
THE IMPACT OF A PRECISION TEACHING INTERVENTION ON THE READING FLUENCY OF TYPICALLY DEVELOPING CHILDREN

Danielle Lambe, Carol Murphy and Michelle E. Kelly*

Maynooth University, Maynooth, Ireland

This research investigated the efficacy of precision teaching (PT) on the reading fluency of typically developing children, aged 7–8 years. Seven participants were assigned to a PT intervention group and received 6 weeks of fluency training using Say All Fast a Minute Every Day Shuffled (SAFMEDS) fluency cards (Phase 1) and a Dolch story (Phase 2). Outcomes were measured using multiple baseline design (MBD) data, Standard Celeration Charts, and pre-intervention–post-intervention fluency scores. The MBD data show increased correct responding for PT participants from baseline to the end of each intervention phase. These improvements were maintained at a 3-week post-intervention follow-up. The MBD clearly demonstrated a replication of intervention effects across participants. The study supports prior research in this area showing that PT can lead to large and socially relevant gains in children's reading fluency. Copyright © 2015 John Wiley & Sons, Ltd.

Applied behavior analysis (ABA), developed from Skinner's (1938, 1957) operant conditioning, is a precise and systematic method used to promote learning (Lovaas, 1987; McEachin, Smith & Lovaas, 1993) and produce behavior change. In their seminal article, Baer, Wolf, and Risley (1968) outlined seven characteristics that must be present in ABA procedures; interventions should be applied, behavioral, analytical, technological, conceptually systematic, and effective and have generality. In short, ABA must identify socially important behaviors to be increased for the individual or group or socially unacceptable behaviors to be decreased. The educational and social needs of an individual are addressed via an individualized intervention that uses replicable science-based techniques to effectively and consistently change behavior to allow for greater access to reinforcement and an improved life experience. Some general teaching tactics frequently involved in ABA are discrete trial teaching, modeling, prompting, shaping, and chaining (Cooper, Heron & Heward, 2007).

*Correspondence to: Michelle E. Kelly, The Department of Psychology, Room SF21, 2nd Floor John Hume Building, National University of Ireland Maynooth, Maynooth, Co. Kildare, Ireland. E-mail: Michelle.E.Kelly@nuim.ie

Two additional major instructional strategies to emerge under the ABA umbrella are direct instruction and precision teaching (PT).

Precision teaching was developed by Ogden Lindsley in the 1960s. As a student of Skinner, Lindsley had ample experience with free operant conditioning and analyses of rates of responding (Pierce & Cheney, 2004). Lindsley brought the focus of these analyses from the laboratory into classrooms, emphasizing the Skinnerian perspective that rate of responding is the most important measure relevant to free operant learning. The PT method was developed as a framework for evaluating the effectiveness of any given teaching method, using the rate of response as a guide. Rate of responding was depicted on a specially developed standardized cumulative graph called a Standard Celeration Chart (SCC) and used to aid both the teacher and learner in their decision-making processes regarding the effectiveness of a teaching approach (Binder, 1988).

As with all ABA-type procedures, PT relies on a systematic approach to teaching. This is evidenced in factors that are considered to be key components of any PT intervention. First, the student in question must have access to daily, timed practice and test sessions; there must be a predetermined target rate (number of responses per time period) and mastery level (number of correct or accurate responses). Increased speed and accuracy of learned skills result in improved responding, retention, maintenance, endurance, application, and transfer of performance of the skill to novel situations (see REAPS; Binder & Watkins, 1990). Performance should be recorded by the learner daily on a SCC, and progress should be discussed with the teacher. Teaching practices should be changed when, on inspection, the data on the SCC show that the current method is not working. Second, in a PT intervention, the behavior must be active (Binder & Watkins, 1990). For example, reading word sheets or completing math worksheets can be taught using PT, while sitting quietly and looking at a book are passive responses that cannot be taught using PT. The 'dead man's test' helps teachers avoid this problem—if a dead man can do it (e.g., sit still), then do not teach it.

