A REVIEW OF FIXED FLUENCY CRITERIA IN REPEATED READING STUDIES

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Abstract

Introduced in the early 1970s, repeated reading has a history of helping students build oral reading fluency spanning almost 40 years. Participants in original repeated reading studies had to meet specific reading rates (i.e., fluency criteria) before considering a passage complete. Since its inception, researchers have employed different fixed reading fluency criteria for a variety of reasons. The current literature review examines fluency criteria origins and rates and subsequent reading outcomes. Results uncovered three distinct groupings of fluency criteria: researcher/teacher imposed, norm/grade-level referenced, and behavioral fluency rates. Repeated reading goal rates ranged from 30 to 210 correct words per minute with some requiring students to make less than a specific number of incorrects per minute (range 2-10) or simply focusing on words per minute (i.e., combining correct and incorrect words read). As a result of repeated reading to a fluency criterion, students demonstrated fluency improvement with the highest rates hovering around the fluency criterion used. Future directions for research follow a discussion focusing on the different components and effects of various repeated reading goal rates.

Keywords: decoding fluency, reading fluency criteria, repeated reading, review, reading practice

Once neglected, oral reading fluency has received increased attention from the educational community (Allington, 1983; Kubina & Morrison, 2000; National Reading Panel, 2000; Pikulski & Chard, 2005). While fluency in general has steadily acquired import in reading, some variations occur with the definition. Definitions of reading fluency include the ability to read quickly, accurately, and with expression while other definitions emphasize speed and accuracy of reading (Kuhn, Schwanenflugel, Meisinger, Levy, & Rasinski, 2012). Focusing only on reading speed and accuracy (i.e., decoding fluency) provides a simple, observable measure for educators and researchers (Archer, Gleason, & Vachon, 2003). While reading research offers slight differences in the definition of fluency,

uniform agreement surrounds the benefit of reading fluency. Notably, a student's ability to read fluently provides a quality measure of overall reading ability (Fuchs, Fuchs, Hosp, & Jenkins, 2001).

The National Reading Panel (2000) categorized fluency as an essential component when reviewing reading. Based on available research, the Panel found that students improve oral reading fluency to a greater extent with systematic, guided practice, rather than independent sustained silent reading or encouraging students to read more. In addition, students across grade levels participating in guided practice enhanced both word recognition and comprehension (National Reading Panel, 2000). Many researchers and teachers have used a guided, explicit practice method identified by the Panel and other research summaries as effective for developing oral reading fluency, repeated reading.

Origin and Theory of Repeated Reading

Repeated reading originated from the work of Dahl (1974), Chomsky (1976), and Samuels (1979). Rather than focusing on beginning readers, Dahl hypothesized ways to improve intermediate level readers; students who could decode printed text, but read slowly. During repeated reading, students practiced reading a single grade-level passage many times until reaching a criterion (i.e., 100 words per minute). Once attained, students initiated the process anew with an additional grade-level passage. Dahl surmised that students' needed to focus their attention on small amounts of reading, rather than spread their practice among many different passages. Her results indicated that as students increased their reading rate, they subsequently improved their reading accuracy. Dahl further conjectured intense practice would facilitate another important outcome. Specifically, the ability to decode fluently would motivate students to comprehend the passage's meaning based on the theory of automaticity (LaBerge & Samuels, 1974).

A critical component of the reading process involves decoding printed words quickly and accurately. Samuels' (1987) assertion provides a starting point for the theory of automaticity. LaBerge and Samuels (1974) suggested that individuals have only so much attention to spend while reading. Students unable to decode text fluently have difficulties comprehending text. Samuels (1987) defines skillful readers as those who can decode and understand simultaneously. While reading fluently sets the stage for comprehension (Allington, 1983; Pikulski & Chard, 2005; Samuels, 1987), students must first demonstrate decoding fluency before moving to other levels of reading (Samuels, 1987). Thus the focus of repeated reading directly entails improving a student's decoding fluency.

Efficacy of Repeated Reading

Previous literature reviews (Chard, Vaughn, & Tyler, 2002; Kuhn & Stahl, 2003; Meyer & Felton, 1999) indicate repeated reading works effectively facilitating oral reading fluency for all students regardless of disability. All students in early grades (e.g., 1st-2nd) profit from practice. Students with reading problems, however, particularly benefit from repeated reading practice (Kuhn & Stahl, 2003). While the overall research on repeated reading falls short in meeting a proposed method of determining an instructional method evidence-based, the authors of the review (Chard, Ketterlin-Geller, Baker, Doabler, & Apichatabutra, 2009) encourage practitioners to continue to employ repeated reading interventions due to the positive outcomes. Kavale (2005), for example, reported a.76 effect size gain for students with specific learning disabilities who engaged in repeated reading.

Repeated Reading Procedures

Repeated reading follows a basic format originally described by Dahl (1974) and Samuels (1979). A student reads a grade-level passage multiple times until reaching a goal. Once reached, the student reads a different grade-equivalent passage to the same goal (Meyer & Felton, 1999). The process can continue with incrementally more difficult text or stop as the student reads new passages fluently. Researchers have modified and tested varied procedural components which can include combinations of number of re-reads per session (e.g., O'Shea, Sindelar, & O'Shea, 1987), error correction (e.g., Daly & Martens, 1994), performance feedback (e.g., Smith, 1979), and/or reading formats such as reading while a teacher or peer reads (Kuhn, 2005) or reading without assistance (Compan, Iamsupasit, & Samuels, 2001; see Chard et al., 2002, and Chard et al., 2009, for examples).

