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Reading Fluency and its Relationship with Comprehension: A Systematic Literature Review

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Abstract: Research on reading fluency variably emphasizes accuracy, automaticity and prosody, without clarifying the direction of its relationship with comprehension. This systematic review aimed to examine the scientific production on the definition of fluency and its relationship with reading comprehension from the perspective of cognitive psychology. Following PRISMA guidelines, the phases of identification, selection, eligibility, inclusion and data extraction were conducted. A search in databases such as Web of Science, *SciELO*, American Psychological Association, among others, resulted in the inclusion of 57 studies. The synthesis revealed that 60% of the researches define fluency as accuracy, automaticity and prosody, identifying it as a predictor of comprehension (81%). In terms of evaluation, accuracy and speed measures are the most used (58%), while prosody remains neglected. It is concluded that advances in the definition of fluency are crucial. This review provides a better understanding of the construct, contributing to teaching and assessment practices.

Keywords: reading, reading fluency, reading comprehension, systematic review

Fluência de Leitura e sua Relação com a Compreensão: Revisão Sistemática da Literatura

Resumo: Pesquisas sobre fluência de leitura enfatizam, de maneira variável, os componentes precisão, automaticidade e prosódia, sem elucidar a direção de sua relação com a compreensão. Esta revisão sistemática objetivou investigar a produção científica acerca da definição de fluência e suas relações com a compreensão leitora, sob a perspectiva da psicologia cognitiva. Seguindo diretrizes PRISMA, foram realizadas as etapas de identificação, seleção, elegibilidade, inclusão e extração da informação. A busca em bases como *Web of Science*, SciELO, *American Psychological Association*, entre outras, resultou em 57 estudos incluídos, cuja síntese evidenciou que 60% das pesquisas definem fluência como precisão, automaticidade e prosódia, sendo preditora da compreensão (81%). Quanto à avaliação, medidas de precisão e velocidade são as mais utilizadas (58%), enquanto a prosódia é negligenciada. Conclui-se que avanços na definição de fluência são cruciais. Esta revisão possibilita um maior entendimento do construto, contribuindo com práticas de ensino e avaliação.

Palavras-chave: leitura, fluência de leitura, compreensão da leitura, revisão de literatura

Fluidez Lectora y su Relación con la Comprensión: Revisión Sistemática de la Literatura

Resumen: Investigaciones sobre fluidez lectora enfatizan, de manera variable, los componentes de precisión, automaticidad y prosodia, sin aclarar su relación con la comprensión. Esta revisión sistemática tuvo como objetivo examinar la producción científica sobre la definición de fluidez y su relación con la comprensión lectora desde la psicología cognitiva. Siguiendo directrices PRISMA, se realizaron las etapas de identificación, selección, elegibilidad, inclusión y extracción de información. La búsqueda en bases como *Web of Science*, SciELO, *American Psychological Association*, entre otras, resultó en la inclusión de 57 estudios, cuya síntesis mostró que el 60% define la fluidez como precisión, automaticidad y prosodia, siendo predictora de la comprensión (81%). En cuanto a evaluación, medidas de precisión y velocidad son las más utilizadas (58%), mientras que la prosodia es descuidada. Se concluye que avances en la definición de fluidez son cruciales. Esta revisión posibilita mejor comprensión del constructo, contribuyendo a prácticas de enseñanza y evaluación.

Palavras clave: lectura, fluidez de lectura, comprensión de lectura, metanálise

According to the cognitive psychology approach, three main skills are involved in reading: word recognition (decoding), reading fluency (RF), and reading comprehension (RC) (Basso et al., 2018). In this field, there are numerous studies addressing word recognition and its relationship with comprehension, while national and international research focusing on fluency is less common. Especially in Brazil, the topic has received limited attention in terms of research and the development of standardized assessment instruments, resulting in a significant gap in the field (Basso et al., 2019), particularly regarding the relationship between fluency and comprehension (Spinillo et al., 2021). One example is the absence of the term "reading fluency" in major national keyword databases. Internationally, the gaps in the field are also being discussed. Kim (2020) reminds us that, although international studies have already shown

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relationships between fluency and comprehension, fluency has been significantly omitted from many theoretical models of reading.

A few years ago, in the early definitions of fluency, the construct was described as ease in word recognition, being considered the result of proficient decoding, that is, accuracy. Currently, research has shown that, in addition to accuracy in word recognition, other components are involved in fluency, such as automaticity, which includes speed, autonomy, effortlessness, and lack of conscious attention (Kuhn et al., 2010), and prosody, considered the musicality of oral language, involving intonation, stress, intensity, duration, and pauses (Basso et al., 2018). Even so, published studies present different definitions of reading fluency, placing varying emphasis on the components of accuracy, automaticity, and prosody, which are generally used to describe it. In the study by Bizama Muñoz et al. (2019), for example, fluency was defined as reading with accuracy and automaticity, as measured by the number of words read correctly. Daane et al. (2005), on the other hand, consider fluency to be phrasing, adherence to syntax, and expressiveness of the reader, that is, prosody. Kuhn et al. (2010), however, understand fluency as a multidimensional skill that combines accuracy, automaticity, and prosody, demonstrated during reading through accurate, fast, and automatic word recognition, along with appropriate rhythm and intonation.

