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Effects of Two Instructional Paces on Pre-K Children's Participation Rate, Accuracy, and Off-Task Behavior in the Language for Learning *Program*

Abstract: Despite the recommendation to maintain a brisk pace while delivering Direct Instruction programs, research evidence in support of brisk instructional pacing is mixed. This study examined the effects of slow- and fast-paced teaching on the response opportunities, participation, accuracy, and off-task behavior of 4 prekindergarten students participating in the *Language for Learning* program. Two teachers taught *Language for Learning* in slow- and fast-paced formats within an alternating treatments design. Differences in participants' percentage of participation were not observed between fast- and slow-paced teaching; however, fast-paced teaching increased participants' rate of responding and rate of correct responding. Additionally, fast-paced teaching decreased participants' off-task behavior. The benefits of fast pacing are discussed in terms of the study's results and previous research on instructional pacing. Suggestions for future research are also presented.

Among the skills acquired in early childhood, oral language is one of the most critical. Oral language affects children's development in a number of important ways. For example, evidence suggests a positive relationship between young children's oral language skills and their performance on cognitive skill measures (Kelly & Dale, 1989). Other research has found that oral language development is predictive of reading acquisition including phonemic awareness and comprehension (Betourne & Friel-Patti, 2003; Scarborough, 1990; Tallal, Allard, Miller, & Curtiss, 1997). Additionally, children who have poorly developed oral language may be socially isolated (Gertner & Rice, 1994) and more likely to develop challenging behavior (Mack & Warr-Leeper, 1992). Moreover, the academic and behavioral problems associated with poorly developed oral language can extend into adolescence and adulthood (Waldron-Soler & Osborn, 2004).

Unfortunately, some children fail to acquire sufficient oral language skills from exposure to their natural environments. For instance, children from low socioeconomic status households are at a disadvantage in terms of learning oral language (Hart & Risley, 1995). Children with disabilities, including specific learning disabilities, also suffer from associated oral language deficits (McArthur & Hogben, 2000). Given

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the importance of oral language, intervention may be necessary for children who lack appropriate skills. *Language for Learning* is a Direct Instruction (DI) program designed for children who need instruction in oral language (Engelmann & Osborn, 1999; Waldron-Soler & Osborn, 2004). *Language for Learning* teaches oral language across six areas: (a) actions, (b) description of objects, (c) information and background knowledge, (d) instructional words and problem-solving concepts, (e) classification, and (f) problem-solving strategies and applications. The program is appropriate for children in preschool, kindergarten, and primary grades, including children who lack age appropriate language skills, children in special education and Title I programs, children who participate in bilingual and ESL programs, and children with speech and language difficulties. Initial studies suggest positive effects of the program on children's language skills (Benner et al., 2002; Waldron-Soler et al., 2002).

The *Language for Learning* program requires precise implementation. Teachers must carefully adhere to scripted directions, use clear signals to evoke choral responses, firm or repeat directions until all group members can perform a response, correct mistakes immediately, and pace lessons quickly (Engelmann & Osborn, 1999). In terms of lesson pacing, Engelmann and Osborn suggest, "[The teacher] and the children should have a sense of moving quickly through the steps of the exercise" (p. 18). Watkins and Slocum (2004) also recommend that teachers maintain a brisk pace while delivering DI programs including *Language for Learning*. They suggest that rapid pacing allows teachers to cover more material, increases student attention, and reduces problem behaviors. However, other than the general recommendation to maintain a brisk pace, there are no exact guidelines for optimal levels of pacing within DI programs. Furthermore, there appears to be mixed support for brisk instructional pacing. In fact, a prevailing view in education appears to be that increasing the duration of pauses, thereby slowing the pace of instruction, enhances learning outcomes (Rowe, 1987; Rowe, 2003; Tobin, 1987). Instructional pacing is defined by several variables (Heward, 1994). These include (a) response latency, the duration between presentation of an instructional stimulus and student response; (b) feedback delay, the duration between student response and teacher feedback; (c) intertrial interval (ITI), the duration between teacher feedback and presentation of the next instructional stimulus; and (d) the rate at which the teacher talks or reads from the presentation script.

Recognizing the importance of pacing variables to student learning, researchers have examined the effects of pacing variables on student participation, accuracy, and off-task behavior. Collectively, these studies find mixed support for brisk instructional pacing. Of the different pacing variables, a number of researchers examined student performance in relation to short versus long duration ITI. In the first of several studies on ITI, Carnine (1976) presented fast- and slow-rate *Distar* reading instruction to two low-achieving first-grade students. Fast-rate instruction was delivered with 0-s ITI, while slow-rate instruction was delivered with 5-s ITI. Fast-rate instruction differentially increased participants' participation and correct responding and decreased off-task behavior when compared to slow-paced instruction.