One repeated reading procedural component entails the process by which a student either finishes working on a single passage and/or moves onto the next passage (i.e., the aforementioned goal). Previous research provides a few options. Researchers have had students read a passage a fixed number of times (e.g., Begeny, Daly, & Valleley, 2006), a fixed number of times within a certain amount of time (e.g., O'Connor, White, & Swanson, 2007), or until reaching a predetermined rate criterion (e.g., Dahl, 1974; Samuels, 1979) before proceeding to additional passages.

The goal of having a student move onto another passage appears to have an associated outcome. A student reading a passage for a fixed number of repetitions usually contained within one session permits the student to encounter a broad range of reading material over the course of a few sessions. However, moving a student to another passage after a fixed number of repetitions produces variability in terminal reading outcomes by not guaranteeing student reading speed or accuracy (i.e., rate). Having students reach a fixed performance criterion expressed as a rate, rather than fixed number of repetitions, offers an alternative for progressing to new reading passages. With an objective criterion for fluency, a student must meet a reading performance threshold as defined by the pre-set quantitative production criterion. The fluency criterion component has a student spend extended amounts of time with fewer passages, rather than less time with more passages (Dahl, 1974).

In practice, then, repeated reading developed with two options for goals. Option 1 involves having a student read a text passage a set or fixed number of times with an undefined reading performance improvement goal (i.e., unspecified rate). For example, Shannon reads a third grade passage on Jackie Robinson three times in one session. A result of option 1 means each student will achieve a variable reading performance in regards to speed and accuracy. For the example with Jackie, she may end with a performance of 71 words correct and 4 words incorrect read in a minute (95% accuracy).

Option 2 has students read a passage until reaching specific reading improvement or fluency criterion (i.e., quantified reading performance goal before moving onto other passages). As an example, Macie reads a passage about favorite summer vacations. Her performance improvement goal came to 135 correct words with 0 to 1 incorrects in one minute. Macie read the passage 10 times over 4 instructional days and met the aim with a 136 correct and 0 incorrect per minute performance. Another student who shared the same fixed fluency criterion would vary in the number of rereads necessary to meet the goal.

While the research base has yet to directly compare the two procedures, a meta-analysis (Therrien, 2004) reported relevant results. The results show the contributing effects of repeated reading intervention components on fluency and comprehension gains. The fixed

number of passages goal of three to four rereads and error correction demonstrated a positive effect. Reading until reaching a fixed performance criterion, however, accounted for the highest effect-size (ES = 1.74) during practice. What other benefits may students receive when reading to pre-set or fixed fluency criterion as previously described? Research from the Precision Teaching literature may prove useful.

***Precision Teaching*.** Precision Teaching began in 1960s (Lindsley, 1964) and hundreds of peer-reviewed studies have appeared in the social sciences (e.g., psychology, special education, sociology) demonstrating its effectiveness and application (Kubina & Yurich, 2012). Precision Teaching, similar to other progress monitoring approaches, does not dictate what or how to teach content. Unlike other progress monitoring approaches, Precision Teaching has developed into a system with specialized methods for monitoring performance, defining instructional targets, and facilitating decision making (White, 2005). Furthermore, a large body of research has emerged that describes the relationship between well-practiced behavior and behavioral fluency (Binder, 1996; Kubina, 2010).

Precision Teachers commonly use performance criteria conveyed by rate or frequency during the practice of both social and academic behaviors (Binder, 1996). Previous data suggests that individuals, who reach preset fluency criteria or performance standards, have associated critical learning outcomes (i.e., retention, endurance, and application to more complex behaviors) important to successful and competent future performance (Kubina & Morrison, 2000). *Retention* measures the degree to which a learner can respond from one frequency to the next separated by an interval of time (Binder, 1996). A student might read a passage, for instance, and answer comprehension questions in reading class and then again the following day. The student's score on the second reading represents that student's retention of correctly answered comprehension questions. Students who demonstrate *endurance* persistently perform behaviors in the face of distraction and over longer periods of time without a reduction in performance (Binder, 1996). And individuals display *application* by demonstrating improvements in complex behaviors (i.e., decoding) due in part to fluent component skills such as phonemic awareness and the alphabetic principal (Carnine, Silbert, Kame'enui & Tarver, 2010; Kubina, Commons & Heckard, 2009).

Purpose and Research Questions

Reading fluency criteria appear in the original model of repeated reading (Dahl, 1974; Samuels, 1979) and research confirms their critical importance as a component of repeated reading (Therrien, 2004). Additionally, evidence from the Precision Teaching database also demonstrates the relationship between performance standards, or fluency criteria, and associated positive learning outcomes (Binder, 1996, 2005; Kubina & Yurich, 2012). The performance standards represent a quantitative and qualitative marker indicative of masterful, fluent performance. The need to continue searching for effective reading practices suggests a close examination of repeated reading studies would yield benefits. Namely, employing fixed fluency criteria as the end goal of repeated reading may result in differential performance and learning outcomes. Specific questions to the present study include, What fluency criteria do participating students reach? Where do those fluency criteria originate? What outcomes do participants display when reading to a fixed fluency criterion?

Methods

Three computerized databases (i.e., PsycINFO, PsyARTICLES, and ERIC) provided the foundation for the initial search. Descriptors and all possible truncations included *repeated reading* or *reading fluency* and *fluency criterion*. An ancestral search of identified articles and pertinent literature reviews (Chard et al., 2002; Kuhn & Stahl, 2003; Therrien, 2004) followed the computerized search. An additional step involved a hand search of the *Journal of Precision Teaching and Celeration*; a journal that oftentimes reports research using performance criteria for various academic and social behaviors.

