# The Efficacy of Phonological Awareness Training with First-Grade Students Who Have Behavior Problems and Reading Difficulties

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RESEARCH HAS DOCUMENTED A GROUP of children possessing both anti-social conduct problems (CP) and attention problems (e.g., hyperactivity, impulsivity, inattention [HIA]). Children demonstrating the combination of conduct and attention problems (CP + HIA) are likely to possess the worst features of both domains. They demonstrate higher frequency and intensity of physical aggression, display greater persistence and earlier onset of antisocial behavior, exhibit lower levels of peer status, have more severe academic deficits, are at heightened risk for substance use, and experience worse future outcomes (e.g., future psychopathy, chronic offending) than children with either disorder alone (Farrington, Loeber, & Van Kammen, 1990; Gresham, Lane, & Lambros, 2000; Hinshaw, 1987; Kuhne, Schacher, & Tannock, 1997; Lynam, 1996; McGee, Williams, & Silva, 1984; Satterfield & Schnell, 1997; Walker, Lahey, Hynd, & Frame, 1987). These risks are unique to the CP + HIA chain and are not evidenced in children who are comorbid for conduct problems and other disorders (Hinshaw, Lahey, & Hart, 1993).

Research has identified a comorbid group of children who have both antisocial and attention problems. Many of these children demonstrate the most deleterious features of both conditions (e.g., aggression and academic underachievement) and experience the most negative outcomes, including school failure, drug and alcohol abuse, and delinquency in adolescence, than either condition alone. Treatment outcome studies, although few in number, suggest that remediation of academic deficits may be associated with reciprocal effects on social and behavioral domains. The purpose of the present study was to conduct a preliminary investigation of the effectiveness of a reading intervention program for first-grade children at risk for conduct and attention problems. Academic, social, and behavioral outcome measures were examined using single case methodology. Findings support the efficacy of early intervention in the area of early reading for these children. However, the findings also suggest that while improvements were noted, the intervention may not have been of sufficient intensity and duration to (a) produce lasting changes and (b) produce beginning reading skill acquisition at a rate commensurate with normally achieving students of the same age.

## Academic Difficulties of Children At Risk for CP + HIA

Although not the most alarming of the characteristics just presented, academic deficits are highly debilitating. Difficulties in the areas of phonological awareness, decoding, and reading comprehension are common among this population (Hinshaw, 1992a, 1992b). Without the ability to use reading to learn as they progress through school, it becomes increasingly difficult for students with CP + HIA to gain access to the core curriculum and participate in learning activities. Consequently, these students have a difficult time attaining academic success (Meyers & O'Shaughnessy, 2000).

Hinshaw (1992b) highlighted the overlap between externalizing behavior disorders and academic underachievement, as well as the strong link to school failure and, in some cases, delinquency in adolescence. Three hypothetical causal models depicting the relationship between academic underachievement and externalizing behaviors were proposed:

1. Academic underachievement leads to externalizing behaviors,
2. externalizing behaviors lead to academic underachievement, and
3. a transactional relationship exists between externalizing behaviors and academic underachievement.

These models have important implications for interventions. For example, consider the first model. If academic underachievement leads to externalizing behaviors, this suggests that children who are unable to successfully engage in and complete academic requirements become frustrated and discouraged. These children may then act out to escape academic task demands (Lane, Beebe-Frankenberger, Lambros, & Pierson, 2001). If the first model is true, logic would indicate that remediating specific academic skill deficits would extinguish emerging problem behaviors by providing children with the necessary tools (e.g., phonological awareness) to be successful in school.

Most research studies, although not all (Lane, 1999), conducted thus far lend some support for the first model (Ayllon & Roberts, 1974; Coie & Krehbiel, 1984). Findings from these investigations have demonstrated that remediation of academic deficits has reciprocal effects on socio–behavioral outcomes. These findings are promising and argue for a focus on academic interventions, particularly those aimed at beginning reading skills, rather than treatments solely aimed at problem behaviors in isolation. As discussed below, interventions designed to diminish antisocial behaviors have proved challenging.

## TREATMENT EFFICACY FOR CHILDREN AT RISK FOR CP + HIA

Effective interventions that "cure" established antisocial behavior patterns simply do not exist. A promising approach lies in primary prevention, which consists of early intervention before the onset of antisocial behavior (Walker & Severson, in press). Primary prevention programs were designed to promote school readiness and prevent school failure. Children who participate in these academic and social prevention programs are more likely to have successful early school experiences, have a stronger commitment to education, and are less likely to drop out and become delinquents (Zigler, 1994).

As previously discussed, behavioral problems and learning difficulties frequently coexist and are evident during the preschool and primary grades (K–3). According to many researchers (e.g., Bullis & Walker, 1994; Kazdin, 1987; Lyon, 1996; Walker, Colvin, & Ramsey, 1995), the optimal time to intervene is during this critical period of development before children's difficulties become too deeply ingrained and secondary problems arise. Thus, current knowledge strongly supports early detection and intervention efforts. Given the scarcity of treatment-outcome studies for children with antisocial behavior that are aimed at the development of academic skills, research in this area is sorely needed. Moreover, given the limited efficacy of interventions targeted at antisocial behaviors, interventions focused on remediation of academic skills, which in turn, may produce positive collateral effects on problem behavior and social competence, may prove to be a better investment of time and resources (Lane, 1999).

Children are expected to learn to read in the primary grades, and those who do not accomplish this important task are severely disadvantaged given that "reading is the key that unlocks virtually all other learning" (U.S. Department of Education, 1999). Low reading achievement places children at risk for negative outcomes, including school failure, behavior problems, and peer and teacher rejection. Further, low reading achievement is highly correlated with school dropout, unemployment, and crime (National Institute for Literacy, 1998). We assert that an enormous potential exists for intervening early in the lives of children at risk for antisocial behavior problems and with interventions aimed at developing protective factors such as early reading skills (O'Shaughnessy, Lane, Gresham, & Beebe-Frankenberger, in press).

Because reading is so critical to independent functioning and early reading problems are good predictors of later difficulties, early reading skills are a logical point of intervention for prevention of later social and academic difficulties. The purpose of the present study is to investigate the efficacy of phonological awareness training with first-grade children at risk for CP + HIA who are also at risk for learning to read. In addition to studying children's responsiveness to phonological awareness training, this study examines the extent to which disruptive behavior is decreased as a collateral effect of improved phonemic awareness.

## METHOD

### District Participation

Five first-grade teachers at three suburban elementary schools, two schools in Atlanta, Georgia, and one school in Tucson, Arizona, agreed to participate. Meetings were held to explain teacher responsibilities, which included (a) nominating students for participation, (b) completing assessment protocols at three time points, and (c) evaluating treatment acceptability and effectiveness at the conclusion of the study.

