self-regulatory tool. In this study, maternal withdrawal during the collaborative session was the strongest positive predictor of comparison children's use of partially internalized private speech during the individual session, yet maternal withdrawal was not associated with this type of private speech for at-risk youngsters. Future research designed to understand the factors that facilitate the use of partially internalized private speech in difficult-to-manage children would appear warranted from these data.

The expected negative relation between other-regulation/negative control and children's task performance, and, to a lesser extent, the expected positive association between maternal teaching and children's performance, were found among the comparison children but not among the behaviorally at-risk group. Maternal modeling/description of her own activity was negatively associated with at-risk children's individual on-task attention, but these variables were unrelated within the comparison children. The fact that such contrasting patterns across groups were found in the relations between dyadic interaction variables, private speech, and task performance highlights the importance of examining the functional dynamics of parent–child interaction within groups of children who vary in their behavioral profiles.

Although the present study with its single point in time correlational design offers valuable preliminary data and hypotheses, it is clear that longitudinal research utilizing methods that will provide more information as to directionality of effect and transactional change over time is sorely needed. Other limitations of the present study (i.e. small sample size, a relatively large number of analyses, relatively low power, failure to confirm several expected effects) suggest numerous avenues for future research and also highlight an urgent need for replication. The correlational analyses concerning relations between scaffolding, private speech, and performance are especially in need of further investigation and replication.

Finally, although necessarily tentative given the limitations discussed above, the present study has a few implications for early intervention and prevention among behaviorally at-risk preschool children and their families. Given that (1) such children can be readily identified by parents and teachers in the preschool years, (2) these children already show similar patterns of both parent–child interaction and private speech usage to those seen in older clinical groups of children with ADHD and other behavior problems, (3) this group is known to be at significant risk for developing more serious behavioral disturbances and psychopathology, (4) the preschool years are seen as critical for the development of self-

regulation, and (5) parent–child interaction is a significant predictor of outcomes for behavior problem preschoolers (Campbell, 1995; Campbell et al., 1994; Kochanska, 1997; Kopp, 1982), it would appear that early assessment, prevention, and intervention for behaviorally at-risk preschoolers and their families is a worthy area of exploration. After additional research brings us to a better understanding of the processes of parent–child scaffolding and its implications for private speech internalization among behavior problem preschoolers, interventions designed to help parents of difficult-to-manage preschoolers scaffold their children's verbal self-regulatory skills may be fruitful, along with cognitive behavioral interventions designed to assist such preschoolers with using and internalizing their private speech (Diaz & Berk, 1995). Finally, if group differences in relations between maternal scaffolding, child speech, and child performance, such as those found in this study, were to be replicated with larger samples, a caution would be in order against simply importing parental guidance strategies from problem-free children and their parents and using them as goals for training parents of behavior-problem preschoolers. Maternal withdrawal, positive teaching, and lack of negative control (maternal scaffolding strategies that might serve to facilitate partially internalized speech, task performance, and on-task attention among preschool children without behavior problems) were not found in this study to be related to such outcomes for the behaviorally at-risk children. Acquiring a more complete understanding of the ecology and functional dynamics of the interactions between parents and both their normally developing and behaviorally at-risk preschool children is clearly needed.

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References

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.

Anderson, C. A., Hinshaw, S. P., & Simmel, C. (1994). Mother–child interactions in ADHD and comparison boys: Relationships with overt and covert externalizing behavior. *Journal of Abnormal Child Psychology*, *22*, 247–265.

Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, *121*, 65–94.

Behrend, D. A., Rosengren, K. S., & Perlmutter, M. (1992). The relation between private speech and parental interactive style. In R. M. Diaz & L. E. Berk (Eds.), *Private speech: From social interaction to self-regulation* (pp. 85–100). Hillsdale, NJ: Lawrence Erlbaum.

Berk, L. E. (1986). Relationship of elementary school children's private speech to behavioral accompaniment to task, attention, and task performance. *Developmental Psychology*, *22*, 671–680.

Berk, L. E. (1992). Children's private speech: An overview of theory and the status of research. In R. M. Diaz & L. E. Berk (Eds.), *Private speech: From social interaction to self-regulation* (pp. 17–53). Hillsdale, NJ: Lawrence Erlbaum.

Berk, L. E., & Potts, M. K. (1991). Development and functional significance of private speech among attention-deficit hyperactivity disordered and normal boys. *Journal of Abnormal Child Psychology*, *19*, 357–377.

Berk, L. E., & Spuhl, S. T. (1995). Maternal interaction, private speech, and task performance in preschool children. *Early Childhood Research Quarterly*, *10*, 145–169.

Berk, L. E., & Winsler, A. (1995). *Scaffolding children's learning: Vygotsky and early childhood education*. Washington, DC: National Association for the Education of Young Children.

Calkins, S. D. (1994). Origins and outcomes of individual differences in emotion regulation. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations (pp. 53–72). *Monographs of the Society for Research in Child Development*, *59* (2–3, Serial No. 240).

Campbell, S. B. (1995). Behavior problems in preschool children: A review of recent research. *Journal of Child Psychology and Psychiatry*, *36*, 113–149.