The existing definitions of fluency, beyond the variation in the components considered, do not make explicit the directionality of the relationship between fluency and comprehension, that is, whether fluency contributes to comprehension, whether comprehension fosters fluency, or whether the relationship is reciprocal (Kuhn et al., 2010). Yildirim et al. (2019), for instance, conceptualize fluency as a bridge between decoding and comprehension, suggesting a reciprocal relationship with the latter, both contributing to and potentially stemming from text understanding. In contrast, Kuhn et al. (2010) regard fluency as a reading component that can either constrain or facilitate comprehension, indicating a unidirectional link between these skills. Divergences are also observed with respect to the assessment of the construct. While some studies evaluate oral reading fluency, others focus on silent reading fluency. Moreover, research may employ word lists, sentences, or full texts, evidencing a range of assessment approaches found in the literature.

Given the limited number of publications and the ongoing debates on the topic, this systematic literature review aimed to examine the state of scientific production on the definition of reading fluency and its relationship with reading comprehension from the perspective of cognitive psychology. The study also seeks to address the following questions: (1) What definitions of reading fluency, in terms of the emphasized components (accuracy, automaticity, and prosody), are present in the literature? (2) What is the prevailing direction in the explanation of the relationship between fluency and reading comprehension? (3) How has fluency been assessed? and (4) How has fluency been defined, evaluated, and related to comprehension in Brazilian research? It is understood that a systematic literature review, by synthesizing the definitions of reading fluency and the components used to describe it, will contribute to a more comprehensive understanding of the construct. Identifying the predominant direction in the explanation of the relationship between fluency and comprehension will also offer insights for teaching the skill, as well as for the development of appropriate interventions. Finally, this study aims to identify the instruments used to assess fluency, considering that the skill varies based on the type of textual material (words, sentences, or passages), the mode of reading (oral or silent), and the components included in the evaluation (accuracy, automaticity, and prosody), thereby elucidating how the construct has been operationalized in the literature.

Method

The present systematic literature review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA guidelines (Moher et al., 2009), which provide a standardized framework for reporting systematic reviews. Although PRISMA is primarily used in health sciences, particularly for reporting randomized clinical trials, it can also serve as a basis for systematic reviews in other fields (Moher et al., 2009). Given the lack of specific reporting guidelines for education research, PRISMA recommendations were adopted with necessary adjustments. Accordingly, the review followed the phases of identification, selection, eligibility, inclusion, and data extraction, based on pre-established criteria. It is important to note that the systematic review protocol was developed but has not been published in a peer-reviewed repository due to the lack of platforms accepting systematic reviews in education. However, the protocol is available on the Open Science Framework platform and can be accessed via DOI: 10.17605/OSF.IO/B6JXF.

Search strategy

The digital libraries used for the study search included the Educational Resources Information Center – ERIC, American Psychological Association – APA, *PubMed*, *EMBASE*, Web of Science, CAPES Periodicals, *SciELO*, Virtual Health Library – VHL, *BVS Psicologia Brasil* and Google Scholar. These sources were selected based on an exploratory analysis of articles conducted prior to the systematic review, which helped identify key publications that guided the selection of studies included in the review. The sources were also chosen for their scientific relevance and their connection to the research field. Additionally, studies identified through manual searches in other sources were included. The search encompassed publications up to December 2020 (the date of this review) without a predefined start date, ensuring comprehensive coverage of the topic. The search strategy used was: “reading fluency”

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AND "Reading comprehension". Only full empirical studies published in peer-reviewed journals were selected, and publications in English, Portuguese, or Spanish were considered. It is worth noting that the participants in the selected studies were speakers of various languages. In addition, studies that examined the relationship between reading fluency and reading comprehension among elementary school students (1st to 9th grade in Brazil and equivalent stages in other countries) were included.

Selection process

In the first phase, identification, the constructed search strategy was applied across the selected search platforms, and the identified studies were then listed in the reference management software Zotero. During this stage, studies retrieved through manual searches in additional sources were also included. Duplicate articles were subsequently removed. In the selection phase, titles and abstracts of the studies were screened, and those that clearly did not meet the established criteria were excluded. In the eligibility phase, the references of the remaining articles were transferred to review management forms. Eligibility criteria (inclusion and exclusion), described below, were then applied through a careful reading of titles and abstracts, along with a brief examination of the full text. At this stage, in addition to the lead researchers, four reviewers, graduate students from the same research group, independently evaluated the titles and abstracts of the studies. Subsequently, given the still large number of remaining studies, quality criteria, defined below, were applied to determine study inclusion. During the inclusion phase, the remaining articles were read in full and included in the review. After the full-text reading of the included studies, a summary of each was compiled using a data extraction form, capturing the following elements: (a) Journal of publication; (b) Year of publication; (c) Full reference; (d) Country of origin; (e) Study objective; (f) Sample size; (g) Age of participants; (h) Educational stage; (i) Type of school (public or private); (j) Instruments used to assess fluency; (k) Definition of fluency; (l) Direction of the relationship between fluency and comprehension; and (m) Main findings.