### Student Participation

Participants were 7 teacher-nominated students (5 boys, 2 girls) with low phonological awareness skills who exhibited higher than average problem behaviors according to the *Social Skills Rating System–Teacher Version* (SSRS-T; Gresham & Elliott, 1990; inclusion criteria to follow). Four of the children were White, 2 were Black, and 1 was Hispanic. None of the students were receiving special education services nor did they have a *Diagnostic Statistical Manual of Mental Disorders* diagnosis according to the cumulative file records. At the onset of the study, participants ranged in age from 74 to 92 months ($M = 84.14$ months, $SD = 7.01$; see Table 1). Four students lived in Arizona and 3 lived in Georgia.

TABLE 1
Student Characteristic

| Variable | Student | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Derk** | **Karina** | **Lilah** | **Nicholas** | **Steven** | **Timmy** | **Willard** |
| Demographics | | | | | | | |
| Age in months | 92 | 80 | 89 | 77 | 74 | 88 | 89 |
| Gender | Boy | Girl | Girl | Boy | Boy | Boy | Boy |
| Ethnicity | Black | White | White | Hispanic | White | White | Black |
| IQ | 69.2 | 86.2 | 100.0 | 87.0 | 98.0 | 86.0 | 89.0 |
| State | GA | AZ | GA | AZ | AZ | AZ | GA |
| SSRS-T (SS) | | | | | | | |
| Social skills | 70 | 80 | 74 | 91 | 84 | 93 | 81 |
| Problem behavior | 127 | 134 | 131 | 125 | 133 | 133 | 130 |
| Academic competence | 62 | 79 | 80 | 67 | 85 | 70 | 70 |
| CEI (Raw) | 5 | 0 | 2 | 5 | 5 | 3 | 9 |
| CFI (Raw) | | | | | | | |
| Adaptive | 25 | 32 | 30 | 25 | 30 | 30 | 31 |
| Maladaptive | 35 | 41 | 39 | 38 | 44 | 31 | 37 |
| TOPA (SS) | 63 | 65 | 73 | 76 | 74 | 63 | 53 |
| SARS (Raw) | | | | | | | |
| Absences | 10 | 2 | 12 | 14 | 1 | 0 | 15 |
| Retentions | Yes | No | No | No | No | No | No |
| NNC | 5 | 0 | 3 | 8 | 4 | 3 | 7 |
| Disc. contacts | 2 | 0 | 1 | 0 | 9 | 0 | 5 |
| Sessions attended | 29 | 30 | 30 | 23 | 30 | 30 | 29 |

*Note.* SSRS-T = Social Skills Rating System–Teacher Version (Gresham & Elliott, 1990); CEI = Critical Events Index (Walker & Severson, 1992); CFI = Combined Frequency Index (Walker & Severson, 1992); TOPA = Test of Phonological Awareness (Torgesen & Bryant, 1994); SARS = School Archival Record Search (Walker, Block-Pedago, Todis, & Severson, 1991); NNC = Negative Narrative Comments.

## Nomination Procedures and Inclusion Criteria

First-grade children with externalizing behavior patterns and poor reading skills, as compared to classmates, were identified as at risk for antisocial behavior by teacher nomination using a modified version of Walker and Severson's (1992) *Systematic Screening for Behavior Disorders* (SSBD). After obtaining parental consent and child assent, teacher-nominated students were screened to determine their eligibility.

For students to be included in this study, three criteria had to be satisfied: (a) a *Test of Phonological Awareness* (TOPA; Torgesen & Bryant, 1994) score at or below the 25th percentile, (b) a Critical Events Index (CEI; Walker & Sever-

son, 1992) of 1 or more or a SSRS-T Problem Behavior score at or above the 75th percentile, and (c) SSRS-T Externalizing and Hyperactivity subscale scores that exceeded gender norms by one standard deviation.

The TOPA is a nationally normed, standardized, 20-item test that measures awareness of the individual sounds within words. Specifically, children are asked to identify the ending sounds in words. In the first subtest, which includes 10 items, children are required to identify which of three words ends in the same sound as a stimulus word. In the second 10-item subtest, children must identify which of four words ends in a different sound from the others. The CEI measures the number of high intensity, low frequency maladaptive behaviors demonstrated over the last 6

months. CEI scores of one or greater warrant the need for additional assessment to ascertain whether or not the students have a behavior disorder (Walker & Severson, 1992). The SSRS-T is a nationally normed and standardized, multirater assessment of student social behavior that can impact teacher–student relations, peer acceptance, and academic performance. The Problem Behavior scale of the SSRS-T includes behaviors that interfere or compete with the acquisition or performance of social skills. The Problem Behavior scale contains 18 items equally distributed among the three subscales of Externalizing Problems, Internalizing Problems, and Hyperactivity Problems.

The 7 participants who met these three criteria were part of a larger study that included 13 additional children who only

met the first two criteria. This article reports results for the 7 children whom we have identified as at risk for CP + HIA—a population of children who are among the most difficult to teach and who are particularly resistant to intervention.

## Intervention Procedures

The student participants, the 7 who met all three criteria and the 13 who met the first two criteria, were assigned to intervention conditions. The two intervention groups in Arizona consisted of 6 students, whereas the two intervention groups in Georgia contained 4 students. Each group met for 30 minutes 3 days a week, for 10 weeks during the second semester of first grade. Therefore, a total of 30 intervention lessons were provided to the children, resulting in 15 hours of training. With one exception (Nicholas, who missed seven lessons), students rarely missed a training session (see Table 1).

To motivate student participation in the reading activities once the novelty of being in the intervention program decreased, a performance based, independent group contingency plan (Gresham & Kendell, 1987) with a graduated criterion for reinforcement was implemented with each group beginning in the third week of the program. Students earned points for participation and correct responses on a daily basis during the pull-out intervention. At the end of the week, students who met the previously specified point criterion for that week could trade their points in for a reinforcer (e.g., stickers, pencils). Points were not allocated during the general education literacy instruction block. Therefore, the reinforcement received during the intervention instruction should not have impacted students' academic and behavioral performances in their general education classrooms.

*Independent Variable: Phonological Awareness Training for Reading.* Thirty lessons were developed by the second author (see O'Shaughnessy, 1999) to accompany Torgesen and Bryant's (1994) *Phonological Awareness Training for Reading* (PATR). PATR was designed to foster children's awareness of the sound structure of words. In particular, it helps children understand how spoken language is represented by the letters of the alphabet. PATR includes four types of activities: rhyming, sound blending, sound segmenting, and reading and spelling. In the first few weeks, children engaged in rhyming activities to focus their attention on the sounds in words. After this, the lessons focused on teaching children how to blend individual sounds to form words. Children are shown how to blend all of the individual sounds in a word (e.g., *d-o-g*) to say the word (*dog*). According to Torgesen and Bryant (1994), blending skills should be taught before segmenting skills because blending is easier for most children to learn.