To meet criteria for the review, all articles had to:

1. Appear in a peer-reviewed journal or constitute one of the seminal repeated reading studies (e.g., Dahl, 1974, Samuels, 1979). Book chapters (i.e., Moseley, 1993) did not meet inclusion criteria.
2. Include a repeated reading component noting a pre-determined static or fixed range reading fluency criterion condition. Studies reporting a variable reading fluency criterion (e.g., Nelson, Alber, & Gordy, 2004) or a reading fluency criterion based solely on student baseline performance (e.g., Lo, Cooke, & Starling, 2011) did not meet inclusion criteria.
3. Report directly measuring the effects of at least one independent variable (i.e., a repeated reading method) on a primary dependent variable of a specific reading behavior (e.g., increases in words read).
4. Use connected text during repeated reading instead of studies focused on word lists (e.g., Berends & Reitsma, 2006).
5. Include participants who attended kindergarten through 12th grade at the time of the study rather than adults (e.g., Levy, Di Persio, & Hollingshead, 1992).
6. Employ a single-subject, experimental or quasi-experimental design rather than a qualitative approach (e.g., Roundy & Roundy, 2009).

The initial search of on-line databases generated 3062 articles of which 20 met inclusion criteria. An ancestral search of pertinent literature reviews and all articles meeting criteria generated four additional articles and five additional articles resulted from the hand search. The qualifying 29 articles, noted with an asterisk in the reference section, meeting review criteria contained 31 studies published in 15 journals.

Coding and Studies Meeting Inclusion Criteria

Initial coding for the review resulted in a division of the identified studies into three sub-groups based on the source of the reading fluency criteria used (See Appendix Tables). Eleven studies (Anderson & Alber, 2003; Dahl, 1974; Dowhower, 1987; Herman, 1985; Joseph & Schisler, 2007; Martens et al., 2007; Polk & Miller, 1994; Samuels, 1979; Selfridge & Kostewicz, 2011; Spence, 2002; Tam, Heward, & Heng, 2006) reported reading fluency criteria based on input from classroom teachers, students, and/or researchers. Fourteen studies from 12 articles (Carroll, McCormick, & Cooper, 1991; Chafouleas, Martens, Dobson, Weinstein, & Gardner, 2004; Gibson, Cartledge, Keyes, & Yawn, 2014; Mercer, Campbell, Miller, Mercer, & Lane, 2000; Musti-Rao, Hawkins, & Barkley, 2009; Staubitz, Cartledge, Yurick, & Lo, 2005; Therrien & Hughes, 2008; Therrien, Kirk, Woods-Groves, 2012; Therrien & Kubina, 2007; Therrien, Wickstrom, & Jones,

2006; Weinstein & Cooke, 1992; Yurick, Robinson, Cartledge, Lo, & Evans, 2006) reported fluency criteria based on grade-level or reading-rate norms. Fluency criteria from the behavioral fluency literature appear in six studies (Kostewicz & Kubina, 2010; Kostewicz & Kubina, 2011; Kubina, Amato, Schwilk & Therrien, 2008; McDowell, McIntyre, Owen & Keenan, 1998; Sweeney, Ring, Malanga & Lambert, 2003; Teigen, Malanga & Sweeney, 2001).

Results

Specific Reading Fluency Criteria and Origins

Researcher/Teacher Imposed Rates. Researchers (Dahl, 1974; Dowhower, 1987; Herman, 1985; Joseph & Schisler, 2007; Martens et al., 2007; Samuels, 1979; Tam et al., 2006) and teachers (Anderson & Alber, 2003; Selfridge & Kostewicz, 2011; Polk & Miller, 1994) created student-specific rates or used one rate school-wide (Spence, 2002) in 10 studies. Oral reading fluency criteria ranged from 75 (Tam et al., 2006) to 200 (Selfridge & Kostewicz, 2011; Polk & Miller, 1994) words (WPM) and correct words per minute (CWPM). The original criterion of 100 WPM (Dahl, 1974) came from curriculum-based criteria (i.e., 35-50 WPM).

Students in early repeated reading studies read to a WPM goal and researchers also reported accuracy (Dahl, 1974; Dowhower, 1987; Herman, 1985) or number of word recognition errors (Samuels, 1979) but did not incorporate either into the fluency criterion. Students participating in more recent research read to, at minimum, a fixed CWPM fluency criterion (Martens et al., 2007; Spence, 2002; Tam et al., 2006). Joseph and Schisler (2007) and Selfridge and Kostewicz also had students meet criterion in two consecutive sessions with researchers from three studies (Anderson & Alber, 2003; Selfridge & Kostewicz, 2011; Polk & Miller, 1994) incorporated a maximum number of errors per minute into their fluency criterion. Therefore, students not only met the CWPM criterion, but also read the passage with no more two (Selfridge & Kostewicz, 2011) or five errors (Anderson & Alber, 2003; Polk & Miller, 1994).