Eligibility criteria

The inclusion criteria for the studies were as follows: (a) Provide a definition of reading fluency and address the relationship between fluency and reading comprehension; (b) Focus on elementary education (1st to 9th grade in Brazil and equivalent stages in other countries, based on age ranges and curricula); and (c) Include a sample of typically developing students. The exclusion criteria were: (a) Emphasis exclusively on fluency; (b) Emphasis exclusively on comprehension; (c) Lack of emphasis on the relationship between reading fluency and comprehension; (d) Focus on early childhood education, secondary education, or adult samples; (e) Include a sample of students with learning difficulties or disorders; (f) Include a sample of low-income students; and (g) Include a sample of students who are native speakers of a second language other than the language assessed. It is important to note that low-income students were excluded, as research has shown that children from socially disadvantaged backgrounds are at a higher risk of developing early reading difficulties (Morais et al., 2013), which could affect the analyses of the relationship between fluency and comprehension.

Quality criteria

The quality criteria established were as follows: (a) The article includes at least the theoretical framework, objective, method, and results; (b) The definition of fluency is clearly and objectively described in the theoretical framework; (c) The explanation of the direction of the relationship between fluency and comprehension is clear and objective and is included in the theoretical framework; (d) The percentage of second-language speakers does not exceed 10% of the sample; (e) The study sample includes more than 15 participants; (f) The instruments used to assess fluency are described; (g) The study's results are clearly and objectively reported, highlighting the findings regarding the relationship between reading fluency and comprehension in tables, graphs, or figures. A study was excluded if it did not meet at least two of the specified quality criteria.