When children first learn how to segment, they practice identifying words that have the same beginning sound. After this skill is acquired, children begin to analyze words more completely. While children are developing their segmenting skills, they continue to practice blending sounds to make individual words. In the segmenting activities, children first identify words that have the same beginning sounds, then the same ending sounds, and finally the same middle sounds. Children are also taught to indicate which position in a word (first, middle, or last) a given sound occupies and to pronounce the individual sounds that are at the beginning and ending of words. In the final lessons, children use letters to represent the sounds in words. This allows them to use their phonological awareness skills in actual reading and spelling activities, which helps them transfer their acquired knowledge of letter sounds to reading and spelling.

*Intervention Setting and Training.* Each intervention session was conducted in a private room at each elementary school (e.g., conference room or empty classroom) by an upper-level undergraduate or graduate student in special education or school psychology (here after referred to as intervention leader). Initially, intervention leaders and four other university students received 5 hours of training prior to beginning the intervention. During training, intervention leaders learned about current conceptions of reading development, effective reading instruction, and worked through prepared phonological awareness training program handbooks. Systematic, ongoing supervision and training was also provided each week during the intervention.

In addition to PATR training, the university students received approximately 2½ hours of training on how to administer and score curriculum-based measures (CBM; Shinn, 1989) of oral reading fluency—Correct Words Per Minute (CWPM; Shinn, 1989), Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Kaminski & Good, 1996), Total Disruptive Behavior (TDB) in the classroom, and Negative Social Interactions (NSI; operational definition based on social engagement category in the SSBD) on the playground. During this training, intervention leaders learned how to assess CBM oral reading skills using 1-minute timed passages and how to score four classes of errors: substitutions, hesitations, mispronunciations, and omissions. They also learned how to assess fluency of word attack skills using 1-minute time probes. The first and second authors used videotaped segments of students in classroom and playground settings to practice assessing TDB and NSI. Intervention leaders practiced administering and scoring CBM oral reading passages, DIBELS nonsense word fluency probes, TDB probes, and NSI probes until they reached 90% interobserver agreement on each measure.

*Treatment Integrity.* Behavioral scripts containing essential intervention components were used to assess treatment integrity of the intervention procedures for each of the intervention groups. The first and second authors recorded the occurrence and nonoccurrence of each component of the intervention for 25% of the intervention sessions in Arizona and 33% of the training sessions in Georgia. This enabled the treatment integrity of each instructional component and each lesson as a whole to be evaluated within and across intervention leaders. Overall, session and component integrity were quite high. The mean session integrity was 90.86% (*SD* =

2.72; range 62.5% to 100%) and the mean component integrity was also 90.86% ($SD$ = 2.72; range 75% to 100%).

## Descriptive Measures

Descriptive measures involved multi-method, multisource assessments including teacher reports, student measures, and school records. The measures described here are based on technically sound practices and instruments for assessing academic and behavioral performance.

***Social Skills Rating System–Teacher Version (SSRS-T).*** The elementary version of the SSRS-T consists of teacher ratings of (a) 30 social skills in three domains (cooperation, assertion, and self-control), (b) 18 problem behaviors in three domains (externalizing, internalizing, and hyperactivity), and (c) 9 items regarding academic competence. Teachers rate each item in the social skills and problem behavior domains on a 3-point Likert scale ranging from *never* (0), *sometimes* (1), or *very often* (2). The Academic Competence subtest scale consists of nine items, each of which is rated by teachers on a 5-point Likert scale. Each point on the Likert scale corresponds to various clusters of students in the classroom (1 = *lowest 10%*, 5 = *highest 10%*). The SSRS has excellent psychometric properties (see SSRS technical manual for details).

***Critical Events Index (CEI).*** The CEI is one part of the SSBD. The CEI is a teacher checklist with 33 items of behaviors with high salience and intensity yet low frequencies (i.e., sets fires). Raw scores range from 0 to 33. The CEI yields cut-off scores for identifying at-risk children.

***Combined Frequency Index (CFI).*** The CFI, also part of the SSBD, is a nationally normed measure containing two subscale scores, Adaptive Behavior (12 items; raw range 12–60; e.g., follows established classroom rules) and Maladaptive Behavior (11 items; raw score range 11–55; e.g., pouts or sulks), which contain behaviors with low intensity yet high frequencies. Each item is rated by the teacher on a 5-point Likert scale.

***Test of Phonological Awareness (TOPA).*** The TOPA is a nationally normed, 20-item test that measures a child's awareness of individual sounds within words. The early elementary version of the TOPA was individually administered to each participant. Students are asked to identify the ending sounds in words, which are represented by pictures. In the first subtest, which includes 10 items, children are required to identify which of three words ends in the same sound as a stimulus word. In the second subtest, which also includes 10 items, children must identify which of four words ends in a different sound from the others. The test yields raw scores, standard scores, and percentiles with test–retest reliability coefficients of .69 to .77 over an 8-week interval.

***Number of Schools Attended, Negative Narrative Comments, Disciplinary Contacts, and Attendance.*** These four variables are recorded as part of the School Archival Record Search (SARS; Walker, Block-Pedago, Todis, & Severson, 1991). The SARS is an instrument designed to quantify school record data on 11 archival variables. *Number of Schools Attended* refers to the number of elementary schools the student has attended. *Negative Narrative Comments* refers to written statements contained in the student's cumulative file that describe academic underachievement and maladaptive behaviors within the past year. *Disciplinary Contacts* involves a written product of a contact between a student and a school-site disciplinarian that has been placed in either a student's cumulative file or disciplinary file (e.g., noncompliance, defiance toward staff). *Attendance* refers to the total number of days the student has been absent from school within the past 12-month period. Interrater reliability estimates on the SARS range from 94% to 100%, with a reliability coefficient of 96% for the total SARS form.

## Dependent Variables

Direct measures of reading and behavior were collected on each child at four time points. Preintervention data were collected at the onset of the second semester of their first-grade year. Weekly probes were collected throughout the 10 weeks of reading intervention. Postintervention data were collected when the intervention concluded. Two weeks later, follow-up data were collected to examine maintenance of treatment effects.

***Reading Measures.*** Two measures of early reading skills were assessed. DIBELS is an instrument designed to provide a measure of fluency on key indicators of early literacy skills (e.g., knowledge of letter names, word attack skills). DIBELS contains four subtests (i.e., Phoneme Segmentation Fluency, Letter-Naming Fluency, Nonsense Word Fluency, and Onset Recognition Fluency) and includes 20, 1-minute probes for each subtest. Each probe can be individually administered to children in preschool through second grade, which allows for frequent, repeated assessment. This assessment has adequate psychometric properties and can be used to screen high-risk students, monitor individual student progress, and evaluate intervention outcomes. In this study, only the Nonsense Word Fluency subtest was administered. CWPM, a curriculum-based measurement of oral reading fluency was assessed using beginning first-grade level decodable minibooks (SRA/McGraw-Hill, 1998). Forty excerpts of approximately 100 words in length were selected from passages in these books and randomly assigned as 1-minute probes. Errors of substitution, omission, and mispronunciations, and hesitations of 3 seconds or more were recorded (Shinn, 1989). The number of words read correctly per minute was calculated for 1-minute probes.