Lindsley (1971) proposed that celeration (increase in rate of responding over time) is the most important aspect of PT and should be used to judge learning gains; thus, he developed the SCC as a means of doing this. In PT, celeration is represented by a trend line on each student's SCC. Lindsley (1990) was a proponent of a 'times-two' ($\times 2.0$) celeration, meaning that learning effectively doubled per day, week, month, or year, depending on which time frame is deemed most appropriate for the behavior modification targeted. The SCC charts are semi-logarithmic in that the y-axis scale intervals depict multiples (1, 10, 100, and 1000) rather than equal intervals (0, 10, 20, and 30) like most other graphs used in educational settings. The Daily Chart is a SCC with 140 days (approximate school year) indicated on the x-axis; thus, a

child's daily learning on a variety of skills can be measured in terms of speed and accuracy. The Daily SCC can be used to record behaviors that occur in a range from once in a 24-h period to 1000 times per minute and is most suited to charting measures of reading fluency (Calkin, 2005). The slope of the celeration line describes the rate of learning (i.e., response frequency); a steeply sloping celeration line indicates a rapidly increasing rate of learning, and a flat celeration indicates no change, while a decreasing celeration line indicates a decreasing rate of learning, or decreasing errors or inappropriate behaviors (Graf & Lindsley, 2002). A completed SCC serves as a learning picture that is amenable to visual analysis to monitor learning progress and guide learning decisions (Lindsley, 1992).

Reports from schools that implement PT interventions suggest that they are an effective method of teaching. For example, the Morningside Academy in Seattle report that PT results in gains in reading, language arts, and math averaging over 2-year gain per academic year (Johnson, 1997). In 1988, the 'Precision Teaching Project', a 4-year school-wide PT intervention study in Montana, reported improvements of between 19 and 44 percentile points for elementary school children who received the PT intervention on subtests of the Iowa Test of Basic Skills (Binder, 1988). Evidence from research studies also provides support for the efficacy of PT as a teaching approach. Chiesa and Robertson (2000) compared a 12-week PT program aimed at improving basic mathematics skills with mathematics lessons as usual. At baseline, correct answers for both intervention and control groups ranged from 0 to 11 per minute. After the PT intervention, correct answers in the control group ranged from 0 to 14 per minute but ranged from 11 to 15 per minute for the intervention group. In Downer (2007), a PT intervention implemented for only 4 min/day was reported to significantly improve mean reading scores for students in infant and junior schools and significantly increased reading age in months from pre-intervention to post-intervention for secondary school students.

Hughes, Beverley, and Whitehead (2007) aimed their PT intervention at increasing reading fluency for students (age 11–12 years) with reading difficulties. The learning target involved the first 220 Dolch sight words. Five students engaged in PT sessions for 20 min a day for 3 to 4 days/week with a teaching assistant (TA) and read for timed 1-min sessions. A further two children worked with a TA for the same amount of time but received lessons as usual (LAU). Baseline scores of reading fluency ranged from 38 to 50 correctly read words per minute (w.p.m.) for the PT group and 32 to 38 correctly read w.p.m. for the LAU group. Over the course of the intervention, reading fluency scores for the PT group steadily increased, with four out of five students more than doubling the number of words read correctly per minute. A maximum fluency score of 160 w.p.m. was recorded in the PT group, with end-of-intervention scores ranging from 70 to 130 for the PT group but only 33 to 44 for the LAU group. The aim of the current study was to investigate the impact of a PT intervention on the

reading fluency of seven typically developing children, aged 7 to 8 years old. The methodology was based on that of Hughes et al. (2007) although the current study did not include a comparison LAU group.

METHOD

Participants

Seven children between the ages of 7 and 8 years participated in this study. All participants attended a primary school for typically developing children in Ireland and were in second class (equivalent to second grade in the USA). The participants comprised four girls and three boys, with a mean age of 7 years 10 months (ranging from 7 years 2 months to 8 years 4 months). None of the participants were reported to have any reading difficulties or other learning difficulties at entry into the study.

Ethical Precautions

The study was approved by the Ethics Committee, Department of Psychology, National University of Ireland Maynooth, and all procedures were conducted in accordance with current ethical standards, paying particular attention to informed consent (parents), voluntariness (children), confidentiality, and data protection.