Normative/Grade-level Rates. Researchers incorporated fluency criterion rates based on grade-level (Mercer et al., 2005; Staubitz et al., 2005; Weinstein & Cooke, 1992; Yurick et al., 2006), student reading rate norms (Chafouleas et al., 2004; Gibson et al., 2014; Musti-Rao et al., 2009; Therrien & Hughes, 2008; Therrien et al., 2012; Therrien & Kubina, 2007; Therrien et al., 2006), and reading rates of a proficient reader (Carroll et al., 1991) in nine studies. Citied from previous publications (e.g., Carnine, & Silbert, 1979; Hasbrouck & Tindal, 1992; Koorland, Keel, & Ueberhorst, 1990; Shapiro, 1996), the CWPM and WPM criterion rates varied considerably (i.e., 30-180) depending on grade-level or reading age of students. Three studies (Musti-Rao et al., 2009; Staubitz et al., 2005; Yurick et al., 2006) reported a WPM criterion and, in addition to Staubitz et al. (2005) and Yurick et al. (2006), Carroll et al. (1991) and Chafouleas et al. (2004) included errors into fluency criteria. Chafouleas et al. (2004) also specified that students had to meet criterion over three consecutive sessions to move to the next passage.

Behavioral fluency rates. Criteria from six studies (Kostewicz, & Kubina, 2010; Kostewicz & Kubina, 2011; Kubina et al., 2008; McDowell et al., 1998; Sweeney et al., 2003; Teigen et al., 2001) reported using oral reading fluency criteria taken from the behavioral fluency (Binder, 1996; 2005) and Precision Teaching literature bases (Freeman & Haughton, 1993; Kubina & Starlin, 2003). The fluency criteria had a smaller variance ranging from 180 to 210 CWPM (Sweeny et al.; Teigen et al). Researchers tallied student

reading errors in five of the studies (Kostewicz, & Kubina, 2010; Kostewicz & Kubina, 2011; McDowell et al.; Sweeney et al.; Teigen et al.), but only Kostewicz and Kubina (2010, 2011) incorporated number of errors (i.e., 2 or less for 99% correct accuracy) into the criterion.

Study Outcomes and Effectiveness

Researcher/Teacher imposed rates. Students improved oral reading fluency scores in each of the 11 studies, but the highest reading performances remained near criterion rates. The amount of reading or the amount of reading time necessary for students to meet criterion varied widely. One student met criterion (i.e., 150 CWPM) a few times during initial one-minute reading (Spence, 2002) while another student met criterion (i.e., 100 CWPM with 5 or fewer IWPM) after almost 3 hours of reading over 23 sessions which included 15 sessions of 10-minute peer-mediated practice (Anderson & Alber, 2003).

Reviewing specific study outcomes, Samuels (1979) reported a student's data which showed an improvement to initial WPM scores on successive passages (i.e., 30, 50, 55, 58, 67). The student also decreased the number of test readings to reach criterion on successive passages from seven in the first to three in fifth (Samuels, 1979). Herman (1985) reported student mean reading rates improved from 47.38 (SD 2.83) to 93.38 (SD 9.38) on story one and 69.63 (SD 11.73) to 92.13 (SD 4.85) on story five. While starting on third grade-level passages, students finished the study reading passages between fourth and thirteenth grade-level (Dahl, 1974). Dowhower (1987) noted student increases to WPM but found little difference between assisted and unassisted repeated reading. Polk and Miller (1994) reported five students spent an average of nine sessions moving from initial reading scores ranging from 30-100 CWPM to criterion rates of 140-200 CWPM. With a criterion of 100 CWPM, Martens et al. (2007) found students could maintain reading fluency scores two days later (approx. 97 CWPM on both reads). Spence (2002) compared two types of instruction on fluency building suggesting fluency with phonic sheets, rather than sight word vocabulary fluency, had greater effects on oral reading fluency. Selfridge and Kostewicz showed three students able to meet criterion faster on the second passage as compared to the first. Finally, Joseph and Schisler (2007) reported no significant reading fluency gain differences after adding either whole-word and phonic analysis to repeated reading.

Normative/Grade-level rates. Students demonstrated improvements to reading fluency. As with previous findings, students met criterion following a wide range of reading time. Therrien and Kubina (2006) found students in intervention met criterion after an average of 1.8 one-minute trials, while Staubitz et al. (2005) noted one student required approximately five hours of reading (i.e., 23 ten-minute peer-mediated reading practice sessions, 20 sessions of 3 one-minute test reading, and 3 sessions of 3 twenty-second test reading) to meet criterion on one passage. Researchers demonstrated effective use of repeated reading to build oral reading fluency when used in peer-mediated formats (Musti-Rao et al., 2009; Staubitz et al; Yurick et al., 2006), and when implemented by paraprofessionals (Mercer et al., 2000). Students also demonstrated greater levels of oral reading fluency with words in- rather than out-of-context (Therrien & Kubina) and when asked to generate questions based on their reading (Therrien & Hughes, 2008; Therrien et al., 2007; 2012). For example, students in the intervention group improved from approx. 68 to 81 CWPM and from 78 to 80 CWPM in the control group (Therrien et al., 2007). Finally comparing two types of criteria (i.e., fixed vs. set number of fluency improvements), student reading scores reached higher CWPM

with fixed rates (100-110 CWPM) rather than meeting criterion with three consecutive improvements (60-70 CWPM; Weinstein & Cooke, 1992).