Extending Carnine's (1976) study, Koegel, Dunlap, and Dyer (1980) investigated the effects of short (1 to 4 s) versus long (4 to 26 s) ITI on the performance of three children with autism engaged in receptive and expressive language tasks. None of the participants met acquisition criteria on receptive or expressive language tasks in the long ITI condition. In contrast, the short ITI condition increased unprompted correct responding to acquisition levels for all participants. Koegel et al. noted that short ITI may reduce opportunities for students with autism to engage in self-stimulatory behavior, increasing their attention to task. To test this assumption, Dunlap, Dyer, and

Koegel (1983) investigated the effects of short (1 to 2 s) and long (greater than 5 s) ITI durations on the correct responding and self-stimulatory behavior of four children with autism. Consistent with conclusions drawn from the previous study, short ITI reduced participants' self-stimulatory behavior and increased correct responding. Darch and Gersten (1985) examined the effects of short versus long ITI durations combined with praise versus no praise on the correct responding and on-task behavior of four children with learning disabilities. Participants made more correct responses and had higher levels of on-task behavior during the short ITI condition. Moreover, correct responding and on-task behavior were higher when short ITI and praise were combined.

In contrast to the studies described, Skinner, Smith, and McLean (1994) found no improvements with short ITI. They compared immediate (0 s) ITI and 5-s ITI instruction on the reading performance of three low-performing elementary students with emotional and behavioral disorders. No differences in reading acquisition or maintenance were found between slow and fast pacing. A possible explanation for Skinner et al.'s finding is that participants were not reported to engage in high rates of off-task behavior during either condition. If the benefits of fast pacing are derived from reducing students' opportunities to engage in off-task behavior (cf. Koegel et al., 1980), students with low off-task behavior may not experience the same levels of performance improvement from fast pacing.

In addition to ITI, several researchers have studied the effects of long and short durations of response latency or wait time on student performance. In contrast to studies of ITI that find mixed, but positive support for fast-paced teaching, these findings suggest that students who are impulsive responders benefit from longer response latencies and slower-paced teaching. Lowry and Ross (1975) compared the effects of a 5-s response delay condition versus a 0-s response delay condition on a matching-to-sample task for students with profound mental retardation who were identified as impulsive responders (i.e., they demonstrated short response latencies and high error rates during instruction). In the 5-s response delay condition, instructional stimuli were moved out of the participants' reach until the end of the interval to prevent responding, whereas in the 0-s delay condition, participants were allowed to respond immediately after the presentation of instructional stimuli. On average, participants made fewer errors on the matching-to-sample task with a 5-s delay than with a 0-s delay.

Subsequent studies of response latency found results similar to Lowry and Ross (1975). Dyer, Christian, and Luce (1982); Lee, O'Shea, and Dykes (1987); and Duker, Van Doeselaar, and Verstraten (1993) compared the effects of short (0 to 5 s) versus long (4 to 10 s) latencies on the response accuracy of children with developmental disabilities, most of who were identified as impulsive responders. Results indicated that students' response accuracy was better with longer response latencies than with shorter response latencies. In these studies, longer response latencies may have improved participants' accuracy by allowing them more opportunity to attend to relevant aspects of the instructional stimuli. Valcante, Roberson, Reid, and Wolking (1989) investigated the combined effects of short versus long response latencies with short versus long ITI durations for young children with multiple disabilities. They also found that irrespective of ITI duration, longer response latencies produced higher percentages of correct responding for participants. Results of these studies should be interpreted with caution because participants were children with developmental disabilities, many of who were impulsive responders. Results may not generalize to students who do not have developmental disabilities or to students who do not have difficulties with impulsive responding. Further research could clarify the relationship of short and long response laten-

cies to the learning of students without developmental disabilities.

Given mixed empirical support for brisk instructional pacing, the current study examined the relationship of slow versus fast instructional pacing on the performance of prekindergarten students participating in the *Language for Learning* program. The primary purpose of the study was to verify if brisk instructional pacing, as recommended by Engelmann and Osborn (1999) and Watkins and Slocum (2004), increases response opportunities, participation, and accuracy, while decreasing off-task behavior of students during *Language for Learning* instruction. A secondary purpose of the study was to examine the effects of long and short duration ITI in combination with a previously uninvestigated pacing variable—teacher talk rate. Instructional pacing during the fast teaching condition was defined by the use of a short duration ITI (1 s or less) combined with a fast teacher talk rate (82–104 words per minute; wpm). During the slow teaching condition, instructional pacing was defined by the use of a longer duration ITI (approximately 5 s) combined with a slower teacher talk rate (35–49 wpm).