Experimental Design

The experimental design was a concurrent multiple baseline design (MBD) across participants, employed to determine if any effect shown was replicated across participants. An MBD design was used because a reversal design was not possible (i.e., when a participant has learned to read words, it was presumed likely that reading the words would maintain across time). Concurrent baseline data collections were commenced with the seven participants, and a PT intervention was introduced with each participant at staggered intervals according to whether the participants' baseline data were stable. The aim was to demonstrate that change occurred contingent on the introduction of a PT intervention with each participant. Mean fluency data were also recorded pre-intervention and at follow-up.

Materials and Apparatus

The intervention comprised two phases: (1) Say All Fast a Minute Every Day Shuffled (SAFMEDS) and (2) Dolch story. Phase 1 used laminated cards (8.5 cm × 7.5 cm) similar to flashcards, each with a different Dolch sight word printed in black Century Gothic font, size 36, on the white cards (SAFMEDS). Dolch sight

words are the 220 most common words in the English language. Phase 2 used a brief Dolch story entitled, 'The Best Thing in the World'. The story was printed in black Century Gothic font, size 16, double-spaced text, on four sheets of A4 white paper, with an average of 168 words per sheet. A timer was used to time practice and test sessions. A daily SCC was used for each participant, as well as daily data recording sheets. Data sheets were used to record all relevant information for each participant, including the current phase, the fluency target/s, total number of words worked through in a session, total number of correctly read w.p.m., total number of incorrectly read or skipped words, and a note of which words had been incorrectly read.

Interobserver Agreement

The primary researcher (first author) and a second observer (a member of the teaching staff) were present for 9 days, equalling approximately 60% of all sessions. Interval recording interobserver agreement (IOA) was used to assess agreement between observers. The total number of words read per participant was recorded, as well as the total number of words read correctly and words read incorrectly or skipped. To calculate IOA, the total number of words read was compared with the number of occasions the observers agreed on whether a word had been read correctly. The smaller number of these was then divided by the larger number (i.e., the total number of agreements was divided by the total number of words). This was multiplied by 100 to obtain a percentage of IOA. Sessions from each of the seven participants were included to gain the mean IOA per session. These ranged from 98.9% to 100%. The mean IOA across the 9 days when IOA recording was carried out was 99.5% agreement on words read correctly.

Procedure

Baseline Data

Before the PT intervention was administered, participants were asked to first read SAFMEDS cards with the target Dolch words and then read the Dolch story, in order to obtain baseline scores of speed and accuracy in both reading modes. No contingent positive reinforcement was provided during baseline conditions for correct or speedy responding, and no corrective feedback was provided.

Baseline Say All Fast a Minute Every Day Shuffled

During the baseline condition, each participant was instructed that he or she would have 1 min to read words on the SAFMEDS cards. The participant started reading when the researcher said, 'Start now', and stopped when the timer went off to signal the end of the 1-min session. Participants were not expressly instructed to read the

words at speed; however, they were told to say each word out loud (See/Say), to immediately skip any word that they could not say and put the card in a pile to their left hand side, and to place cards with words they could say in front of them. Participants were also informed that the investigator would take any incorrectly read words from the pile in front of them and put it into the 'could not say' pile. This was to ensure that there was an accurate count of words read correctly and incorrectly and words skipped. After each session, each participant helped the investigator to count up each pile of words and record their scores (correct +, incorrect -, and skipped S) on their data sheet. Fluency data were collected across three 1-min sessions initially. The researcher started the PT intervention with one participant at a time (as per MBD); the PT intervention could only be started once the participant's baseline data were stable (i.e., roughly similar scores on three consecutive occasions). While the first participant with stable baseline data was receiving the PT intervention, baseline measurement continued for the remaining participants.

Baseline Dolch Story

To obtain baseline scores for the story-reading condition, each participant was instructed to read the story aloud, but again, participants were not instructed to read quickly. As in the SAFMEDS baseline condition, the participant was informed that he or she would be timed for 1 min and that the minute would start on the researcher's signal and would stop when the timer sounded. The researcher had one copy of the Dolch story for each participant and marked any words that had been skipped (S) or incorrectly read (-) on this copy. After reading, the participant helped the researcher to add up the amount of words read correctly and incorrectly and/or skipped, and scores were recorded on the participant's data sheet. As discussed earlier, when baseline scores were stable, the participant was moved onto Phase 1 of the PT intervention. If baseline data were variable for a participant, baseline conditions were continued with that participant until data became stable. The PT intervention involved working with the investigator for 20–30 min after school, 3 days/week for 6 weeks.