Behavioral fluency rates. As with previous studies, students demonstrated fluency gains. Excluding incomplete and non-disaggregated data, students reached criterion on a passage within a range of 16 minutes (Kostewicz & Kubina, 2011) to 58 minutes (Kubina et al., 2008) of reading. Kostewicz and Kubina (2011) found students improved reading fluency on difficult science material, often jumping from approximately 70 CWPM to the criterion of 200 within 6-9 sessions of repeated practice and subsequent retell scores more highly correlated with CWPM rather than number of minutes reading. McDowell et al. (1998) demonstrated a student with reading delays could reach high CWPM criteria with difficult passages improving from 100 to 200 CWPM. Other studies showed oral reading fluency gains for an individual student (Tiegen et al., 2001) to many students receiving intervention from pre-service teachers (Sweeney et al., 2003). The other two studies (Kostewicz & Kubina, 2010; Kubina et al., 2008) reported various comparisons. Retention scores for students reading to different criteria (i.e., 200 v. 123 CWPM) decreased at a similar rate over time (i.e., 3.5 months). However, students reading passages to 200 CWPM had higher terminal reading rates than students who met the 123 CWPM criterion (Kubina et al.). Kostewicz and Kubina (2010) compared traditional repeated reading to a fluency criterion and interval sprinting and found similar one-minute test scores and number of trials to criterion. Students improved from initial reading scores ranging from 62-95 CWPM with 1-9 IWPM to criterion meeting scores of 200-229 CWPM with 1-4 IWPM.

Discussion

Specific Fluency Criteria

Reading fluency criteria in the reviewed studies ranged from 30 to 210 words or correct words per minute. Some criteria allowed for no more than 2-10 errors per minute (e.g., Staubitz et al., 2005) and others had students meet criteria multiple sessions in a row (e.g., Chafouleas et al., 2004). Two main findings emerge. First, fixed fluency criteria greatly differ in absolute number. Second, how researchers measure fluency differs. A discussion on absolute difference bridges into reader outcomes covered later in the discussion with the measurement or focus of different criteria covered next.

Three major dependent measures constitute fixed fluency criteria. Students reached criterion by reading a certain number of words per minute (correct plus incorrect words per minute; e.g., Samuels, 1979), correct words per minute (e.g., Martens et al., 2007), or a combination of a certain number of correct words per minute in conjunction with no more than a certain number of incorrect words per minute (e.g., Anderson & Alber, 2003). At face value, each seems to represent oral reading fluency, however only measurement of one type of criterion meets an accepted definition of oral reading fluency.

Authoritative reading sources (e.g., Archer, et al. 2003; Fuchs et al., 2001) assert decoding fluency manifests objectively as the speed and accuracy of reading text. Maintaining a criterion of words per minute covers half the equation, reading speed, but ignores the second part. Students reading to a WPM criterion do not have to attend to errors nor do they count against reading skill level. Hypothetically, students could read 100 words incorrectly, yet still meet criterion. Correct words per minute alone fails to attend to either aspect of the oral reading fluency definition. Reading fluency combines corrects

and incorrects to garner reading speed, albeit the fewer errors the reader makes the better. Students can read with 50% accuracy when meeting criteria that focus strictly on CWPM. Only by measuring and attending to both correct and incorrect words per minute in isolation does a fixed fluency criterion meet the definition of oral reading fluency. A reading score of 150 CWPM with 1 IWPM clearly denotes both speed and accuracy (99.3%).

While criteria accounting for CWPM appear often (66% of studies), errors receive less direct (i.e., included in the criterion) attention (37% of studies). Initially considered a secondary concern (Dahl, 1974), measuring and accounting for errors plays an important role. For example, Daane, Campbell, Grigg, Goodman and Oranje (2005) reported students making the fewest errors on oral reading fluency tests correlated with higher comprehension scores. Additionally, Kostewicz and Kubina (2010) showed the data for one student who improved CWPM while also increasing the number of IWPM demonstrating the independent nature of behavior (Lindsley, 1990); CWPM and IWPM do not have to balance out during repeated reading interventions. Students can steadily improve CWPM while also increasing IWPM potentially decreasing reading accuracy. Therefore, researchers not measuring and displaying both reading variables, and more importantly including them in a fluency criterion, fail to provide the proper picture of decoding fluency.

Fixed Fluency Criteria Origins

Based on citation and other explanations, three distinct rate categories emerged from the current literature base: researcher/teacher-imposed, normative/grade-level, and behavioral fluency. The initial fixed criterion rates imposed on students resulted from a normal course of scientific study. Dahl (1974) and Samuels (1979) made logical choices (i.e., referring to curriculum-based criteria) in establishing reading criteria rates. Others (e.g., Dowhower, 1987; Herman, 1985) simply cited the rates used in previous research (i.e., Samuels, 1979). Since the 1990s, the majority of researchers (over 70% of remaining studies) explicitly reference fixed fluency reading criteria from published reading rates, either norm-referenced/grade-level or behavioral fluency rates maximizing our advancement of a science of reading.

Oral reading fluency rates receive attention for a variety of reasons. Hasbrouck and Tindal (1992) published readings rates of many different students in different grades providing a snapshot of the distribution of reading scores. Kubina and Starlin (2003) display a range of reading rates that have associated reading outcomes. In both cases, the rates displayed guide fluency criteria choice and stimulate research and practice. With both types referenced within the reviewed body of studies, the vast difference in absolute number (i.e., 180 words) may speak more to intent and use of proposed rates.

Two interactions with students rely on oral reading fluency criteria rates: assessment and practice. Reading fluency tests (e.g., curriculum-based measurement; CBM) measure current performance and reading growth (Wayman, Wallace, Wiley, Ticha & Espin, 2007). Reading fluency practice (i.e., repeated readings) builds oral reading fluency (Chard et al., 2002). In both instances, researchers and practitioners refer to published fluency rates to maximize interpretation and/or practice.