Campbell, S. B. (1997). Behavior problems in preschool children: Developmental and family issues. *Advances in Clinical Child Psychology*, *19*, 1–26.

Campbell, S. B., & Ewing, L. J. (1990). Hard-to-manage preschoolers: Adjustment at age nine and predictors of continuing symptoms. *Journal of Child Psychology and Psychiatry*, *31*, 871–889.

Campbell, S. B., March, C. L., Pierce, E. W., Ewing, L. J., & Szumowski, E. K. (1991). Hard-to-manage preschool boys: Family context and the stability of externalizing behavior. *Journal of Abnormal Child Psychology*, *19*, 301–318.

Campbell, S. B., Pierce, E. W., March, C. L., Ewing, L. J., & Szumowski, E. K. (1994). Hard-to-manage preschool boys: Symptomatic behavior across contexts and time. *Child Development*, *65*, 836–851.

Crockenberg, S., & Litman, C. (1990). Autonomy as competence in 2-year-olds: Maternal correlates of child defiance, compliance, and self-assertion. *Developmental Psychology*, *26*, 961–971.

Danforth, J. S., Barkley, R. A., & Stokes, T. F. (1991). Observations of parent–child interactions with hyperactive children: Research and clinical applications. *Clinical Psychology Review*, *11*, 703–727.

Diaz, R. M., & Berk, L. E. (Eds.). (1992). *Private speech: From social interaction to self-regulation*. Hillsdale, NJ: Lawrence Erlbaum.

Diaz, R. M., & Berk, L. E. (1995). A Vygotskian critique of self-instructional training. *Development and Psychopathology*, *7*, 369–392.

Diaz, R. M., & Lowe, J. P. (1987). The private speech of young children at risk: A test of three deficit hypotheses. *Early Childhood Research Quarterly*, *2*, 181–194.

Diaz, R. M., Neal, C. J., & Amaya-Williams, M. (1990). The social origins of self-regulation. In L. C. Moll (Ed.), *Vygotsky and education: Instructional implications and applications of sociohistorical psychology* (pp. 127–154). New York: Cambridge University Press.

Diaz, R. M., Neal, C. J., & Vachio, A. (1991). Maternal teaching in the zone of proximal development: A comparison of low- and high-risk dyads. *Merrill-Palmer Quarterly*, *37*, 83–107.

Diaz, R. M., Winsler, A., Atencio, D. J., & Harbers, K. (1992). Mediation of self-regulation through the use of private speech. *International Journal of Cognitive Education and Mediated Learning*, *2*, 1–13.

Douglas, V. I. (1988). Cognitive deficits in children with attention deficit disorder with hyperactivity. In L. Bloomingdale & J. Sergeant (Eds.), *Attention deficit disorder: Criteria*,

cognition, *intervention* (pp. 65–81). New York: Pergamon Press.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN: American Guidance Service.

Egeland, B., Kalkoske, M., Gottesman, N., & Erickson, M. F. (1990). Preschool behavior problems: Stability and factors accounting for change. *Journal of Child Psychology and Psychiatry*, *31*, 891–909.

Fox, N. A. (1994). Dynamic cerebral processes underlying emotion regulation. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations (pp. 152–166). *Monographs of the Society for Research in Child Development*, *59* (1–2, Serial No. 231).

Fox, N. A., Schmidt, L. A., Calkins, S. D., Rubin, K. H., & Coplan, R. J. (1996). The role of frontal activation in the regulation and dysregulation of social behavior during the preschool years. *Development and Psychopathology*, *8*, 89–102.

Gable, S., & Isabella, R. A. (1992). Maternal contributions to infant regulation of arousal. *Infant Behavior and Development*, *15*, 95–107.

Gardner, F. E. M. (1994). The quality of joint activity between mothers and their children with behaviour problems. *Journal of Child Psychology and Psychiatry*, *35*, 935–948.

Gaskill, M. N., & Diaz, R. M. (1991). The relation between private speech and cognitive performance. *Infancia y Aprendizaje*, *53*, 45–58.

Gauvain, M., & Fagot, B. (1995). Child temperament as a mediator of mother-toddler problem solving. *Social Development*, *4*, 257–276.

Greenberg, M. T., Speltz, M. L., & DeKlyen, M. (1993). The role of attachment in the early development of disruptive behavior problems. *Development and Psychopathology*, *5*, 191–213.

Grusec, J. E., Hastings, P., & Mammone, N. (1994). Parenting cognitions and parenting schemas. In J. G. Smetana (Ed.), *Beliefs about parenting: Origins and developmental consequences* (pp. 5–19). San Francisco, CA: Jossey-Bass.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. San Diego: CA: Academic Press.

Henderson, H. A., & Rubin, K. H. (1997). *Internal and external correlates of self-regulation in preschool-aged children*. Paper presented at the biennial conference of the Society for Research in Child Development, Washington, DC, April.

Hinshaw, S. P. (1994). *Attention deficits and hyperactivity in children*. Thousand Oaks, CA: Sage.