***Direct Observation Measures.*** Two direct observation measures were assessed: (a) Total Disruptive Behaviors (TDB) in the classroom, and (b) Negative Social Interactions (NSI; Walker & Severson, 1992) on the playground. These measures were collected in 10-minute observation sessions using duration recording at four time points previously mentioned. TDB and NSI were measured by starting a stopwatch whenever the target

student was engaged in any of the behaviors described below and stopping the watch when the student ceased the behavior. TDB and NSI were converted to a percentage by recording the elapsed time by the total time observed and multiplying by 100 (Range: 0%–100%). These recording procedures closely paralleled the recording procedures for academic engaged time as specified in the SSBD.

### Total Disruptive Behavior (TDB).
TDB is a class of behavior that disturbs or disrupts the classroom ecology and interferes with classroom instruction. Examples of disruptive behavior include being out of seat without permission; touching or grabbing others' property; hitting, biting, choking, or slapping others; any audible noise other than vocalizations related to instruction (e.g., screaming, yelling, cursing, criticizing others); and/or noncompliance with teacher instructions.

### Negative Social Interaction (NSI).
NSI is defined as a class of behavior that disturbs or disrupts ongoing play activities and involves any occurrence of physical or verbal aggression (Walker & Severson, 1992). Negative verbal behavior includes name-calling, bossy commands or statements, statements of rejection, possessive statements, accusations, uncomplimentary statements, aggressive threats, taunts, or quarrelsome behavior. Negative physical behavior includes rough, harmful bodily contact; rough, painful, or irritating contact with objects or materials; or physical pestering. As previously mentioned, this definition is based on a modified version of the social engagement category as specified in the SSBD.

### Interobserver Agreement.
Interobserver agreement (IOA) estimates were randomly collected during 25% of the observation sessions and at least once during each of the four data collection points. Mean IOA scores were as follows: DIBELS 90.24% ($SD$ = 5.77; range, 79%–100%); CWPM 94.12% ($SD$ = 7.08; range, 70%–100%); TDB 91.73% ($SD$ = 9.31; range, 50%–100%); and NSI 92.11% ($SD$ = 7.54; range, 80%–100%).

## Social Validity Measures

### Intervention Rating Profile (IRP-15).
The IRP-15 (Martens, Witt, Elliott, & Darveaux, 1985) is a 15-item scale that assesses treatment acceptability from the teacher perspective. Teachers are asked to evaluate 15 statements pertaining to intervention procedures and outcomes (e.g., I liked the procedures used in this intervention). The instrument uses a 6-point Likert rating scale ranging from *strongly disagree* (1) to *strongly agree* (6). Total point values for the IRP-15 range from 15 to 90.

### Children's Intervention Rating Profile (CIRP).
The CIRP (Witt & Elliott, 1983), a 7-item questionnaire, uses a 6-point Likert scale of children's acceptability rating ranging from 1 (*I do not agree*) to 6 (*I agree*) (Elliott, 1988; raw score range 7–42). The CIRP has been validated on more than 1,000 students in Grades 5 through 10 with an average coefficient alpha of .86 (Elliott, 1988). Wording of the CIRP was slightly altered to make the statements understandable to younger children.

### Children's Social Validity Interview (CSVI).
The CSVI (Lane, 1997) contains open- and close-ended items to assess social validity from the student's perspective. Thirteen of the close-ended items used a 3-point Likert scale (1 = *not much*, 2 = *a little*, and 3 = *a lot*) to measure children's acceptability ratings with an emphasis on satisfaction of intervention components, skills acquired, and use of acquired skills. A composite score, Overall Use, was created by summing the 5 items (9–13) related to use.

## Experimental Design and Statistical Analyses

The experimental design for this study was a multiple baseline across intervention groups (Johnston & Pennypacker, 1993). Three children, Derk, Lilah, and Willard, were in the first intervention group and four children, Karina, Nicholas, Steven, and Timmy, were in the second intervention group. Each child was assessed on CBM oral reading fluency (CWPM), word attack fluency (DIBELS), TDB, and NSI at the four specified time points. After stable baseline levels were established for the reading measures, the above measures were assessed weekly during the intervention phase to monitor individual growth. Given the situational specificity of behavior (Kazdin, 1979), greater variability among the behavioral variables was expected. Thus, in some instances (e.g., Karina), stability of TDB and NSI was not achieved in the baseline phase prior to the introduction of the intervention.

In addition to the traditional method of visual inspection that detects primarily large treatment effects, and therefore is susceptible to Type I errors, data were analyzed by other methods that more closely examine treatment effects. Specifically, the following methods were utilized: (a) mean score comparisons across phases, (b) CWPM goals-to-achievement calculations, and (c) calculation of effect sizes (Busk & Serlin, 1992).

### Mean Scores Comparisons.
Mean scores comparisons are one component of the Time Series Analysis (TSA) method (Fisch, 1998; Velicer & Harrop, 1983). A change in mean scores between phases indicates a change in behavior, while a change in slope, or trend line, indicates both within and between phase changes in behavior (Gresham, 1998). Although this method of analysis is effective in detecting smaller magnitude changes in behavior, TSA has been criticized due to the large number of data points necessary to yield precise results (Center, Skiba, & Casey, 1985–1986; Kazdin, 1984). In addition, there is some controversy as to whether autocorrelation of data points exists and, if so, whether autocorrelation may substantially inflate Type I errors (Fisch, 1998).

### CWPM Growth Calculations.
For purposes of this investigation, two projected levels of growth, normative and ambitious, were calculated. Fuchs, Fuchs, Hamlett, Walz, and Germann (1993) stated that the normative level of growth for CWPM in first grade is 2.10 words per

week ($SD$ = .80). An ambitious rate of growth is based on established reading normative slope data and increases by one standard deviation. Accordingly, an ambitious goal for first-grade students is an increase of 2.90 words per week. For example, if a student's baseline median score is 20 CWPM, one would expect that at the end of a 10-week intervention, a rate of 41 CWPM [20 + (2.10 × 10 weeks)] is a normative goal and a rate of 49 CWPM [20 + (2.90 × 10 weeks)] is an ambitious goal. From these values, the children's actual growth during the intervention phase was compared to both the normative and ambitious levels of growth.

*Effect Sizes.* Computation of a treatment effect sizes utilizes an approach that is based on the homogeneity of variance assumption, using a pooled standard deviation as the error term (Busk & Serlin, 1992; Gresham, 1998). In this investigation an effect size was computed by subtracting the baseline mean from the treatment mean and dividing by the pooled standard deviation. This method can be used for calculating effect sizes for each individual, as well as for the overall treatment effect across students. Because single case design investigates intraindividual behavior changes that are often disregarded as error in group design research, the effect sizes were calculated for each child.