Intervention Phase 1: Say All Fast a Minute Every Day Shuffled

The intervention followed the same basic format as the baseline measures described earlier, with some important differences. Each participant was given a pile of SAFMEDS to read and was told by the investigator to say the words as quickly as they could while trying not to make mistakes or skip words during a timed period of 1 min. Correctly read words were placed in a pile in front of the participant, and incorrect or skipped words were placed in a pile to their left. Corrective feedback was provided for

incorrect or skipped words at the end of each timed practice session, and the words were rehearsed by the participant before beginning the subsequent timed period.

Based on Hughes et al.'s 2007 study, an *overall star target* rate of correct responding was set at 70 (or more) correctly read w.p.m., with two or less read incorrectly or skipped words (henceforth referred to as 70/2 w.p.m.), to be reached by the end of the study. The investigator explained this to each participant at the beginning of the intervention. *Interim targets* were also calculated for each participant based on their current ability. Interim targets were set by multiplying the middle value of the first three baseline measures for each participant by 1.5 (to obtain a reasonable w.p.m. target), while keeping two incorrect or skipped words as the 'error' target. The relevant target was stated by the investigator before each test session, but the participant was encouraged primarily to beat his or her previous score (compete with self). Each participant was given a maximum of five timed, 1-min *practice* sessions per PT session. Upon reaching their interim targets in three of these practice sessions, they would do their *test* session for the day, which was also a timed 1-min session. The scores for the test session were recorded on each participant's data sheet and SCC. When the interim target was reached on three consecutive test sessions, the participant could aim for the overall star target (i.e., 70/2 w.p.m. for the star targets). If a participant failed to reach an interim target on three occasions during the practice sessions, they would not complete their test session on that day.

Contingent positive feedback was provided as follows: Praise and attention were delivered throughout the procedures for correct responding, and a participant who reached his or her interim targets on w.p.m. and error measures on three occasions during the session was allowed to play games such as Xs and Os or 'hangman' with the investigator (1 min of play for each of the w.p.m. and error targets met). Repeated achievements of interim targets indicated that play time with the investigator and social praise and attention were functioning as positive reinforcers for reading fluency behaviors for the participant. Failure to reach interim targets over three consecutive PT sessions was taken as a cue for the investigator that play time and investigator attention might not be functioning as a reinforcer and that alternative reinforcement may be required for the participant (e.g., 3-min computer time or reading an age-appropriate magazine). Corrective feedback was provided for incorrect or skipped words at the end of each timed practice session. Social praise was provided for effort at all times, regardless of performance, but the investigator delivered more animated praise for correct and speedy and/or speedy responding, and this was accompanied by access to other more potent reinforcement as described.

Progression from Phase 1 to Phase 2 was contingent upon the stability of the test session results. When the participants reached the overall star target (70/2 w.p.m.) on three consecutive test sessions in Phase 1, he or she would move to Phase 2 (the Dolch story reading phase). Phase 2 followed somewhat similar procedures as

Phase 1 but used the Dolch story rather than SAFMEDS cards. Thus, participants had access to the Dolch story during pre-intervention measures but not again until they had moved onto Phase 2 after the successful completion of Phase 1.

Intervention Phase 2: Dolch Story

The target in this phase again involved reading fluency in terms of speed and accuracy. Initial w.p.m. targets were set at 1.5 times the middle value of the first three baseline measures, and error targets remained at two or less per minute. Overall star targets were also set and were again guided by procedures in Hughes et al. (2007). Star targets for Dolch story reading fluency in Phase 2 were set at 120–180/2. Phase 2 continued until the 6-week intervention period was complete.

Post-intervention/Follow-up Measurement

Upon completion of the intervention sessions, the school term ended for Christmas break (3-week duration), after which the investigator returned for one session to conduct follow-up assessments with each of the seven participants. These tests were identical in content and procedure to the baseline tests described at the beginning of this section.