CBM, often conducted as one to three one-minute readings of a previously unread passage, allows students' scores to readily compare to normative reading rates (Hasbrouck & Tindal, 1992). The role of reading rate becomes a comparison - a yard stick - to evaluate where the student currently reads with normative rates as a referent. CBM assessment outcomes possibly identify an area of need and can prompt practitioners

to implement reading fluency practice (e.g., repeated reading). Educators working with students actively and systematically engaged in building decoding fluency maintain a different agenda. Unlike CBM and a few cold readings of a passage, students spend extended periods of time with the same passage reading toward a static fluency criterion (Kubina & Starlin, 2003).

Normative/grade-level rates fit well in an assessment model. The rates vary by grade, age, and ability and provide ready access for comparison (Hasbrouk & Tindal, 1992). Behavioral fluency rate ranges, derived for the observed outcomes of practice, do not vary by age and present performance level. Fowler (1993) suggests that students must decode at a minimum of 200 words per minute to comprehend. Considering reading speeds necessary for comprehension, research and practitioners should have students practice until reaching reading speeds mirroring those outcomes. Supported by the outcome data from the current literature base, it does not seem plausible that students reading orally 80-90 CWPM will smoothly transition to silently reading 200+ CWPM. Researchers and practitioners determining fluency criteria for practice should refer to lists of criteria that publish practice fluency criteria.

Reader Outcomes Based on Different Fluency Criteria Rates

Fluency criteria sources and absolute rates play a role guiding rate choice. However, the many questions of fluency criteria choice distill to one: what outcomes do students experience as a result of reading quickly and accurately at a given rate? The literature base suggests that students rarely read faster or more accurately than required (i.e., fixed fluency criterion). Students also needed a wide range of practice time, 1 (Spence, 2005) to 300 minutes (Staubitz et. al., 2005) to reach different criteria. Additional findings (i.e., unrelated to a specific criterion) suggest positive reading improvements to normative test (e.g., Spence, 2002) and comprehension-related scores (e.g., Dowhower, 1987). Direct comparisons of outcomes associated with different fluency criteria appear limited in the literature.

Overall, students asked to reach fluency criteria consisting of more CWPM and fewer IWPM display faster and more accurate reading. That does not mean a student participating in studies with other criteria could not read faster. They just did not under practice conditions which ceased. Another criterion-related finding comes from Kostewicz and Kubina (2011). Student retell scores more highly correlated to words read than times reading the passage placing an importance on criterion choice. In addition to noted difference, one specific criterion comparison did emerge.

Martens et al. (2007) reported students maintained oral reading fluency gains two days following reaching a 100 CWPM criterion. Kubina et al. (2008) showed students reaching both 123 CWPM and 200 CWPM on separate passages decreased reading scores similarly over time (2 weeks, 2 months, 3.5 months). Scores on passages read to 200 CWPM consistently outperformed scores on 123 CWPM with students still scoring greater than the lower fluency criterion 3.5 months out. While limited, practitioners can ask how long out and how fast would they like students to perform a critical reading skill: 2 or 98 days later?

Another question related to outcome revolves around potential reading productivity. A student able to read at 30 CWPM (e.g., Mercer et al., 2000) encounters considerably less text over time than a student who can read fluently at 210 CWPM (e.g., Sweeny et al., 2003). Over the course of a day, students may read for two to three hours in total. Reading behavior at 30 CWPM allows a student to interact with 5,400 words daily. At 210 CWPM,

the number rises to 37,800; approximately one and a half times what a student reading at 30 CWPM reads over a school week. Building reading fluency through practice should strive for the greatest immediate and long-reaching gains for the individual student. Aligning practice fluency choice with advantageous practice criteria seems paramount.

Future Research Directions

Two avenues of research lay open for examining reading fluency criteria in repeated reading interventions. First, researchers can continue to examine the effects of different criteria in comparison. For example, both Kubina et al. (2008) and Martens et al. (2007) examined the retention effects of RRFC interventions. However, Kubina et al. report a direct retention outcome comparison of more than one criteria (i.e., 123 and 200 CWPM). Other RRFC outcomes require direct comparisons between multiple criteria such as reading transfer between passages, number of sessions or minutes to criterion, and other generalization measures (i.e., recall or other comprehension measures). Researchers can use various publications (e.g., Carnine, & Silbert, 1979; Freeman & Haughton, 1993; Hasbrouck & Tindal, 1992; Koorland, et al., 1990; Kubina & Starlin, 2003; Shapiro, 1996) as rationales for the different suggested reading fluency rates.

Second, a noticeable direction exists in the RRFC literature base: a direct comparison between reading to fixed fluency criteria and reading a fixed number of repetitions, the aforementioned options one and two. The comparison can examine the same outcomes noted above (i.e., reading transfer, retention, application on comprehension tasks, etc.). An obvious and difficult aspect of the comparison will be the balance of practice time. Once controlled for, the results may further guide repeated reading research.

Conclusions

One form of reading fluency, decoding fluency (Kuhn et al., 2012), results from practice and more specifically, systematic practice (Archer et al., 2003). One important aspect of reading practice involves the inclusion of a reading fluency criterion (Therrien, 2005). First examined almost 40 years ago, researchers and practitioners have employed a wide range of oral reading fluency criteria for a variety of reasons (e.g., normative/grade-level, behavioral fluency). In all cases, students demonstrated an improvement to reading fluency, however, students rarely read faster or more accurately than the criterion used. Certain fluency criteria seem more appropriately matched with practice, the singular goal of repeated readings and produce more positive student outcomes. Regardless, the inclusion of a static fluency criterion with repeated reading allows students a clear marker for practice and improvement.