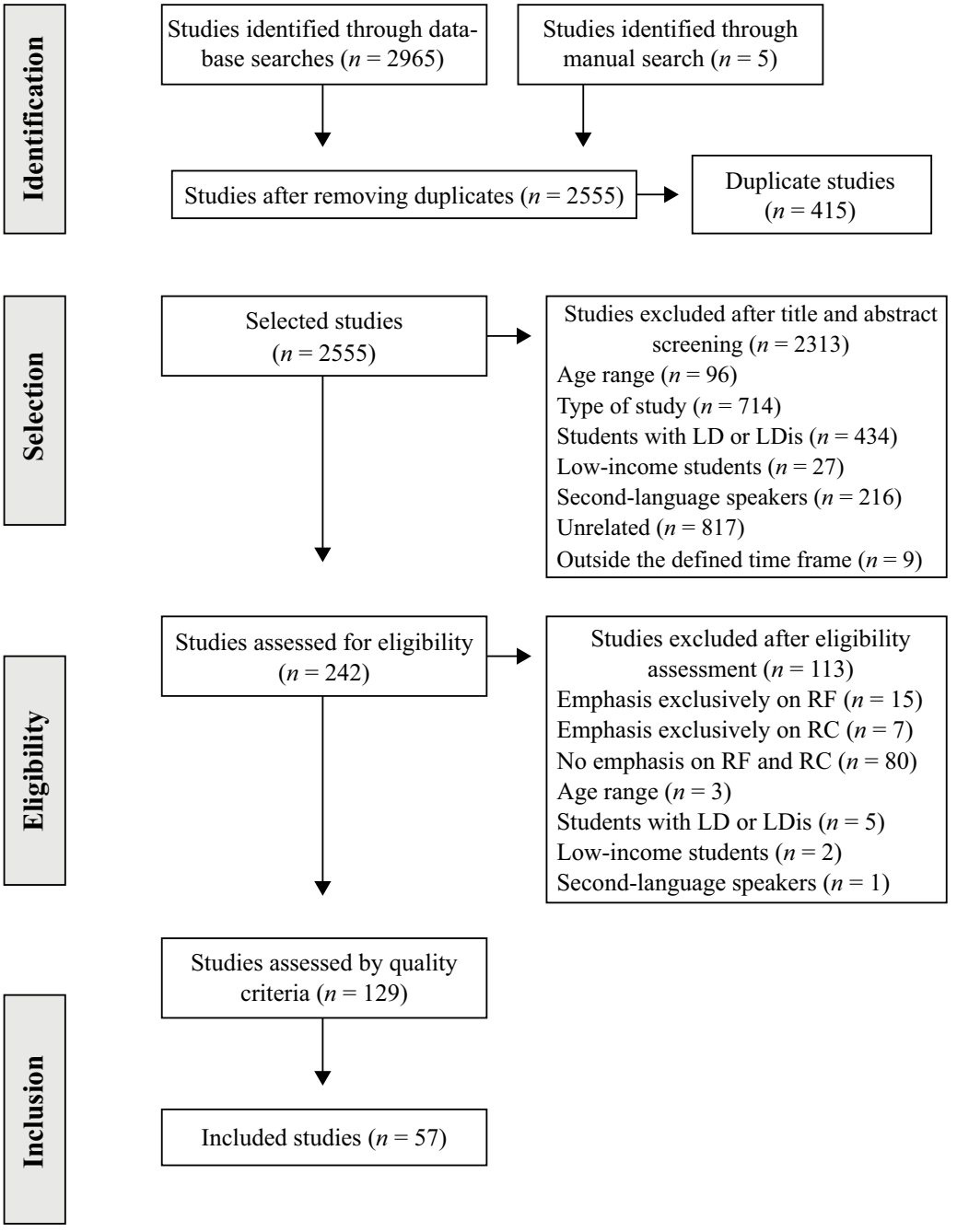
Results

In the first phase, identification, a total of 2,965 studies were retrieved from searches in the selected databases. Additionally, five studies were identified through manual searches in other sources, totaling 2,970 studies (Figure 1). Duplicate studies (n = 415) were removed using a reference manager. In the selection phase, the titles and abstracts of the remaining 2,555 studies were reviewed. Studies were excluded for the following reasons: outside the defined age range (n = 96); not empirical (e.g., theoretical, review papers, or other types) (n = 714); sample consisting of students with Learning Disabilities (LD) or Learning Disorders (LDis) (n = 434); sample consisting of low-income students (n = 27); or sample consisting of second-language speakers (n = 216). Studies unrelated to the topic (n = 817) and studies published outside the defined time frame (n = 9) were also excluded. In the eligibility phase, the titles, abstracts, and, briefly, the full texts of the remaining 242 studies were reviewed. At this stage, the inclusion and exclusion criteria were applied, leading to the removal of studies with emphasis exclusively on fluency (n = 15), exclusively on comprehension (n = 7), or lacked an emphasis on the relationship between fluency and comprehension (n = 80). Additional exclusions were made for studies outside the defined age range (n = 3), and those with samples including students with the following characteristics: LD or LDis (n = 5), low-income (n = 2), and second-language speakers

(n = 1). A total of 129 studies remained and underwent quality assessment based on the previously defined criteria. In the inclusion phase, 57 studies remained for full-text reading and qualitative synthesis (Figure 1). The final selection comprised studies published in English (n = 51), Portuguese (n = 5), and Spanish (n = 1).