RESULTS

A multiple baseline design was employed to measure the staggered introduction of the intervention across the seven participants. Figure 1 shows the number of correctly read w.p.m. for each participant from baseline to Phase 1 (SAFMEDS), Phase 2 (Dolch story), and finally, post-intervention. The data in Figure 1 are presented in the order each participant started receiving the PT intervention. The number of intervention sessions required per participant to meet the predetermined criteria in Phase 1 varied from 5 to 10 sessions, and participants completed either four or five PT intervention sessions in Phase 2. The MBD graph clearly shows that the PT intervention produced improvements in accuracy of responding from baseline to the end of each intervention phase for each participant. These improvements were maintained at the 3-week post-intervention sessions. The MBD facilitated a demonstration of replicated effects across all seven participants.

Standard Celeration Charts and Error Rates

Phase 1: Say All Fast a Minute Every Day Shuffled

Participants' daily SCC data (available upon request) were examined using visual analysis in accordance with the tradition in ABA to focus on social or

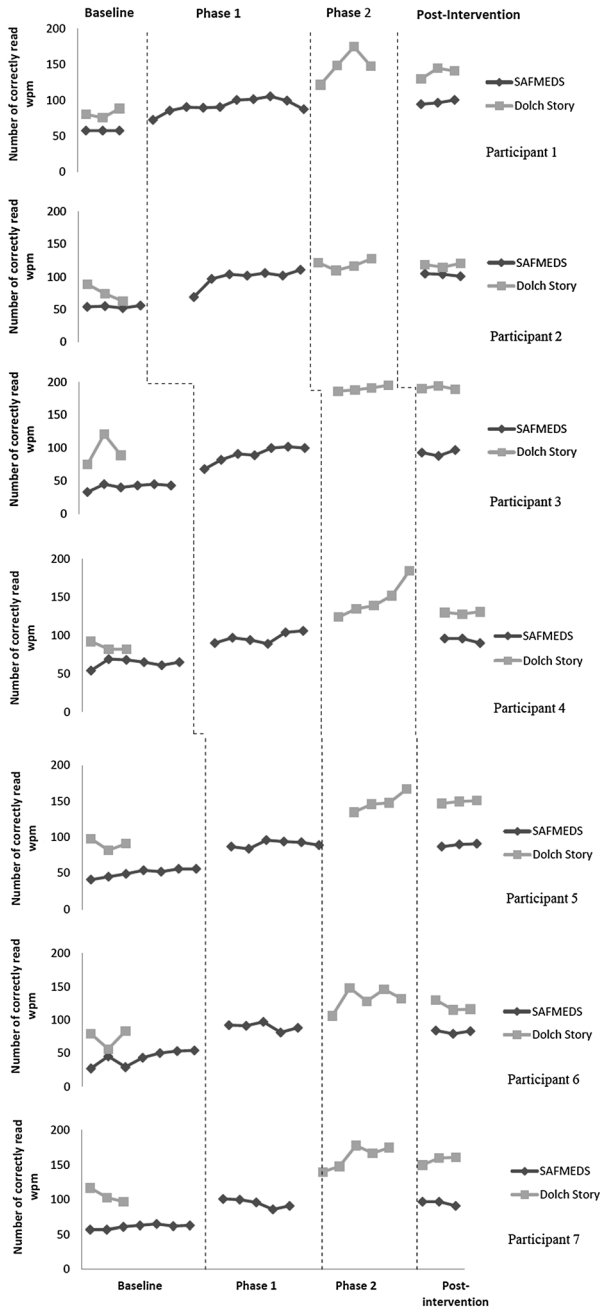


Figure 1. Multiple baseline design graphs showing the number of correctly read words per minute across sessions for each participant. Intersection lines indicate progression to the next phase of the study.

clinical significance rather than statistical significance. The SCCs displayed the progression of reading fluency during 1-min reading tests, with accurate responses increasing and errors decreasing for each participant across the PT intervention. Each graph had an upward slope (from left to right) for accurate responses, which indicated increasing scores in the desired direction. Although no participant achieved a celeration of $\times 2.0$ per week, which is the optimum rate of learning for PT (Graf & Lindsley, 2002), all participants did make continuous gains on each session.