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Appendix

Researcher/Teacher Imposed Rate Studies

Study	Participants	Measures	Criterion	Outcomes
Anderson & Alber (2003)	15 yo male with ED	CWPM; IWPM	100 CWPM with fewer than 5 IWPM	Improved from 12 CWPM/ 7 IWPM to 102 CWPM/ 1 IWPM in 23 sessions
Dahl (1974)	32 2nd grade students; poorest readers in program	WPM; Reading accuracy	100 WPM	Repeated readings main effect showed significance on the Timed Oral Reading Tests (word recognition errors and number of sessions required to read 100-word passage)
Dowhower (1987)	17 2nd grade students able to read 50 WPM with, at minimum, 85% accuracy	WPM; Accuracy; Unaided recall questions; Prosodic measures	100 WPM	Higher initial and final mean reading scores for assisted vs. unassisted students. Fewer mean readings to criterion for the assisted group. Higher mean comprehension scores for the assisted group.
Herman (1985)	8 4th 5th or 6th grade students reading 35-50 WPM	WPM; Speech pauses; Total miscues (all errors); Combined accuracy (correct + self-corrects, and acceptable errors)	85 WPM	Students read faster and made fewer errors on the final read versus the initial read of both story 1 and 5. Comparing the initial reads of story 1 and 5, students scored significantly better on rate, miscues, and accuracy. Final reads of both 1 and 5 did not differ significantly.
Joseph & Schisler (2007)	60 students (1st, 2nd, or 3rd graders with 28 receiving special education services)	Group Mean of CWPM; Group mean of CWPM per minute of instructional time	90 CWPM on 2 consecutive readings	Students improved oral reading fluency equally under all three conditions.
Martens et al. (2007)	30 students (20 2nd and 10 3rd graders with 15 receiving special education)	CWPM	100 CWPM	Students receiving intervention, as compared to control, improved oral reading fluency and maintained those gains 2 days later
Polk & Miller (1994)	5 male students (11-18 yo with ED)	CWPM; IWPM; Retells per minute	140-200 CWPM	During the 9 week repeated reading intervention, students reached criterion on an approx. ave. of 3 passages (range 2-4) requiring an approx. ave. of 9 sessions (range 5-14)
Samuels (1979)	A student with mental retardation who had a difficulty learning to read	WPM; Word recognition errors	85 WPM	Higher initial WPM reading score on successive passages; fewer errors on successive passages
Selfridge & Kostewicz (2011)	3 female students aged 9-10 with SLD	CWPM; IWPM	200 CWPM; no more than 2 IWPM; across 2 days	Each student reached criterion on 2 passages requiring fewer days on the 2nd passage

Researcher/Teacher Imposed Rate Studies (Cont.)

Study	Participants	Measures	Criterion	Outcomes
Spence (2002)	35 students (3th-9th grade) reading average of 3.8 years behind grade level	CWPM; IWPM	150 CWPM	Sample students improved initial readings and completed passages to criterion every 8 days. All students improved reading fluency and Wide Range Achievement Scores.
Tam et al. (2006)	5 9-11 yo students (2 females and 3 male, 3 with special needs)	CWPM; IWPM; Comprehension questions answered correctly	Exp. determined criterion rates per student (e.g., 75 CWPM)	Students read more ave. CWPM and made fewer IWPM moving from the 1st, 2nd, and 3rd criterion passages. Students reached criterion after an average of approx. 5 sessions (range 3-10).

Note. SLD= Specific learning disabilities; ED = Emotional disturbance; CWPM = Correct words per minute; IWPM = Incorrect words per minute; WPM = Words per minute

Normative/Grade-level Rate Studies

Study	Participants	Measures	Criterion	Outcomes
Carroll et al. (1991)	4 male students (11-12 yo with SBH)	CWPM; IWPM	100 CWPM with 3 or fewer IWPM	Two students met criterion on 2 passages and two on 3 passages. Student ranged from 21-91 as a low CWPM and 75-123 as a high CWPM.
Chafouleas et al. (2004)	3 female students (8-9 yo reading below same-aged peers)	CWPM; IWPM	60 CWPM with no more than 3 IWPM met over 3 consecutive sessions	One student met criterion first and another read fastest (135 CWPM/ 1 IWPM) under the RR alone condition. The final student's data suggest highest scores under the RR with feedback condition (100 CWPM/ 3 IWPM)
Gibson et al. (2014)	8 first graders with reading fluency and comprehension difficulties	CWPM and retell words per minute; CWPM and retell words per minute on generalization passages;	Benchmark for 1st grade (40 CWPM)	Student's reached criterion on multiple passages during intervention (Phase I), however stronger gains on generalization passages occurred with higher reading criteria (Phase II).
Mercer et al. (2000)	49 middle school students with SLD	CWPM; IWPM	30-40 CWPM early 1st; 40-60 CWPM late 1st; 60-80 CWPM early 2nd; 80-100 CWPM late 2nd; 100-180 CWPM 3rd and 2 or less IWPM	All students made significant gains in reading grade level as a result of reading fluency instruction. Student who participated longer made greater gains.
Musti-Rao et al. (2009)	12 students aged 9-12yo (5 males, 7 females) 6 with and 6 without special needs (i.e., SLD, SED, and OHI)	WPM	90 WPM for 2nd graders, 110 WPM for 3rd graders, 118 WPM for 4th graders	All students showed reading rate improvements as compared to baseline as a result of reading fluency practice. Students, however, did not reach end-of-year benchmarks.
Staubitz et al. (2005)	6 students aged 9-11yo (4 males, 3 females all with or at-risk for ED)	WPM; Comprehension questions answered	145 WPM for 4th graders and 180 WPM for 6th graders with 10 or fewer errors	Students met criterion on an ave. of 3 passages taking an approx. ave. of 7 sessions.
Therrien & Hughes (2008)	18 students aged 9-13 with SLD in reading; 14 students aged 9-13 reading two years below grade level	CWPM; Factual and Inferential Questions	2nd grade: 94 CWPM; 3rd grade: 114 CWPM; or 4 Maximum Reads	Students improve reading fluency and when compared; repeated readings improved factual comprehension more than question generation.