Method

Participants and Setting

Participants were four typically developing African-American prekindergarten students, 5 to 6 years old, attending a summer school program in an urban charter school for students at-risk for academic failure. Approximately 25 children attended the program, which occurred 5 days per week for 3 hr per day during the morning. The program provided instruction in reading, mathematics, and language within a general education classroom setting. In addition to *Language for Learning*, children received reading and math instruction with the *Reading Mastery Level I* and *Connecting Math Concepts Level A* programs. When children were not participating in DI programs, they completed independent seatwork or engaged in play and recreational activities. The classroom was cotaught by two teachers who were 1st-year doctoral students in special education and applied behavior analysis. Both teachers received instruction and coaching in the implementation of DI programs from supervisory staff prior to the study, although neither teacher had experience implementing DI programs prior to the summer school program. One girl, Shawna, and three boys, Felix, Austin, and Tyrone, were selected for the study because they emitted high rates of off-task behavior during instruction as determined by anecdotal observation by the teachers. Experimental sessions were conducted during two daily small group sessions with Lessons 33 to 46 of *Language for Learning Presentation Book A*. Participants, seated in groups of four with their backs to the classroom, faced the teacher who sat in a corner, approximately 1 m in front of the participants. Two participants were assigned to each group, which included two other children who were not participating in the study. Alex and Felix received instruction from Teacher 1, while Shawna and Tyrone received instruction from Teacher 2. During the experimental sessions, the remainder of the class completed independent seatwork to minimize distractions.

Materials

Materials for the study were the *Language for Learning Presentation Book A*, various items required for specific exercises (e.g., pencil, toothbrush, paper), data sheets, pencils and clipboards for data collection, and chairs for children to sit. A Hitachi 2900A video camera was used to videotape sessions to collect off-task behavior data.

Dependent Variables

There were five dependent variables in the study: opportunities per minute, percentage of academic responses, academic responses per minute, correct responses per minute, and off-task behavior. Data on opportunities per

minute were collected to assess the effects of slow- and fast-paced teaching on teacher-presented response opportunities. Opportunities per minute were determined by dividing the number of teacher-posed questions by the number of minutes per session. In contrast, percentage of academic responses and academic responses per minute were collected to evaluate the effects of slow and fast teaching on student participation. Percentage of academic responses was calculated by dividing the number of participant responses by the number of response opportunities per session and multiplying by 100. Academic responses per minute were calculated by dividing the number of participant responses to teacher-posed questions by the number of minutes per session. Correct responses per minute were determined by dividing the number of correct student responses by the number of minutes per session. Finally, off-task behavior was defined as any nonlesson related behavior (e.g., out-of-seat, nonlesson related talk, touching another student). Off-task behavior was measured using a 5 s partial interval recording procedure for the duration of each instructional session.

Observation and Recording Procedures

Opportunities per minute, percentage of academic responses, academic responses per minute, and correct responses per minute were recorded by observers who sat within view of the teacher and participants. Teacher 1 and 2 alternated as primary observers, while a classroom assistant and university supervisor acted as secondary observers to collect interobserver agreement data. Responses were scored using paper data sheets and pencils. For each teacher-posed question, an observer recorded whether participants emitted a correct response, an incorrect response, or a nonresponse. Observers viewed videotapes of the experimental sessions in order to record off-task behavior. Each session was divided into 5-s intervals; a "yes" was recorded if any off-task behavior occurred during any portion of the interval, whereas a "no" was recorded if no off-task behavior occurred during any portion of the interval.

Experimental Design

An alternating treatments design (ATD; Barlow & Hersen, 1984) was used to evaluate the differential effects of slow and fast teaching on response opportunities, participation, accuracy, and off-task behavior. Slow and fast teaching sessions were alternated at random, with no more than two slow or fast teaching sessions occurring consecutively. All sessions were conducted in the same location, and all teaching procedures were held constant except for the pacing of lessons.

Procedures

Teachers delivered lessons from the *Language for Learning Presentation Book A* during two 5-min experimental sessions per day. Participants chorally responded to teacher-posed questions. Both teachers followed the general procedures for conducting lessons outlined in the presentation book and teacher's guide except for modifications to instructional pacing. The only additional deviation from the presentation book was the use of a standard correction procedure. When one or more participants made an incorrect response, the teacher (a) modeled the correct response; (b) repeated the question, allowing participants to say the correct response along with him or her; and (c) repeated the question, allowing participants an opportunity to emit a correct, independent response. When participants made two consecutive error responses, the teacher repeated the procedure and then moved to the next question. When all students answered a question correctly, the teacher provided praise (e.g., "good") and moved to the next question.