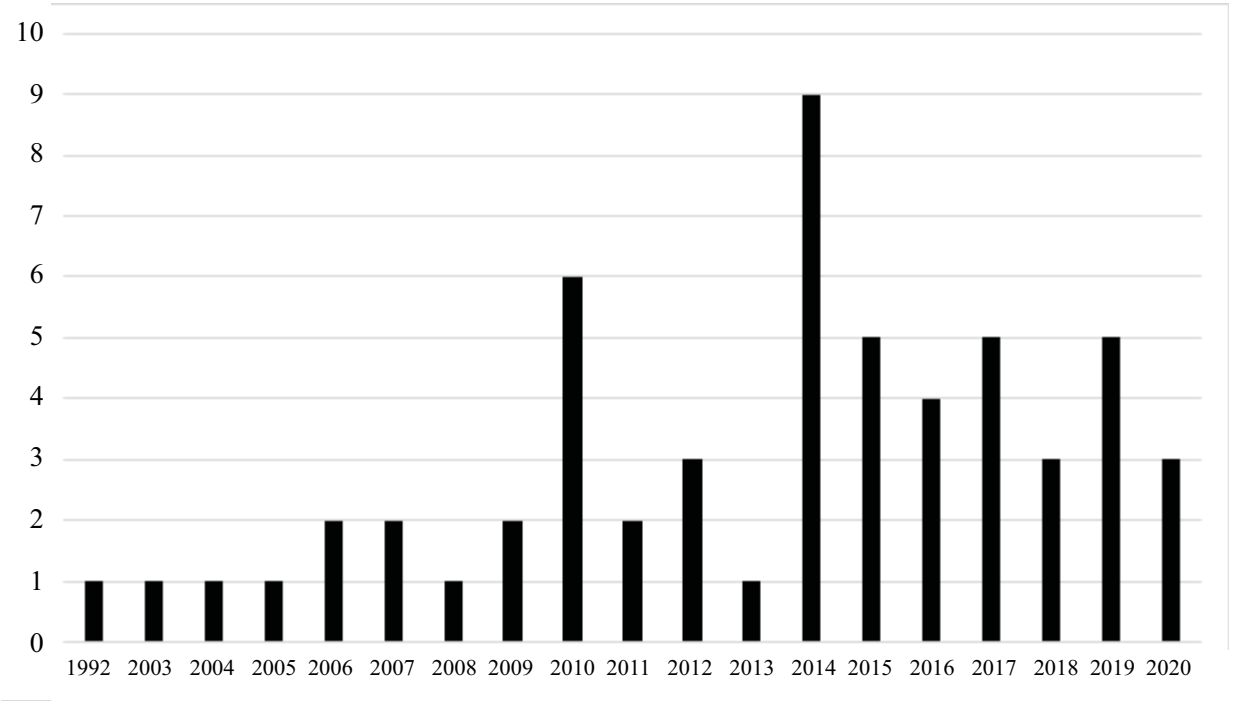
Figure 1

Prisma flow diagram with the phases of the systematic review



After the inclusion of the articles and full-text reading, information was extracted and summarized. A synthesis and complete reference list of the studies can be accessed via DOI (DOI 10.17605/OSF.IO/B6JXF). Regarding the publication years, the studies were published between 1992 and 2020, with the highest number of publications in 2014 (n = 9; 16%) and 2010 (n = 6; 11%) (Figure 2). In Brazil, the included studies were published between 2009 and 2020. In terms of journal distribution, the included studies appeared in 28 different journals, with Reading and Writing (n = 6, 11%) publishing the most, followed by the Journal of Research in Reading, Scientific Studies of Reading and Reading Research Quarterly, each with the same number of publications (n = 5; 9%).

Figure 2
Number of studies published per year

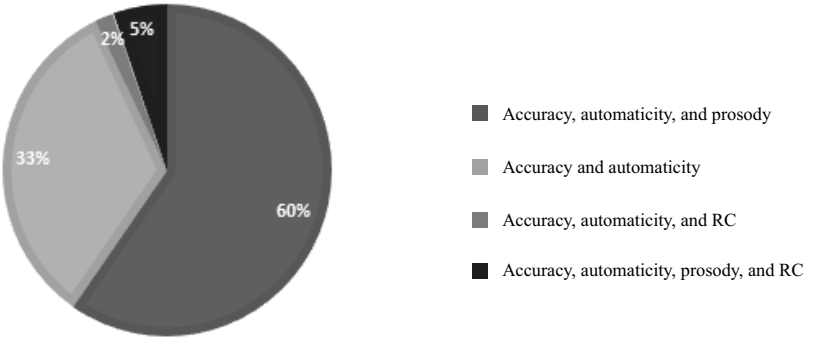


The articles were published in 14 different countries, with the United States having the highest number of studies (n = 28; 49%), followed by Brazil (n = 6; 10%), Portugal (n = 5; 9%), Turkey (n = 4; 7%), and Spain (n = 3; 5%). The Netherlands and Israel each had two published studies (3%), while Argentina, Canada, Chile, Greece, Italy, South Korea, and Norway each had one (2%). All Brazilian studies were conducted in the Southeast region, specifically in São Paulo (n = 3), Minas Gerais (n = 2), and Rio de Janeiro (n = 1).

The most frequently studied school grades were the 4th grade, assessed in 45% (n = 26) of the studies, and the 2nd grade of elementary education, assessed in 42% (n = 24). In Brazil, research also focused primarily on 2nd (n = 3) and 4th (n = 3) grades. The mean age of participants across the reviewed studies ranged from M = 6.7 to M = 15.6 years.

In response to the question, "What are the definitions of reading fluency in the literature regarding the emphasized components (accuracy, automaticity, and prosody)?", it was observed that most studies define the construct as comprising accuracy, automaticity, and prosody (n = 34; 60%). Some studies consider only accuracy and automaticity (n = 19; 33%), while 5% (n = 3) incorporate accuracy, automaticity, prosody, and reading comprehension, and 2% (n = 1) consider accuracy, automaticity, and reading comprehension (Figure 3). Among the six studies conducted in Brazil, half define fluency based on accuracy and automaticity (n = 3), while the other half include accuracy, automaticity, and prosody (n = 3).

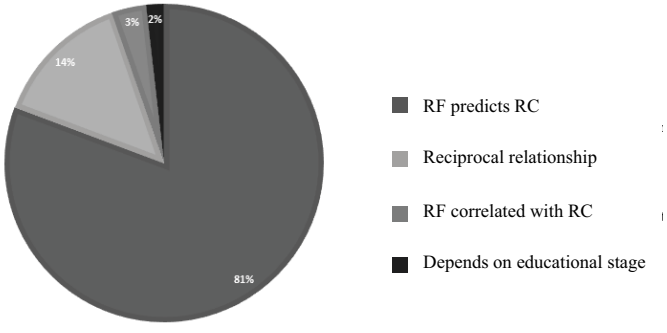
Figure 3
Percentage of reading fluency definition