# RESULTS

## Mean Score Comparisons

Examination of mean changes by phases revealed that all participants, boys and girls alike, made substantial gains in word attack skills (DIBELS; see Table 2). The growth in DIBELS was expected given that the DIBELS measure most closely paralleled the skills targeted during the reading intervention. Students appeared to maintain their respective gains during both postintervention and follow-up data collection points. Several students (e.g., Lilah, Steven, Timmy, and Willard) continued to make gains even after the intervention concluded as evidenced by postintervention mean scores. However, only

Timmy continued to make gains during the follow-up phase.

Similarly, inspection of mean values between baseline and intervention data phases indicated that all students showed improvements in CWPM. Derk, Karina, Lilah, Timmy, and Willard continued to show improvement in oral reading fluency into the postintervention phase. Unfortunately, Karina and Nicholas's CWPM means decreased in the follow-up condition to a level below the baseline phase.

TABLE 2
Mean Changes by Phase

| Student | Measure | | | | | | | |
| | DIBELS | | CWPM | | TDB | | NSI | |
| | M | (SD) | M | (SD) | M | (SD) | M | (SD) |
| Derk | | | | | | | | |
| Baseline | 12.3 | (3.82) | 2.9 | (0.90) | 32.7 | (18.05) | 10.7 | (11.70) |
| Intervention | 44.5 | (19.59) | 14.1 | (6.23) | 30.5 | (23.71) | 8.0 | (7.89) |
| Post | 42.5 | (3.54) | 18.00 | (4.24) | 45.0 | (16.97) | 7.5 | (3.54) |
| Follow up | 40.7 | (5.13) | 18.00 | (1.00) | 24.3 | (21.36) | 5.0 | (8.66) |
| Karina | | | | | | | | |
| Baseline | 22.4 | (4.06) | 3.4 | (1.17) | 5.8 | (8.69) | 13.9 | (17.16) |
| Intervention | 28.5 | (5.91) | 6.7 | (4.76) | 3.0 | (7.09) | 2.9 | (5.95) |
| Post | 23.0 | (4.36) | 8.0 | (9.54) | 17.3 | (25.01) | 2.7 | (4.62) |
| Follow up | 23.7 | (4.93) | 1.7 | (1.53) | 0.0 | (0.00) | 0.0 | (0.00) |
| Lilah | | | | | | | | |
| Baseline | 5.0 | (1.83) | 5.6 | (1.72) | 25.6 | (19.86) | 3.9 | (5.24) |
| Intervention | 29.7 | (11.15) | 11.9 | (5.24) | 21.8 | (22.69) | 5.0 | (6.39) |
| Post | 48.5 | (0.71) | 18.0 | (0.00) | 42.0 | (2.83) | 0.0 | (0.00) |
| Follow up | 38.3 | (9.07) | 21.0 | (6.24) | 15.3 | (15.37) | 1.7 | (2.89) |
| Nicholas | | | | | | | | |
| Baseline | 15.3 | (13.80) | 2.9 | (1.29) | 13.2 | (13.17) | 4.6 | (7.38) |
| Intervention | 29.4 | (6.17) | 9.5 | (6.57) | 5.0 | (6.90) | 1.9 | (3.31) |
| Post | 28.7 | (1.15) | 8.7 | (3.21) | 4.0 | (6.93) | 2.3 | (1.53) |
| Follow up | 28.7 | (1.15) | 2.7 | (0.58) | 35.3 | (22.81) | 8.0 | (13.00) |
| Steven | | | | | | | | |
| Baseline | 15.3 | (2.16) | 8.8 | (3.16) | 28.6 | (19.52) | 7.2 | (7.69) |
| Intervention | 24.7 | (5.85) | 15.4 | (4.97) | 24.3 | (36.19) | 1.6 | (4.12) |
| Post | 25.0 | (4.58) | 14.7 | (9.07) | 34.0 | (39.51) | 11.3 | (6.51) |
| Follow up | 23.7 | (7.02) | 8.0 | (6.08) | 35.3 | (31.34) | 16.7 | (20.82) |
| Timmy | | | | | | | | |
| Baseline | 2.8 | (4.66) | 1.7 | (1.16) | 24.6 | (27.11) | 2.5 | (2.84) |
| Intervention | 19.2 | (11.00) | 6.4 | (2.99) | 4.4 | (6.85) | 2.3 | (3.16) |
| Post | 23.3 | (8.08) | 10.3 | (7.57) | 4.7 | (5.69) | 3.0 | (3.00) |
| Follow up | 25.0 | (5.20) | 3.7 | (0.58) | 3.7 | (6.35) | 0.0 | (0.00) |
| Willard | | | | | | | | |
| Baseline | 14.7 | (3.55) | 5.7 | (0.76) | 30.1 | (20.92) | 12.9 | (11.19) |
| Intervention | 29.2 | (4.69) | 8.0 | (3.92) | 29.9 | (19.97) | 9.3 | (10.67) |
| Post | 38.0 | (2.83) | 15.5 | (0.71) | 27.5 | (3.54) | 5.0 | (7.07) |
| Follow up | 31.7 | (5.69) | 12.3 | (3.79) | 24.3 | (15.63) | 6.7 | (7.64) |

*Note.* DIBELS = Dynamic Indicators of Basic Early Literacy Skills (Kaminski & Good, 1996); CWPM = Correct Words Per Minute; TDB = Total Disruptive Behavior; NSI = Negative Social Interactions.

Visual inspection of TDB means indicated that all students showed decreases in TDB from baseline to intervention phases. However, Derk, Karina, Lilah, Steven, and, to a lesser extent, Timmy showed increases in disruptive behavior from intervention to postintervention phases. Only Willard experienced steady decreases in disruptive behavior during each of the four data collection phases. Examination of Figures 1 and 2 reveals that for some students (e.g., Willard, Timmy, Karina) a reciprocal relationship existed between word attack and disruptive behavior in the classroom. Namely, improvements in reading skills (DIBELS) were accompanied by decreases in disruptive behavior (TDB).

All students except Lilah showed decreases in negative social behavior (NSI) in the playground setting between baseline and intervention phases. However, only Derk and Karina continued to show improvement during postintervention and follow-up phases. Two students, Nicholas and Steven, actually showed *increases* in NSI during the follow-up phase relative to baseline.

## CWPM Growth

Comparisons between the children's mean CWPM during baseline with the CWPM in Week 10 of the reading intervention indicate that all children made progress in oral reading fluency. However, only one child—Nicholas—met his individual normative projected levels of growth (see Table 3 and Figure 3). In some instances, a student's (e.g., Nicholas and Derk) actual level of growth more closely approximated his or her respective level of normative growth than did other participants (e.g., Timmy and Karina). As was the case with DIBELS, there were not dramatic gender differences on this measure.