Both teachers used a self-cueing system to maintain fast and slow teaching. During fast teaching, teachers counted "one-one-thousand" silently to maintain a brief ITI. During slow teaching, teachers counted "one-one-

thousand, two-one-thousand, three-one-thousand…" up to 5 s to maintain a longer ITI. No formal system was used to maintain a fast versus slow teacher talk rate. Both teachers simply read the lesson script quickly during the fast teaching condition and more slowly during the slow teaching condition.

Interobserver Agreement

Interobserver agreement for response opportunities, correct responding, and off-task behavior was collected for 36% of the sessions. Interobserver agreement for response opportunities was calculated by dividing the larger number of response opportunities scored by the smaller number of response opportunities scored and multiplying by 100. Mean interobserver agreement for response opportunities was 99.3% (range = 97.9–100). Interobserver agreement for correct responding was calculated by the scored-interval agreement method (Cooper, Heron, & Heward, 1987). All intervals (response opportunities) in which both observers recorded the nonoccurrence of behavior were ignored in calculating the agreement score. Interobserver agreement for correct responding was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. Mean interobserver agreement for correct responding was 90.2% (range = 86.4–93.8). Interobserver agreement for off-task behavior was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. Mean interobserver agreement for off-task behavior was 82.5% (range = 72.4–87.2).

Procedural Fidelity

Procedural fidelity data were collected for 36% of the experimental sessions, selected at random, to ensure that fast and slow teaching procedures were implemented correctly. Data were collected on the average number of wpm spoken and the average duration of ITI in fast and slow conditions. Average wpm was calculated by counting the total number of words spoken per session and dividing by the number of minutes in the session. Average ITI duration was calculated by measuring the cumulative duration of ITIs per session and dividing by the total number of response opportunities.

Fast teaching. During the fast teaching sessions, teachers read the lesson script at 82–104 wpm, with an ITI of 1 s or less. Specifically, Teacher 1 spoke an average of 86 wpm (range = 82–94), with an average ITI duration of 1.02 s (range = 0.7–1.5). Teacher 2 spoke an average of 97 wpm (range = 84–104), with an average ITI duration of 0.7 s (range = 0.4–1.0).

Slow teaching. During the slow teaching sessions, teachers read the lesson script at 35–59 wpm, with an ITI of approximately 5 s. Specifically, Teacher 1 spoke an average of 48 wpm (range = 35–59), with an average ITI duration of 4.9 s (range = 4.4–5.1). Teacher 2 spoke an average of 40 wpm (range = 36–45), with an average ITI duration of 6.3 s (range = 5.7–7.4).