Errors were generally below two per minute and fell from baseline to follow-up; a trend was illustrated by a slightly downward slope from right to left on the SCCs. The combination of an ascending celeration line for accurate responding and a descending celeration line for errors indicated that the participants' SAFMEDS reading fluency increased as a function of the PT intervention. The SCCs and raw data were also examined to investigate the effect of the PT intervention on error rates on SAFMEDS. The mean number of errors per minute at baseline was 2.57, which then dropped to 1.43 at follow-up. The biggest reductions in error rates from baseline to follow-up were made by Participants 2 and 3, who both scored -3 errors, dropping from five and four errors per minute to two and one, respectively.

Phase 2: Dolch Story

Visual analysis of the Dolch story data on the individual SCCs (available upon request) similarly showed an increase in reading speed and accuracy (fluency) for each participant. That is, the combination of an increasing celeration line for accurate responding and a decreasing celeration line for errors indicated that Dolch Story reading fluency increased as a function of the PT intervention. As mentioned earlier, error data were examined in order to determine if the PT intervention had any effect on the rate of errors from baseline to follow-up. The mean number of errors per minute at baseline was 6.4, while a mean of 2.4 was recorded at follow-up. The biggest reduction in error rates was made by Participant 6 who reduced errors by 14 from baseline to follow-up (15 errors per minute to one error per minute).

Targets (Phases 1 and 2)

All participants reliably reached their star targets for both SAFMEDS and the Dolch Story by the end of the intervention. Each participant also maintained their achieved level of fluency at follow-up (Table 1).

Table 1. Baseline, post-intervention, follow-up, and personal best (PB) data (words per minute read accurately) for all participants.

Participant	Precision teaching							
	Say All Fast a Minute Every Day Shuffled				Dolch story			
	Baseline	Post-intervention	Follow-up	PB	Baseline	Post-Intervention	Follow-up	PB
1	58	88	101	106	81	148	141	175
2	54	111	101	111	89	128	121	128
3	41	89	91	96	98	167	151	167
4	54	106	90	106	92	148	131	152
5	33	99	97	102	75	195	189	195
6	27	88	83	97	79	132	116	146
7	57	91	91	101	117	175	161	178

Pre-intervention–Post-intervention Comparisons

Pre-intervention–Post-intervention Say All Fast a Minute Every Day Shuffled Fluency Rates

Participants 1–7 started on w.p.m. scores for SAFMEDS of 58, 54, 41, 54, 33, 27, and 57 and then increased these scores to reach personal bests of 106 [+48], 111 [+57], 96 [+55], 106 [+52], 102 [+69], 97 [+70], and 101 [+44], respectively (Table 1).

Pre-intervention–Post-intervention Dolch Story Fluency Rates

Participants 1–7 started on w.p.m. scores for the Dolch story of 81, 89, 98, 92, 75, 79, and 117 at baseline and increased these scores to reach personal bests of 175 [+94], 128 [+39], 167 [+69], 152 [+60], 195 [+120], 146 [+67], and 178 [+61], respectively (Table 1).

DISCUSSION

The MBD graphical data show an increase in the number of correctly read w.p.m. for all participants in both SAFMEDS and Dolch story conditions, indicating that reading fluency increased as a function of the PT intervention. The MBD data demonstrated experimental control and a replication of intervention effects across participants; that is, when the PT intervention was applied in a sequential fashion across participants who demonstrated a stable level of responding (i.e., words correctly read per minute), accuracy of responding increased in response to the

intervention across all seven participants and was maintained at a 3-week post-intervention follow-up (see also Table 1).

Importantly, all participants reliably reached, and indeed surpassed, their reading targets. By the last day of the intervention, each participant had reached his or her star targets for both the SAFMEDS and the Dolch story. This result shows that the participants reached fluency not only on measures where words were presented in isolation and in a random order (as in the SAFMEDS trials) but also when Dolch words are combined with other non-practiced words to contribute to a prose. The gain in the number of correctly read w.p.m. combined with the reduction in errors involves two factors, speed and accuracy, that are highlighted by Bloom (1986) as highly important in the development of fluency, automaticity, or mastery. The current results add support to existing research (e.g., Hughes et al., 2007) that shows that PT is an effective intervention for increasing reading fluency.