## Effect Sizes

All children demonstrated strong improvement in word attack skills (DIBELS) as evidenced by effect sizes ranging from 1.22 to 3.81 ($M$ = 2.45; $SD$ = 0.98; see Table 4). The three oldest stu-

dents, Derk, Lilah, and Willard, all of whom resided in Georgia, showed the greatest gains in word attack skills with effect sizes of 2.75, 3.81, and 3.52, respectively. Similarly, all students experienced an increase in the correct number of words read per minute with CWPM effect sizes ranging from 0.98 to 3.14 ($M$ = 1.80; $SD$ = 0.73). Derk and Timmy, who had very low CWPM in the baseline phase, made strong growth in oral reading fluency.

Although all students showed decreases in disruptive classroom behavior (TDB), the results were more varied relative to the reading measures with TDB effect sizes ranging from –1.19 to –0.01 ($M$ = –0.40; $SD$ = 0.44). The three oldest students, Derk, Lilah, and Willard, showed the least improvement in classroom behavior (TDB) with small effect sizes of –0.11, –0.18, and –0.01, respectively. Timmy, who had (a) the lowest levels of maladaptive behavior on the CFI,
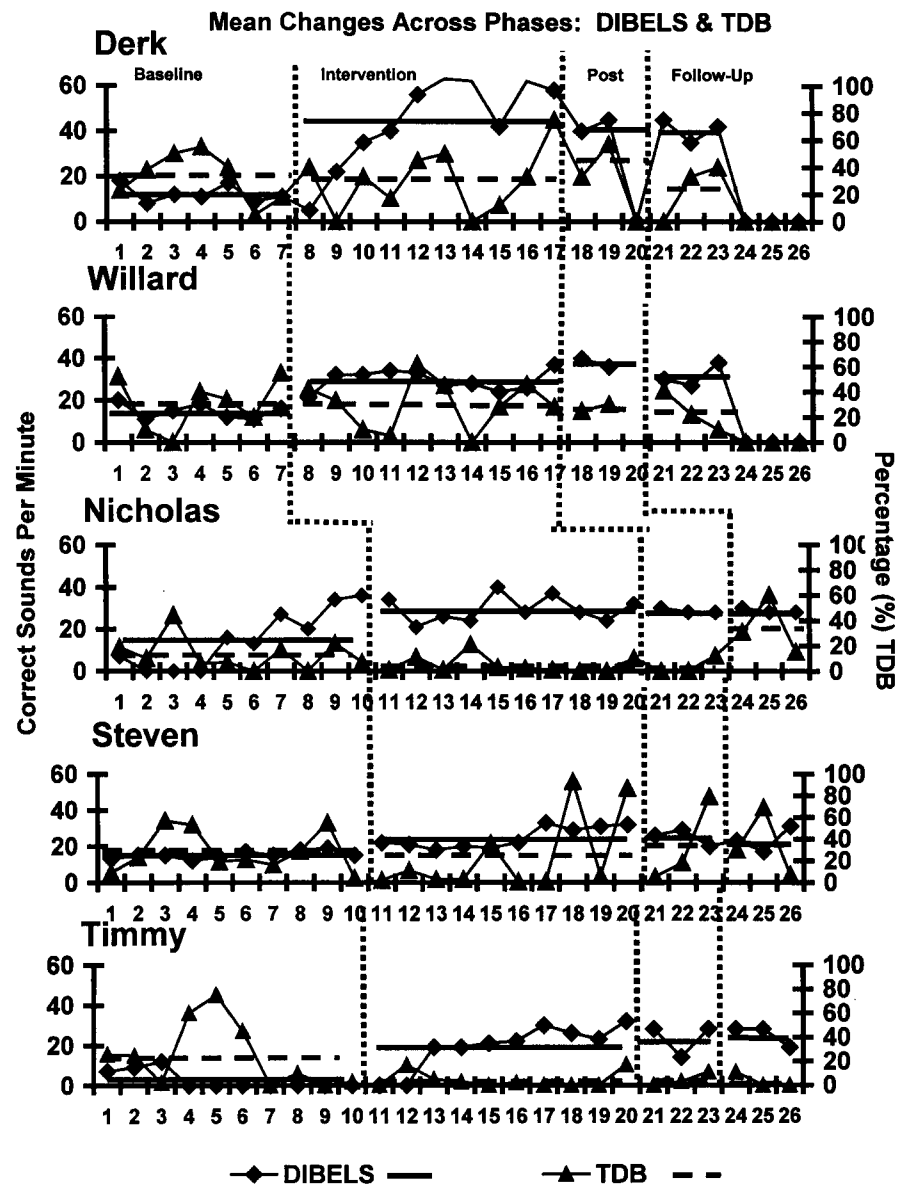


FIGURE 1. Dynamic Indicators of Basic Early Literacy Skills (Kaminski & Good, 1996; DIBELS) and Total Disruptive Behavior (TDB) Mean changes: Boys.
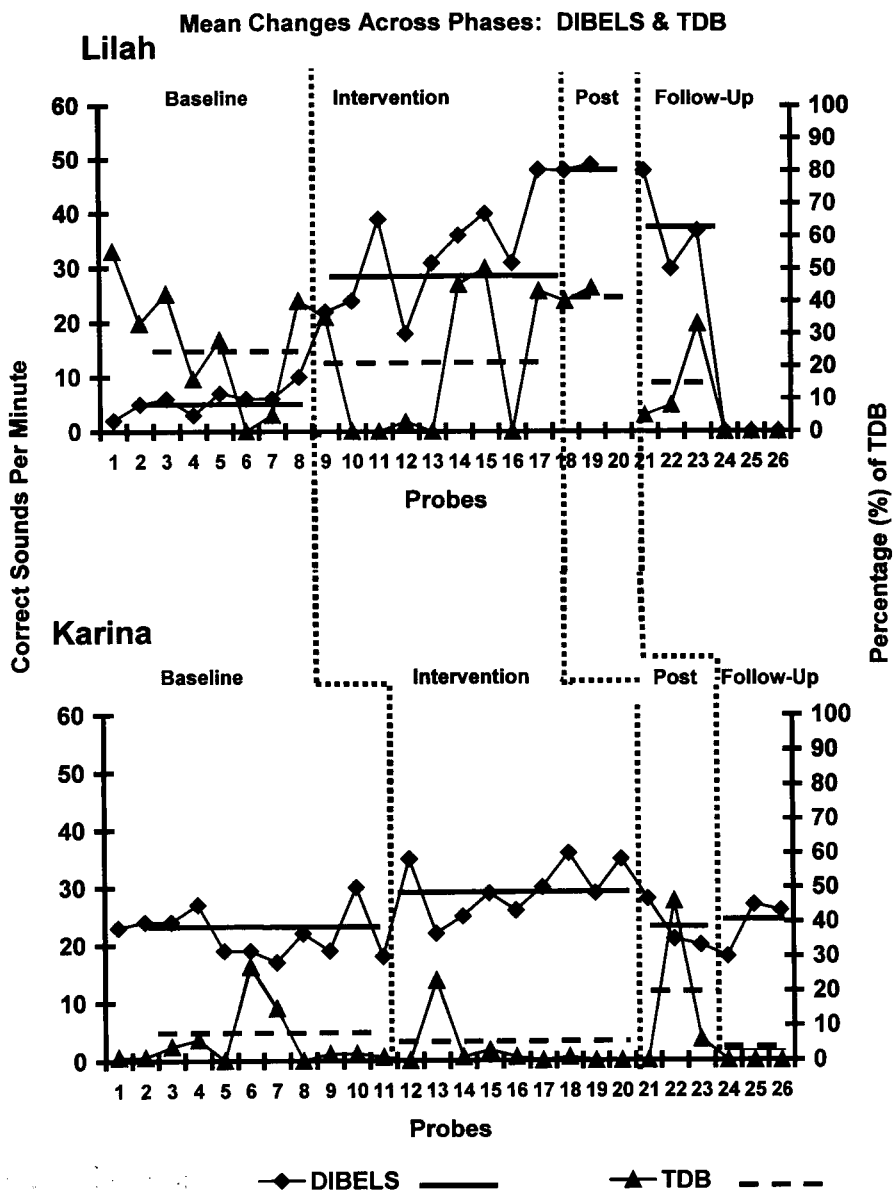
**Mean Changes Across Phases: DIBELS & TDB**