Regarding the question, "What is the predominant direction in explaining the relationship between fluency and reading comprehension?", most studies indicate a unidirectional relationship, in which fluency predicts comprehension (n = 46; 81%). Some studies suggest a bidirectional relationship, where fluency and comprehension are reciprocally related (n = 8; 14%). In 3% of the studies (n = 2), no specific directionality is proposed, though a relationship between fluency and comprehension is acknowledged, while 2% (n = 1) argue that the direction of the relationship depends on the educational stage being assessed (Figure 4). Among the Brazilian studies, all conclude that fluency predicts comprehension (n = 6). Notably, the data on directionality of the relationship between fluency and reading comprehension were derived from the theoretical frameworks of the studies rather than from their empirical analyses. Regarding the statistical methods employed, 61% (n = 35) of the studies used correlation and regression analyses, 30% (n = 17) relied solely on correlation analyses, and 9% (n = 5) used only regression analyses. This finding suggests that, although many studies theoretically propose a specific direction for the relationship between fluency and comprehension, a significant portion (30%) depend exclusively on correlation analyses, which do not permit causal inferences.

Figure 4

Percentage of the direction of the relationship between fluency and reading comprehension



Regarding the question "How has fluency been assessed?", findings indicate that 88% (n = 50) of the studies evaluated oral reading fluency, 10% (n = 6) assessed both oral and silent reading fluency, and 2% (n = 1) measured only silent reading fluency. Among the studies assessing oral reading fluency, 53% (n = 30) of the studies employed standardized measures, with the fluency subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good et al., 2002) being the most frequently used instrument (n = 9). For silent reading fluency, 86% (n = 6) of the studies applied standardized measures, with the Test of Silent Reading Efficiency and Comprehension (TOSREC) (Wagner et al., 2010) being the most commonly used instrument (n = 2). In terms of assessment components, the majority (57%, n = 32) of studies evaluating oral reading fluency focused on accuracy and speed. For silent reading fluency, most studies (n = 5) used measures that assessed fluency and comprehension simultaneously. Additionally, 44% of the studies (n = 25) used sentences to assess both oral and silent reading fluency.

Regarding the studies published in Brazil (n = 6), most assessed oral reading fluency (n = 5) using informal research tasks. Only one study employed standardized instruments, including the Word-Pseudoword Reading Competence Test (Seabra & Capovilla, 2010). In terms of fluency components, Brazilian studies predominantly measured accuracy and speed (n = 3), based on text reading (n = 4) and word list reading (n = 2). In addition to these findings, the Impact Factor (IF) of each study was calculated following the methodology proposed by Nogues and Dorneles (2021). Google Scholar was used to identify the number of citations for each article, which was then divided by the time (in months) from the publication date to the search stage. The studies with the highest impact factors were Klauda and Guthrie (2008) (IF = 3.5) and Jenkins et al. (2003) (IF = 3.17), indicating that these were the most frequently cited and influential works included in this review.

Discussion

Considering the components emphasized in the definition of fluency, the qualitative synthesis revealed that most studies defined the construct as comprising accuracy, automaticity, and prosody (n = 34; 60%). This finding highlights that an increasing number of studies have demonstrated that these components are essential for reading fluency. In the study by Fernandes et al. (2018), accuracy (r = .34; p < .01), reading rate, i.e., the number of words read per minute, a measure of automaticity (r = .68; p < .01), and prosody (r = .45; p < .01) in the 2nd grade were correlated with reading comprehension in the 3rd grade of elementary school. Results from more recent studies included in this review also suggest the need for an integrated approach that considers all three components simultaneously (Yildirim et al., 2019). This perspective is particularly relevant for research, as it aligns with key

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international guidelines on reading instruction, such as those outlined by the National Reading Panel (2000).

It is worth noting, however, that a significant portion of the included studies defines fluency based only on accuracy and automaticity (n = 19; 33%), indicating that while the definition of fluency is increasingly expanding to encompass all three key components, many studies still exclude prosody. Kuhn et al. (2010) argue that prosody is the dimension of fluency that most clearly indicates whether a reader has understood a text, as the appropriate use of intonation, pauses, and other prosodic elements provides evidence of comprehension. Interestingly, a small subset of the included studies (n = 4; 7%) incorporate comprehension into their definitions. Valencia et al. (2010) point out that when fluency is simultaneously defined as accuracy, automaticity, prosody, and comprehension, the relationship between fluency and reading comprehension becomes even stronger. Basso et al. (2018) also highlight that, although controversial, incorporating comprehension into fluency assessment instruments provides a more comprehensive evaluation of the construct. Therefore, it is essential to consider not only fluent reading, characterized by accuracy, automaticity, and prosody, but also the reader's comprehension of the text.

Regarding the predominant direction in the relationship between fluency and comprehension, most studies support a unidirectional perspective, in which fluency predicts comprehension (n = 46; 81%). Among the studies that conducted regression analyses, notable findings emerged despite differences in instruments, techniques, and age groups. For instance, Bizama Muñoz et al. (2019) found that fluency, assessed as automaticity and accuracy, accounted for 21% of the variance in reading comprehension in the 3rd grade of elementary school. Similarly, Yildirim et al. (2019) reported that accuracy, speed, and prosody together explained 63% of the variance in narrative text comprehension in the 7th grade of elementary school.