Normative/Grade-level Rate Studies (Cont.)

Study	Participants	Measures	Criterion	Outcomes
Therrien et al. (2012)	30 students in 3rd, 4th, and 5th grade	DORF (CWPM)	50th Percentile CWPM for current reading level; maximum 4 rereads	Repeated readings and non-repetitive readings produced similar oral reading fluency gains.
Therrien & Kubina (2007)	16 students (14 3rd and 2 5th graders; 5 females and 11 males)	CWPM; Errors; Trials to criterion	93 CWPM	Students required fewer trials to criterion when reading words in context rather than word lists.
Therrien et al. (2006)	30 students with or at risk for SLD (13 4th, 10 5th, 6 7th, and 1 8th graders)	CWPM; Comprehension questions answered correctly	50th Percentile CWPM for current reading level	Students in the intervention group averaged 2.4 rereads to reach criterion and read faster than control.
Weinstein & Cooke (1992)	4 male student (7-10 yo) with LD	CWPM	90 CWPM; 3 straight CWPM improvements	Students required more reading trials to reach the fixed rather than the improvements criterion, but did reach higher CWPM during sessions.
Yurick et al. (2006) – Study 1	8 5th graders (10-11 yo, 4 males and 4 females, 2 with LD)	WPM; Accuracy %; Comprehension Questions	180 WPM and 10 or fewer errors and comprehension questions correct	Students improved accuracy to 95% and reached criterion on 3.5 passages with an average number of sessions to criterion of 5.4
Yurick et al. (2006) – Study 2	8 3rd graders	WPM; Accuracy %; Comprehension Questions	145 WPM and 10 or fewer errors and comprehension questions correct	Students improved accuracy to 90% and reached criterion on 7.4 passages with an average number of sessions to criterion of 5.7
Yurick et al. (2006) – Study 3	6 4th graders	WPM; Accuracy %; Comprehension Questions	180 WPM and 10 or fewer errors and comprehension questions correct	Students improved accuracy to 94% and reached criterion on 2.5 passages with an average number of sessions to criterion of 7.6

Note. LD = Learning disabilities; SLD = Specific learning disabilities; ED = Emotional disturbance; SED = Severe emotional disturbance; SBH = Severe behavioral handicaps; OHI = Other health impairments; CWPM = Correct words per minute; IWPM = Incorrect words per minute; WPM = Words per minute; DORF= DIBELS Oral Reading Fluency

Behavioral Fluency Rate Studies

Study	Participants	Measures	Criterion	Outcomes
Kostewicz & Kubina (2010)	3 male students (2 4th grade male students with SLD or OHI; 1 2nd grade student receiving Title 1 services)	CWPM; IWPM	200 CWPM with 2 or less errors	Students first met the criterion under the interval sprinting condition 3 times and 3 times under the repeated reading condition. Students displayed reading transfer from 1st to 2nd passage.
Kostewicz & Kubina (2011)	7 students (3 females and 4 males) with SLD or EBD in 7th and 8th grade	CWPM; IWPM; Retell words	200 CWPM with 2 or less errors	Students improved accuracy and CWPM from pre- to post-assessments on passages from a science textbook. All students reached criterion on four consecutive passages each after approx. 8 sessions. Four students displayed improving CWPM and three decreasing IWPM on initial readings of successive passages.
Kubina et al. (2008)	3 9yo students 1 male and 1 female with SLD and 1 male with EBD	CWPM	123 and 200 CWPM for 2 consecutive days	All students maintained higher retention scores on passages read to 200 vs. 123 CWPM at 2 weeks, 2 months and 3.5 months.
McDowell (1998)	13 y.o. male reading 3 years behind	CWPM; IWPM; Recall facts per minute	200 CWPM	Student met aim on two passages after 6 and 3 sessions with a high score of 209 CWPM. Recalled approximately 11 passage facts per minute each session.
Sweeny et al. (2003)	39 4th grade students (over half participated in special education, ELL, or Title 1	CWPM; IWPM	180-210 CWPM	Compiled reading celerations show reading fluency rates increased for all students. Multiple students met criterion on multiple passages (more than one, but not more than 6) during the 5 week study.
Teigen et al. (2001)	10 yo male with SLD	CWPM; IWPM	180-210 CWPM	Student met aim with a score of 228 CWPM/ 1 IWPM during the 9th session.

Note. SLD = Specific learning disabilities; EBD = Emotional behavioral disabilities; OHI = Other health impairments; ELL = English language learner; CWPM = Correct words per minute; IWPM = Incorrect words per minute.