Results

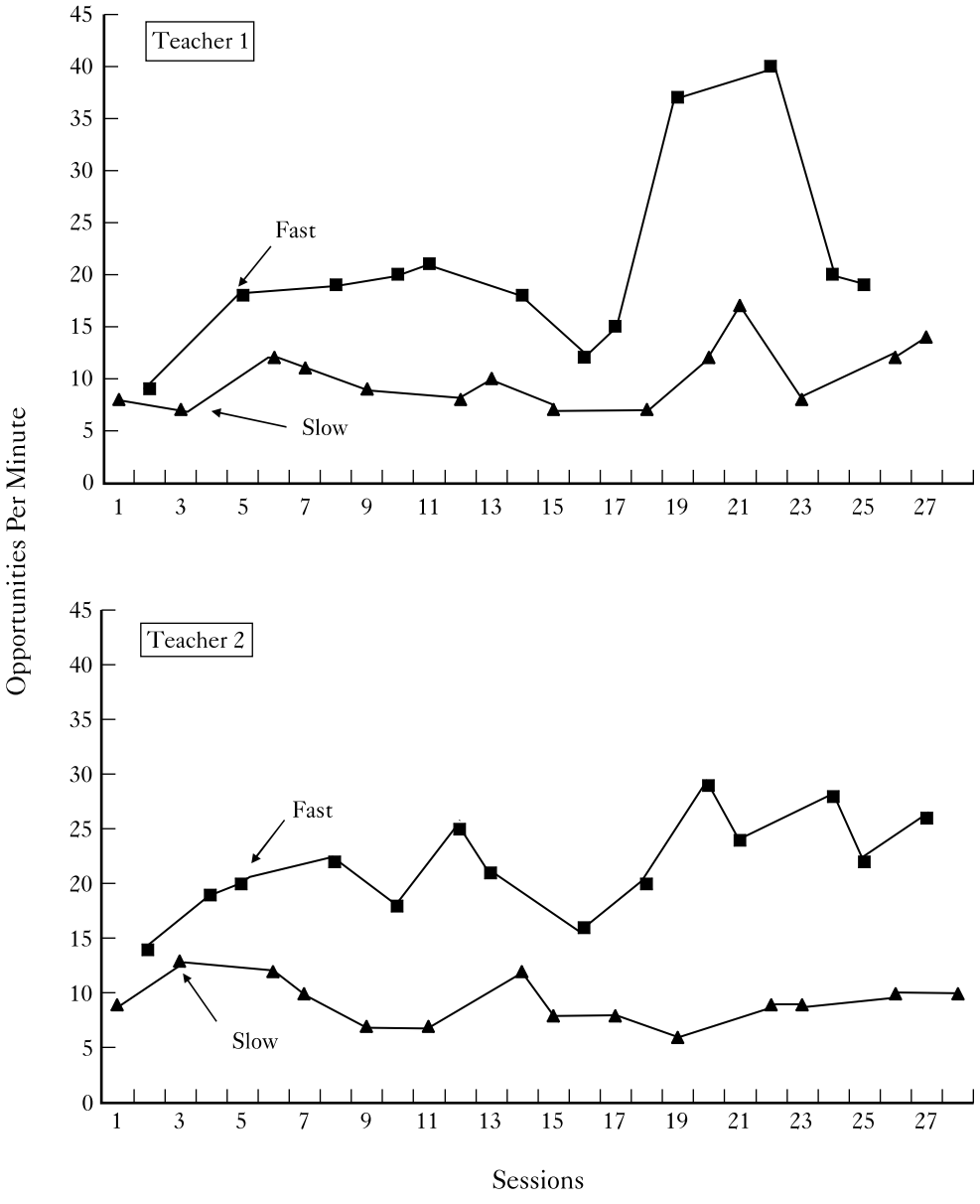
Figure 1 shows the opportunities presented per minute by Teachers 1 and 2 during each session. On average, Teacher 1 presented 9.5 opportunities per minute during the slow-paced condition and 17.8 opportunities per minute during the fast-paced condition. Similarly, Teacher 2 presented 9.3 opportunities per minute during the slow-paced condition and 21.7 opportunities per minute during the fast-paced condition.

Table 1 shows participants' mean percentage of academic responses, responses per minute, correct responses per minute, and mean percentage of off-task behavior. Participants demonstrated an average of 79.6% academic responses (range = 69–95.7) during fast-paced teaching and an average of 79.1% academic responses (range = 62.8–96.3%) during slow-paced teaching. In contrast, participants demonstrated an average of 6.7 responses per minute (range = 5.2–8.2) during fast-paced

teaching, compared to only 2.9 responses per minute (range = 2.3–3.4) during slow-paced teaching. Similarly, they demonstrated an average of 5.4 correct responses per minute (range = 3.5–6.9) during fast-paced teaching, and 2.1 correct responses per minute (range = 1.7–2.6) during slow-paced teaching. Figure 2 shows participants' correct responses per minute for

Figure 1

Opportunities per minute presented by Teachers 1 and 2.



each session. Overall, there were clear differences in the number of responses and number of correct responses between both conditions.

Table 1 also shows the mean percentage of 5-s partial intervals during which participants were off task. On average, participants engaged in fewer intervals of off-task behavior during the fast condition (M = 52%; range = 47.7–57.7) than during the slow condition (M = 74.4%; range = 66.7–80.9). Figure 3 shows the percentage of intervals of off-task behavior for each participant across sessions. Although overlaps in the data are apparent, the fast condition consistently produced a lower percentage of intervals of off-task behavior when compared with the slow condition.

Discussion

The data suggest that fast-paced teaching increased teacher-presented response opportunities as well as participants' rate of responding and rate of correct responding. Nearly twice as many opportunities per minute occurred during fast-paced teaching than during slow-paced teaching. Moreover, academic responses per minute and correct responses per minute more than doubled during fast-paced teaching. Although the data were variable, results suggest that fast-paced teaching also decreased participants' off-task behavior. The benefits of fast-paced teaching were offset to some extent by the finding that percentage of responding was similar across fast and slow conditions. Still, the results reflect benefits of fast versus slow-paced teaching in terms of increased learning opportunities, response rates, response accuracy, and decreased off-task behavior.