Similar to Hughes et al. (2007), inspection of the raw data in this study appears to suggest a relationship between the level of fluency for reading Dolch words as measured during SAFMEDS trials and the level of emerging fluency for reading Dolch words in a story. Participants were required to reach their targets on three consecutive occasions before they could move on to practice with the Dolch story. An inspection of the SCCs for all participants showed a surprising leap in the number of accurately read w.p.m. from baseline (obtained before the PT intervention began) and the first score taken for all participants as each individually began working on the Dolch Story during PT sessions. A weakness in the design of this study, however, was that all baseline measures were taken before the intervention began, so any possible effect of SAFMEDS practice on reading fluency of the Dolch story cannot be identified with any degree of certainty. The only baseline measures available for the Dolch story were taken before Phase 1 of the intervention began, but not again before Phase 2 began, so it is possible that the overall and final gains made on measures of reading fluency for the Dolch story were influenced not only by the positive reinforcement contingencies of the PT intervention but also by practice effects and levels of fluency gained during Phase 1. To solve this issue, the presentation of Phases 1 and 2 could be counterbalanced across participants. Alternatively, assessment measures of reading fluency for the Dolch story could be taken at three time points: pre-intervention, post-Phase 1, and post-Phase 2. This would allow for greater insight into what effect mastering Dolch words can have on the overall level of fluency for reading an age-appropriate text that contains those, and other, non-practiced words.

Further to this, Hughes et al. (2007) also carried out analysis on the words that were incorrectly read in tests of prose reading, breaking them into groups of either Dolch words or non-target words (non-Dolch words that, therefore, were not practiced during the intervention). The researchers could then attest to the fact that after practicing with SAFMEDS, the number of correctly read Dolch words during story

reading was between 400 and 450, while errors made on Dolch words were zero for all PT participants; whereas for the two LAU participants in their study, 100 and 370 Dolch words were correctly read with 70 and 300 errors. An inspection of non-target words showed that PT participants reliably read over 200 correctly, while making approximately 40 or less errors, whereas the LAU participants correctly read approximately 160 words with 100 errors made. An analysis of this type would be useful in assessing how effective Phase 1 was on participants' ability to fluently read the Dolch words, leaving them to focus on the remaining words that may be more difficult (Bloom, 1986; Nathan & Stanovich, 1991).

The inclusion of the LAU group in the Hughes et al. study also allowed for a greater degree of certainty regarding the efficacy of the PT intervention. Including a comparable 'treatment as usual' control group would have been beneficial in the current study to allow for direct comparisons to be drawn between PT and usual reading lessons that are currently delivered to typically developing children in our school system. Future studies should consider randomized controlled trial (RCT) designs to examine the effects of PT versus active controls, particularly because RCTs are considered to be the 'gold standard' for evaluating the effectiveness of interventions (Akobeng, 2005).

Parallels between this research and previously conducted research can also be drawn in relation to Downer (2007); importantly, in that study, the PT intervention was only carried out for 4 min/day with each participant. This comes to a total of 20 min/week, which is significantly less than the 90 min/week provided during the current research. However, it is important to note that the investigator in the current study worked with all seven participants in a group, allowing them to practice in pairs and conduct test sessions with the investigator. Meaningful gains in reading fluency scores for the first 100–200 sight words were reported by Downer (2007), who pointed out that the intervention was not only a cost-effective and time-effective one but that it also had the potential to produce gains in sight recognition beyond those required by the National Curriculum Strategy in the UK at the time, simply by having students gain 2 w.p.m. each week for 3 years. These increases are in line with those produced by children in the current study, although the current participants more often than not made larger gains than +2 w.p.m. per week.

In conclusion, a PT intervention resulted in large and socially relevant gains in reading fluency with Dolch words, as measured by correctly read w.p.m. in SAFMEDS and Dolch story trials, for all participants in this study. The observed improvements in performance add support to existing research that shows the efficacy of PT as a classroom intervention. Although this study involved a small number of participants in a single-subject design, the MBD facilitated a demonstration of replicated effects across participants on each occasion that the PT intervention was introduced.

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