Jacobvitz, D., & Sroufe, L. A. (1987). The early caregiver–child relationship and attention deficit disorder with hyperactivity in kindergarten: A prospective study. *Child Development*, *58*, 1496–1504.

Kagan, J., Reznick, J. S., & Snidman, N. (1987). The physiology and psychology of behavioral inhibition in children. *Child Development*, *58*, 1459–1473.

Kochanska, G. (1993). Toward a synthesis of parental socialization and child temperament in early development of conscience. *Child Development*, *64*, 325–347.

Kochanska, G. (1997). Multiple pathway to conscience for children with different temperaments: From toddlerhood to age 5. *Developmental Psychology*, *33*, 228–240.

Kochanska, G., Aksan, N., & Koenig, A. L. (1995). A longitudinal study of the roots of preschoolers' conscience: Committed compliance and emerging internalization. *Child Development*, *66*, 1752–1769.

Kochanska, G., Murray, K., Jacques, T. Y., Koenig, A. L., & Vandergeest, K. A. (1996). Inhibitory control in young children and its role in emerging internalization. *Child Development*, *67*, 490–507.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*, *18*, 199–214.

Kuczynski, L., & Kochanska, G. (1995). Function and content of maternal demands: Developmental significance of early demands for competent action. *Child Development*, *66*, 616–628.

Olson, S. L., Bates, J. E., & Bayles, K. (1990). Early antecedents of childhood impulsivity: The role of parent–child interaction, cognitive competence, and temperament. *Journal of Abnormal Child Psychology*, *18*, 317–334.

Patterson, G. R., DeBaryshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist*, *44*, 329–335.

Porges, S. W., Doussard-Roosevelt, J. A., & Maiti, A. K. (1994). Vagal tone and the physiological regulation of emotion. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations (pp. 167–186). *Monographs of the Society for Research in Child Development*, *59* (1–2, Serial No. 231).

Porges, S. W., Doussard-Roosevelt, J. A., Portales, L. A., & Suess, P. E. (1994). Cardiac vagal tone: Stability and relation to difficulties in infants and 3-year-olds. *Developmental Psychobiology*, *27*, 289–300.

Pratt, M. W., Kerig, P., Cowan, P. A., & Cowan, C. P. (1988). Mothers and fathers teaching 3-year-olds: Authoritative parents and adult scaffolding of young children's learning. *Developmental Psychology*, *24*, 832–839.

Rutter, M. L. (1997). Nature-nurture integration: The example of antisocial behavior. *American Psychologist*, *52*, 390–398.

Schachar, R., Tannock, R., Marriot, M., & Logan, G. (1995). Deficient inhibitory control in attention deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, *23*, 411–437.

Shaw, D. S., & Bell, R. Q. (1993). Developmental theories of parental contributors to antisocial behavior. *Journal of Abnormal Child Psychology*, *21*, 493–518.

Shaw, D. S., Keenan, K., & Vondra, J. I. (1994). Developmental precursors of externalizing behavior: Ages 1 to 3. *Developmental Psychology*, *30*, 1–10.

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, *26*, 978–986.

Sigel, I. (1982). The relationship between parental distancing strategies and the child's cognitive behavior. In L. Laosa & I. Sigel (Eds.), *Families as learning environments for children* (pp. 47–86). New York: Plenum Press.

Silverman, I. W., & Ippolito, M. F. (1995). Maternal antecedents of delay ability in young children. *Journal of Applied Developmental Psychology*, *16*, 569–591.

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years*. New York: Cambridge University Press.

Stansbury, K., & Gunnar, M. R. (1994). Adrenocortical activity and emotion regulation. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations (pp. 108–134). *Monographs of the Society for Research in Child Development*, *59* (1–2, Serial No. 231).

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. In N. A. Fox (Ed.), The development of emotion regulation: Biological and behavioral considerations (pp. 25–52). *Monographs of the Society for Research in Child Development*, *59* (1–2, Serial No. 231).

Vaughn, B. E., Kopp, C. B., & Krakow, J. B. (1984). The emergence and consolidation of self-control from 18 to 30 months of age: Normative trends and individual differences. *Child Development*, *55*, 990–1004.

Vygotsky, L. S. (1978). In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.), *Mind in society: The*

development of higher mental processes. (Original work published 1930, 1933, 1935.) Cambridge, MA: Harvard University Press.

Winsler, A. (1998). Parent–child interaction and private speech in boys with ADHD. *Applied Developmental Science*, *2*, 17–39.

Winsler, A., & Diaz, R. M. (1995). Private speech in the classroom: The effects of activity type, presence of others, classroom context, and mixed-age grouping. *International Journal of Behavioral Development*, *18*, 463–488.

Winsler, A., Diaz, R. M., & Montero, I. (1997). The role of private speech in the transition from collaborative to independent task performance in young children. *Early Childhood Research Quarterly*, *12*, 59–79.

Zentall, S. S., Gohs, D. E. & Culatta, B. (1983). Language and activity of hyperactive and comparison of children during listening tasks. *Exceptional Children*, *50*, 255–266.

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