Results of the current study replicate previous ITI studies that found better student performance with fast-paced teaching (Carnine, 1976; Darch & Gersten, 1985; Dunlap et al., 1983; Koegel et al., 1980). At least two reasons may account for improved performance

Table 1

Mean Percentage of Academic Responses, Academic Responses Per Minute, Correct Responses Per Minute, and Percentage of Off-Task Behavior for Children During Fast- and Slow-Paced Teaching

Participants	Percentage of academic responses		Responses per minute		Correct responses per minute		Off task	
	Fast	Slow	Fast	Slow	Fast	Slow	Fast	Slow
Felix	69.0%	72.8%	5.2	2.8	3.5	1.7	48.8%	66.7%
Austin	77.2%	84.6%	6.2	3	5.5	2.3	47.7%	72.9%
Shawna	76.5%	62.8%	7	2.3	5.5	1.8	54.0%	80.9%
Tyrone	95.7%	96.3%	8.2	3.4	6.9	2.6	57.7%	77.3%

Figure 2

Correct responses per minute during fast- and slow-paced teaching for Felix, Austin, Shawna, and Tyrone.

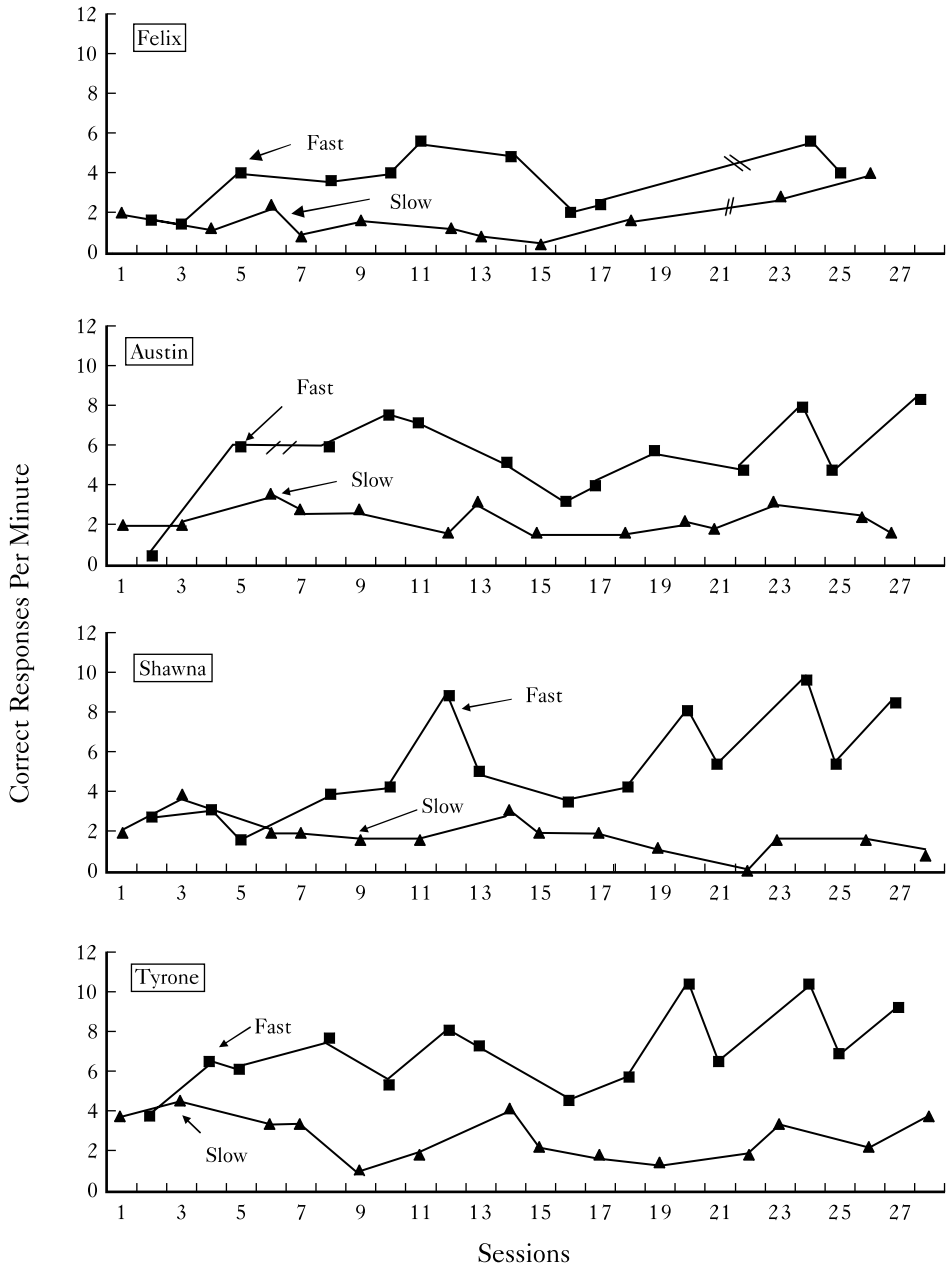
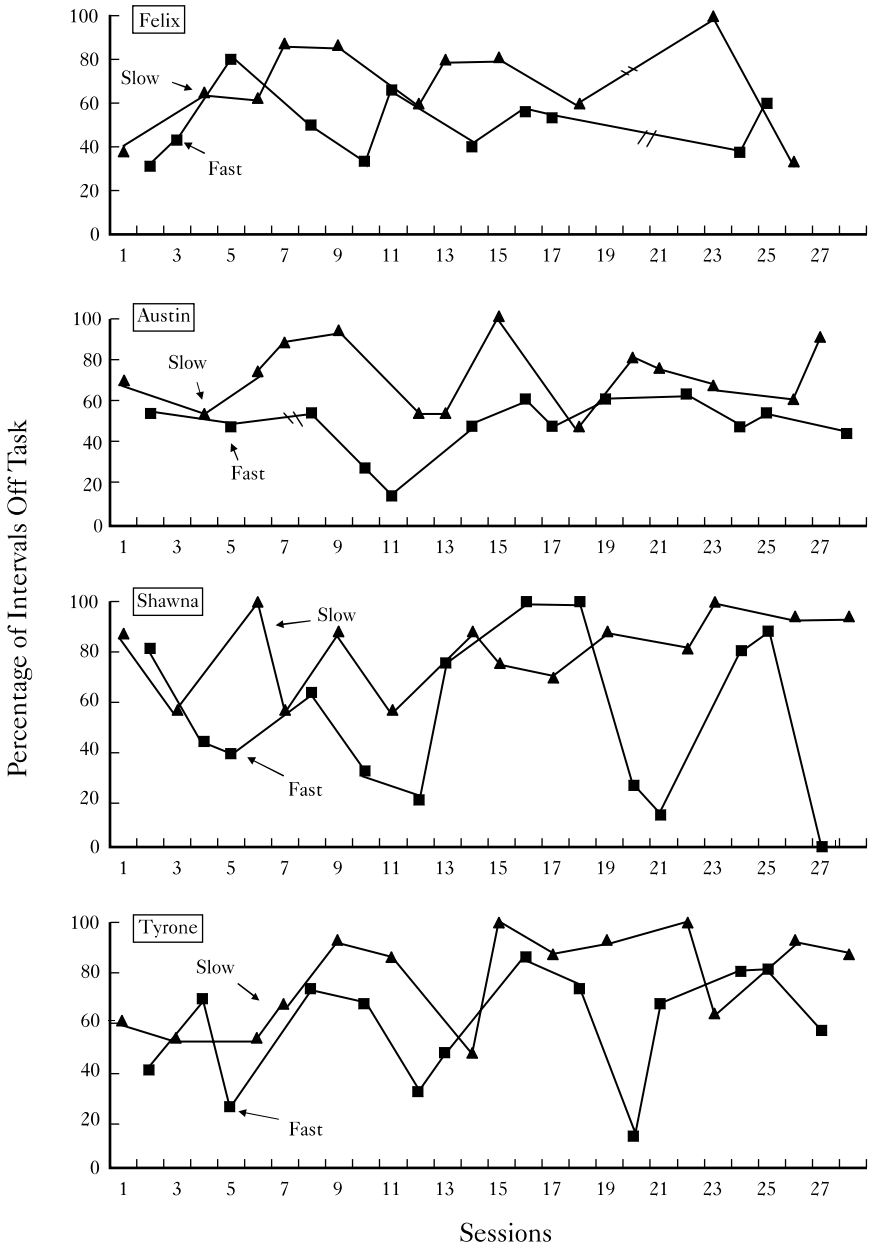


Figure 3

Percentage of intervals of off-task behavior during fast- and slow-paced teaching for Felix, Austin, Shawna, and Tyrone.



in the current study. First, fast-paced teaching allowed teachers to present nearly twice as many learning trials. Increased presentation rates, in turn, produced higher rates of student responding. Second, fast-paced teaching allowed less opportunity for participants to engage in off-task behavior, increasing their attention to task and increasing response accuracy. The relatively high percentages of off-task behavior across both conditions may be explained by the absence of systematic behavior management procedures implemented by Teacher 1 or 2. Still, fast-paced teaching alone produced substantial reductions in off-task behavior when compared to slow-paced teaching.