It is worth noting that although the unidirectional relationship between fluency and comprehension was the most common explanation in the studies, Klauda and Guthrie (2008) argued that this perspective required further discussion. They highlighted existing evidence suggesting that fluency not only contributes to comprehension but is also shaped by it, characterizing a reciprocal causal relationship. Moreover, they noted that this view has been supported by reading professionals and researchers. In the present review, 14% (n = 8) of the studies considered this relationship. Some authors suggest that the inclusion of prosody in fluency definitions implies this perspective (Meggiato et al., 2021). Kuhn and Stahl (2003) propose that reading with prosody supports text comprehension but also argue that a certain level of comprehension is necessary for the reader to incorporate prosodic elements into reading. In the study by Veenendaal et al. (2016), after testing unidirectional statistical models, the bidirectional model between prosody and comprehension showed the best fit, with prosody explaining 65% of the variance in comprehension and comprehension accounting for 76% of the variance in prosodic reading in 6th grade. Additionally, researchers describe fluency as a bridge between word recognition and text comprehension, with prosody playing a crucial role in linking decoding to comprehension (Rasinski, 2012). Notably, among the studies that considered a reciprocal relationship between fluency and comprehension (14%, n = 8), a significant portion included prosody as a component in the definition of fluency and incorporated comprehension measures in fluency assessment.

Regarding the directionality of the relationship between fluency and reading comprehension, some studies acknowledge that these skills are correlated but do not clearly define the direction of this relationship due to its complexity (Kocaarslan, 2019). One study even suggests that the direction of this relationship depends on the educational stage (Fernandes et al., 2018). This consideration is important, as researchers indicate that the relationship between fluency and comprehension tends to be stronger in the early stages of reading development, when students are still acquiring decoding and automaticity skills. In later stages, as these skills become more refined, the focus shifts to comprehension. For example, Valencia et al. (2010) found that accuracy and reading rate lose their predictive power over comprehension as reading skills become more sophisticated and texts become more complex. According to the authors, speed and accuracy are expected to play a greater role in comprehension during the early stages of reading. Valencia et al. (2010) also observed trends suggesting that the contribution of prosody increases across all educational stages analyzed, while the contribution of accuracy declines between the 4th and 6th grades. In other words, as fluency develops, readers rely less on accuracy and automaticity and more on prosody. Thus, understanding that prosody is essential for reading comprehension but, as argued by Kuhn and Stahl (2003), also requires a certain level of comprehension to be effectively used, it is expected that the relationship between fluency and comprehension evolves over time. This relationship may be more unidirectional in the early grades, where accuracy and automaticity are crucial for comprehension, and more bidirectional in later stages, where prosody and comprehension become reciprocally related (Meggiato et al., 2021).

Regarding the assessment of this skill, most studies (88%; n = 50) focused exclusively on oral reading fluency, while fewer studies (12%; n = 7) examined silent reading fluency. Gentilini et al. (2020) argue that oral reading is more frequently used because it allows for the assessment of all fluency components, particularly prosody. However, Paige et al. (2014) note that while prosody is typically associated with oral reading, evidence from eye-tracking studies suggests that prosodic information is also processed during silent reading. These assessments, which measure pauses and regressions in eye movements, highlight the role of prosody in comprehension in both oral and silent reading (Paige et al., 2014; Spinillo et al., 2021). Furthermore, as students advance in school and their reading skills develop, they increasingly engage in silent rather than oral

reading, underscoring the importance of employing diverse reading assessments methods (Valencia et al., 2010).

It is also important to note that, according to Klauda and Guthrie (2008), different fluency measures (word, sentence, text) are associated with comprehension in distinct ways and at different educational stages. For instance, word-level fluency tends to correlate with comprehension in the early grades, 1st to 3rd, whereas sentence- or text-level fluency may be more strongly linked to comprehension in intermediate grades, 4th to 6th (Klauda & Guthrie, 2008). In this review, a substantial portion of the studies (35%) assessed fluency through sentence reading, with the most common metric being the number of correctly read words per minute (72%). However, Jenkins et al. (2003) emphasize the importance of using texts in fluency assessments, as words are typically read more quickly in context than in isolation (e.g., word lists). According to the authors, fluency and comprehension exhibit a stronger correlation when fluency is measured through text reading (Jenkins et al., 2003).

Considering the fluency components assessed, most studies measured only accuracy and speed (58%). This finding appears controversial, given that the majority defined the construct as comprising accuracy, automaticity, and prosody (60%). In other words, although most studies recognize the importance of accuracy, automaticity, and prosody in defining fluency, reading prosody remains a neglected component in assessment. Authors suggest that prosody is a challenging component to quantify, as it requires recording oral reading and qualitatively analyzing pauses, intonation, and reading fluidity (Basso et al., 2018), making the assessment process more complex. In the literature, instruments for fluency evaluation remain scarce, and those specifically designed to measure prosody are even rarer. However, there is no doubt that assessments incorporating multiple measures of oral reading fluency offer a more comprehensive understanding of the construct, serving as more accurate indicators of overall text comprehension (Valencia et al., 2010).