FIGURE 2. Dynamic Indicators of Basic Early Literacy Skills (Kaminski & Good, 1996; DIBELS) and Total Disruptive Behavior (TDB) Mean changes: Girls.

were examined to ascertain the extent to which teacher and students were satisfied with the intervention. In general, the teachers rated the intervention favorably as evidenced by a mean IRP-15 rating of 77.00 $(SD = 4.00)$. This favorable rating was anticipated given that the students were afforded extra instructional assistance, and the teachers did not have to conduct the intervention groups themselves. Similarly, the students also rated the intervention as acceptable with a mean CIRP value of 35.00 $(SD = 2.77)$. The mean Use Composite score $(M = 10.43; SD = 3.99)$ from the CSVI suggests that the children used the skills acquired in the reading intervention. Scores on the Use Composite variable ranged from 5 to 15 with the low score going to Nicholas, who attended by far the fewest number of training sessions.

## Discussion

The objectives of this study were twofold. The first objective was to examine the impact of phonological awareness training with first-grade children at risk for CP + HIA who are also at risk for learning to read. The second objective was to investigate the degree to which problem behaviors were decreased as a collateral effect of improved phonemic awareness.

Results of analyses related to the first objective support the efficacy of an early reading skills intervention for children who are at risk for CP + HIA. Specifically, all children who participated in the phonemic awareness training intervention experienced substantial growth in word attack skills and oral reading fluency as evidenced by effect sizes, mean score comparisons, and CWPM growth calculations. Nonetheless, the findings also suggest that while improvements were noted, the intervention may not have been of sufficient intensity and duration to (a) produce lasting changes (e.g., in several cases decreases in TDB were not sustained into follow-up phases) and (b) produce reading fluency growth at a rate commensurate with normally achieving students (e.g., only one child achieved normative growth in CWPM).

(b) zero absences from school during the 12 month period prior to the onset of the intervention, and (c) substantial progress in word attack skills (DIBELS) and oral reading fluency (CWPM), made the greatest progress in classroom behavior (effect size = −1.19). As expected, the NSI effect sizes revealed varied results for improved social behavior on the playground. The NSI effect sizes ranged from −0.95 to 0.19 $(M = -0.41; SD = 0.43)$. In general all children, with one exception (Lilah),

showed positive behavioral changes as evidenced by negative effect sizes. Lilah actually showed a slight increase in negative social interactions on the playground between the baseline and intervention phases with an effect size of 0.19.

### Social Validity

Frequency tables and mean values associated with individual items and composite scores on the IRP-15, CIRP, and CSVI

## TABLE 3
### Correct Words Per Minute (CWPM) Growth

| Student | Baseline Mdn (SD) | CWPM[a] | | |
| --- | --- | --- | --- | --- |
| | | Actual | Normative | Ambitious |
| Derk | 3.0 0.90 | 21 | 24.0 | 32.0 |
| Karina | 3.0 1.17 | 13 | 24.0 | 32.0 |
| Lilah | 6.0 1.72 | 20 | 27.0 | 35.0 |
| Nicholas | 2.5 1.29 | 24 | 23.5 | 31.5 |
| Steven | 8.0 3.16 | 20 | 29.0 | 37.0 |
| Timmy | 1.5 1.16 | 7 | 22.5 | 30.5 |
| Willard | 6.0 0.76 | 14 | 27.0 | 35.0 |

[a]Week 10 of intervention.

## TABLE 4
### Effect Sizes

| Student | Measures | | | |
| --- | --- | --- | --- | --- |
| | DIBELS | CWPM | TDB | NSI |
| Derk | 2.75 | 3.14 | −0.11 | −0.28 |
| Karina | 1.22 | 1.11 | −0.35 | −0.95 |
| Lilah | 3.81 | 1.81 | −0.18 | 0.19 |
| Nicholas | 1.41 | 1.68 | −0.82 | −0.50 |
| Steven | 2.34 | 1.62 | −0.15 | −0.95 |
| Timmy | 2.09 | 2.26 | −1.19 | −0.07 |
| Willard | 3.52 | 0.98 | −0.01 | −0.33 |

Note. DIBELS = Dynamic Indicators of Basic Early Literacy Skills (Kaminski & Good, 1996); CWPM = Correct Words Per Minute; TDB = Total Disruptive Behavior; NSI = Negative Social Interactions.

In terms of the second objective, results suggest that for some first-grade children, secondary interventions targeting academic skills resulted in positive collateral effects on behavior. Examination of effect sizes and mean changes by phase provides preliminary evidence of a reciprocal relationship between improvements in phonemic awareness skills and decreases in maladaptive behaviors. In general, as beginning reading skills (DIBELS and CWPM) increased, maladaptive behav-

iors in the classroom (TDB) and on the playground (NSI) decreased. Moreover, the skills acquired in the intervention sessions (e.g., improved phonemic awareness) were then used by the students during literacy instruction in their general education classrooms. It was during the general education literacy instruction that disruptive behavior was observed and measured. As such, increased early literacy skills, such as oral reading fluency, could be associated with newly acquired competence in phonemic awareness. The increased efficacy in early reading skills appears to have enabled the children to participate in the reading activities during literacy, which directly competed with time for disruptive behavior (Gresham, 1998).