The results do not replicate research on response latency that found performance improvements with longer duration latencies and slower-paced teaching (Duker et al., 1993; Dyer et al., 1982; Lee et al., 1987; Lowry & Ross, 1975; Valcante et al., 1989). Although response latency was not directly manipulated in this study, the rate of teacher talk indirectly affected response latency. Specifically, during the fast-paced condition, teachers' rapid talk rate created shorter response latencies; whereas during the slow-paced condition, teachers' slow rate of talk created longer response latencies. The differences in outcome between the current study and previous studies may be explained by differences in participant characteristics. Participants in previous studies were primarily children with developmental disabilities, many of who were characterized as impulsive responders, whereas participants in this study were typically developing children.

The current study examined the effects of an additional pacing variable—teacher talk rate. The procedures and data do not permit a differential analysis of the effects of talk rate versus ITI duration. Still, it is reasonable to conclude that, apart from ITI, fast talk allowed Teachers 1 and 2 to present more learning trials and allowed participants less opportunity to emit off-task behavior. Tentatively, it may be concluded that the benefits of short ITI may be enhanced by increasing the rate of teacher talk. In contrast to the positive results for response opportunities, response rates, accuracy, and off-task behavior, no differences in student participation were found between slow- and fast-paced teaching. The reasons for this are not known.

Descriptions of how this research contributes to the literature on instructional pacing follow. First, it replicates previous studies, supporting the use of fast instructional pacing for children with learning and behavioral problems. Contrary to the popular wisdom that slower pacing allows students needed time to "process" instructional content and, consequently, improves performance (cf. Rowe, 1987), the current study's data suggest that slower pacing may hinder student performance in critical ways. Second, this study examined the effects of a previously uninvestigated pacing variable—teacher talk rate. In practical terms, the results of the study suggest that teachers who implement *Language for Learning* should maintain a brisk pace, speaking quickly and moving rapidly from one question to the next, consistent with the recommendations of Engelmann and Osborn (1999) and Watkins and Slocum (2004). However, results may not generalize to all lesson presentation formats. Teachers 1 and 2 read lessons from a scripted Direct Instruction presentation book. Teachers who present lessons extemporaneously may have difficulty maintaining the fast talk rates implemented in this study. For teachers who use unscripted lessons, considerable practice may be necessary to achieve fluent pacing.

The study has several limitations that should be considered in relation to the results. First, teachers did not follow the error correction and firming procedures described in *Language for Learning Presentation Book A*. The relatively high rate of errors observed in the data may be related to the absence of prescribed procedures. Second, teachers used an informal sys-

tem to maintain fast- and slow-paced teaching. Although ITI and wpm differed across fast- and slow-paced conditions, a formal system may have allowed teachers to maintain fast- and slow-paced teaching more consistently, reducing unwanted variability and error in the data. For example, a metronome could have been used to maintain fast and slow talk rates as well as short and long ITI. Another limitation of the study was the number of participants. To establish the robustness of fast pacing as an effective teaching variable, the results of the study should be replicated across additional children, including children of differing backgrounds and learning abilities.

Results of the study suggest a number of areas for research. Instructional pacing is not solely defined by the duration of the ITI or teacher speech rate as examined in the current study. Future studies should investigate other components of instructional pacing such as the presentation of instructional stimuli, the duration of response latency or wait time, the use of response prompts, the length or complexity of student responses, and feedback delay. Investigations of instructional stimuli could examine the effects of teacher's rate of speech (as an isolated variable or in conjunction with other elements of pacing), the complexity of stimuli (e.g., item, question, or problem), and/or delivery mode (e.g., visual, vocal verbal) on instructional pacing and student behavior. The most effective duration of think time or wait time for optimal student performance while maintaining fast-paced instruction may also be investigated. The manner in which a teacher presents an antecedent response prompt may also affect the pacing of instruction. Therefore, the form, timing, duration, speed of response prompting procedures, and tactics for transferring stimulus control (e.g., time delay) are also experimental manipulations to be examined. Additionally, future studies may investigate the mode of student response (e.g., oral, written, both) and the length or complexity of response (e.g., "bird" or "That animal is a bird.") and its effects on instructional pacing and student behavior. Finally, the form of the feedback itself (e.g., affirmation or reinforcement, error correction, instructive feedback) and the immediateness of feedback (e.g., the latency between student response[s] and feedback) may affect student learning. A short ITI in combination with the components described should also be considered in future investigations of the effects of instructional pacing on student behavior.

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