Regarding how fluency has been defined, assessed, and related to comprehension in Brazilian research, it was found that studies published in Brazil (n = 6) were concentrated in the Southeast region of the country. Similar to other studies, the most frequently assessed age groups were 2nd and 4th grades of elementary school. Additionally, about fluency definitions and the emphasized components, half of the studies considered accuracy and automaticity (n = 3), while the other half also included prosody. Concerning the direction of the relationship between the investigated skills, all studies considered fluency as a predictor of comprehension, focusing on the early years of education. Based on the instruments used in each study's methodology, most studies assessed oral reading fluency (n = 5), with the majority also employing informal research tasks (n = 4). As for the fluency components evaluated, half of the studies measured accuracy and speed (n = 3). These findings indicate that, although still in its early stages and geographically limited, research on fluency in Brazil has been advancing. Notably, recent studies on the topic can be found in the literature (Gentilini et al., 2020; Martins & Capellini, 2019). Additionally, these investigations share similarities with other international studies included in this review, such as the age range considered in assessments. Brazilian research still faces challenges in refining fluency definitions and exploring its relationship with comprehension. Half of the studies analyzed considered only accuracy and automaticity, reinforcing the idea that fluency is a predictor of comprehension. Nonetheless, as previously mentioned, other components, such as prosody, are essential for reading fluency (Rasinski, 2012), and there are different ways to conceptualize the relationship between fluency and comprehension. Some studies, for instance, emphasized that this relationship depends on the age group assessed (Fernandes et al., 2018; Meggiato et al., 2021). Regarding the assessment of the construct, Brazilian research also needs to advance in terms of the type of reading evaluated, the components considered, and, especially, the use of standardized measurement instruments, as informal tasks were predominantly used. Unfortunately, there is still a scarcity of standardized and norm-referenced instruments that comprehensively assess fluency and are published in the country (Basso et al., 2018).

As some final considerations, the findings of this systematic literature review suggest that, despite progress in fluency research, considerable variability remains in how the topic is addressed. A significant portion of studies defines fluency in terms of accuracy, automaticity, and prosody; however, prosody remains largely neglected in assessments. It is also evident that reading fluency is assessed exclusively in oral reading, while silent reading fluency, which is more challenging to quantify, tends to be overlooked. Thus, both internationally and in Brazil, further advancements are needed in defining fluency and understanding its relationship with comprehension. This progress is essential, as the conceptualization of fluency directly impacts how this skill is taught in schools. In Brazil, national assessments indicate low reading proficiency levels in the early years of primary education, highlighting gaps in the instruction of both fluency and comprehension (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira [INEP], 2023).

The development and dissemination of standardized instruments capable of measuring the construct with greater precision are also necessary. Assessments should encompass all fluency components (accuracy, automaticity, and prosody), while also considering how factors such as reading modality (oral or silent), material type (word, sentence, or text), and age group influence results and shape the relationship between fluency and comprehension. Expanding the availability of assessment instruments is urgent, as Brazil currently has only one standardized and norm-referenced evaluation that comprehensively measures fluency, incorporating all key components (Basso et al., 2019). Notably, this instrument also integrates a comprehension measure into textual reading assessments, setting it apart from other available evaluations.

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Beyond its relevance to cognitive psychology research, this study also has important educational and clinical implications. A deeper understanding of the fluency construct and its relationship with comprehension can enhance teaching practices through specific and appropriate interventions. Although the studies reviewed here present diverse findings, certain points of consensus emerge, offering insights for fluency instruction. Specifically, fluency instruction should: (1) include interventions in reading prosody rather than focusing solely on automaticity and accuracy; (2) emphasize reading comprehension, given that fluency and comprehension are interrelated skills; (3) incorporate oral and silent reading, as both influence comprehension (Meggiato et al., 2021); and (4) promote diverse reading activities, including words, sentences, and texts, since each plays a distinct role depending on the reader's age. Thus, in addition to examining the current state of scientific production on the relationship between fluency and comprehension, this study also identified gaps and limitations in the field, providing a foundation for further investigations and advancements. Moreover, this study is particularly relevant as, to date, no systematic reviews on this topic have been published in Brazil, making a valuable contribution to research in the area.

As a limitation, it is important to mention the need to adapt the PRISMA recommendations, as no specific guidelines exist for conducting systematic reviews in the field of education. Nevertheless, all fundamental steps of this research methodology were rigorously followed. Additionally, conducting a meta-analysis would have complemented the findings; however, the heterogeneity of the included studies made this procedure unfeasible. Lastly, it is also worth highlighting the need for future research to update the findings of the present review.

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