Results also suggest that older children's maladaptive behaviors appear to be more resistant to intervention than younger children's, even though the intervention was implemented during "the window of opportunity" described by Kazdin (1987). The three oldest children, despite making the greatest progress in word attack skills (DIBELS), proved to be the most resistant to behavioral changes as evidenced by their small effect sizes for TDB measures. Further, it is interesting to note that Karina, one of the younger participants, who had the highest rating on the Problem Behavior subscale on the SSRS-T ($SS$ = 134) and the second highest score on the Maladaptive subscale of the CFI (raw = 41), actually demonstrated decreases in negative social behavior on the playground (NSI) from baseline to intervention phases (effect size = −0.95) despite the severity of her problem behaviors. Given the brevity of the intervention, changes in behavior were not expected to generalize to the playground setting. However, it was encouraging to see that even a 10-week intervention did impact social behavior in an unstructured setting.

## Limitations

As is often the case with school-based research, this study is not without limitations. First, this study consists of a small sample size that places constraints on the experimental design and the types of
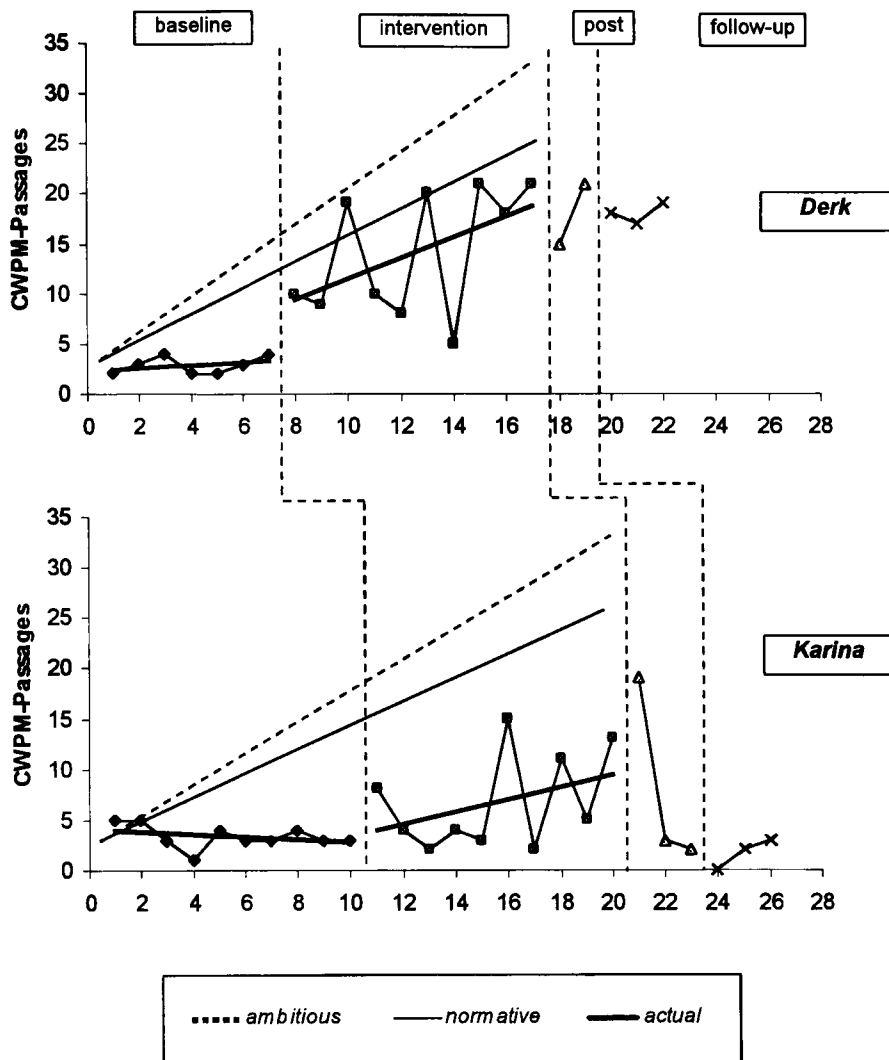
FIGURE 3. Correct Words Per Minute (CWPM) growth trends: A sample illustration.

schools to design and implement socially valid, academic interventions that will create changes in both academic and behavioral domains.

## Directions for Future Research

The overarching goal leading to the previously mentioned objectives was to provide preliminary indications of the efficacy of Hinshaw's (1992a) hypothetical model: Academic underachievement leads to externalizing patterns. The intent of the study was not to suggest that a 10-week academic intervention is of sufficient magnitude and intensity to unilaterally improve early literacy skills and permanently decrease disruptive behaviors; instead, it was to provide evidence to inform future research. If results of this brief intervention suggest that improved phonemic awareness is associated with decreases in disruptive behavior, these findings may provide the direction necessary for larger scale, more intensive interventions to be conducted with this population. Findings from this, when interpreted in conjunction with the findings of other treatment-outcome studies (see Ayllon & Roberts, 1974; Coie & Krehbiel, 1984; Lane, 1999) provide preliminary evidence to warrant implementation of this type of practical, cost-effective, academic-oriented intervention on a larger scale, particularly given that the outcomes might ultimately result in long-term benefits to the children and to society as a whole.

Clearly, it is essential that interventions be conducted early in a child's educational career (Kazdin, 1987; Walker & Severson, in press). Although the outcomes of this study are encouraging in that they provide direction for how best to intervene with this most challenging population, the findings are, at best, preliminary. There is a need for additional experimentally sound treatment-outcome studies to explore the magnitude of deficiencies, in academic and behavioral domains, in relation to the magnitude of intervention necessary to obtain desired outcomes (Gresham, 1991; Nevin, 1988). Also, much of the research exploring remediation of aberrant behavior has fo-

analyses that can be conducted. Small sample sizes also limit the ability to generalize findings to the population under investigation. Clearly, it is difficult to obtain a larger sample size when studying extreme populations, especially when conducting treatment-outcome studies. However, single case design methodology has certain core elements such as flexibility and inspection of intrasubject variability (Hayes, 1981) that prove useful when studying extreme populations. Second, the three oldest children resided in Georgia. Thus, it is difficult to determine if their "resistance to intervention" was a function of their age or if it was due to

subtle, undetectable differences between either the interventions or interventionist in Georgia and Arizona. Third, it may be that the results were not more robust due to the brevity of the intervention. Given that this population is characterized as being resistant to intervention, it is quite possible that future treatment-outcome studies will need to be of greater depth and breadth in order to produce lasting changes with children at risk for CP + HIA.

Despite these limitations, it is important to note that overall, teachers and students alike were satisfied with the intervention procedures and outcomes. This indicates that it may be possible for

cused on risk factors. There is a need to expand the scope of investigations to identify characteristics, including both risk and protective factors (Forness, Kavale, MacMillan, Asarnow, & Duncan, 1996), of students who do and do not respond to secondary interventions. For example, research by Doll and Lyon (1998) indicated that high rates of engagement in academics and related productive activities serve as protective factors to children characterized as "resilient." However, for some children, tertiary interventions, with a broader focus that includes socio–behavioral domains (O'Shaughnessy et al., in press) may be necessary to produce lasting changes for students at risk for CP + HIA.

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## Authors' Notes

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