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Syntactic Awareness and Reading Comprehension: A Systematic Review of Cross-Linguistic Transfer

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ABSTRACT

Syntactic awareness or the ability to reflect on and manipulate grammatical structures is a key component of reading comprehension. While individual studies show that syntactic awareness may support cross-language reading comprehension, prior literature reviews have not examined syntactic awareness as a distinct construct, leaving unclear how syntactic transfer varies across language pairs, learner profiles, and instructional contexts. A systematic literature review is therefore needed to clarify the extent and nature of this transfer in varied contexts. This article presents a systematic literature review synthesizing empirical evidence from 2015 to 2025 on how syntactic awareness transfers across languages to influence reading comprehension. Guided by PRISMA protocols, a total of 953 studies were selected from three databases, namely, ProQuest, Web of Science, and ERIC, and only 23 peer-reviewed studies were systematically reviewed regarding their research designs, participant demographics, language pairings, and methodological limitations. This review finds that current research is largely cross-sectional, using regression or structural equation modeling (SEM) with varied syntactic awareness and reading measures, and is dominated by studies on primary immersion learners and a narrow set of language pairings. Although previous research has produced mixed findings, this review finds overall support for the positive role of syntactic awareness transfer in reading comprehension across languages. However, this relationship is influenced by factors such as vocabulary and word reading. The review recommends the adoption of more longitudinal, experimental, and mixed-methods research designs, along with greater inclusion of adult participants and linguistically diverse populations. It also emphasizes the need to validate bilingual syntactic awareness instruments in order to deepen the understanding of syntactic awareness transfer in reading comprehension.

Keywords: Syntactic Awareness; Reading Comprehension; Cross-Linguistic Transfer; Additional Language Reading; Systematic Review

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INTRODUCTION

Reading comprehension involves the extraction and integration of meaning from written texts and is a central skill in academic development (Snow, 2002). In multi-language contexts, it is a multifaceted process influenced by linguistic knowledge, cognitive resources, and the learner's existing language repertoire (Friesen & Frid, 2021). One of the most crucial yet understudied components in the domain of reading comprehension research is syntactic awareness, which is defined as the ability to consciously recognize, reflect on, and manipulate grammatical structures (Gombert, 1992). It facilitates sentence parsing, disambiguation, and information integration, all of which are essential for successful reading comprehension (Brimo, Lund, & Sapp, 2018; Tong & Deacon, 2025; Zipke, 2007).

While the role of syntactic awareness has been well documented in monolingual reading development, its cross-linguistic applicability in bilingual and multilingual contexts remains less clearly established (Siu & Ho, 2020). Clarifying this applicability is particularly important for understanding cross-linguistic transfer, the process by which individuals draw upon linguistic knowledge, skills, or features from one language to support or hinder the acquisition or use of another language (Jarvis & Pavlenko, 2008). Such transfer may occur at various linguistic levels, such as phonological, lexical and syntactic, and it can either support or interfere with subsequent language acquisition. Given that cross-linguistic transfer plays a crucial role in multilingual reading development (Kim & Piper 2019) and the centrality of syntactic processing to reading comprehension, clarifying the transferability of syntactic processing across languages is essential for advancing theoretical models of multilingual reading comprehension and informing pedagogical approaches to multilingual reading instruction.

Theoretically, several models substantiate the claim that syntactic skills can influence reading comprehension across languages. The Reading Systems Framework (Perfetti & Stafura, 2014) posits that reading comprehension is supported by the integration of three core knowledge systems: linguistic, orthographic, and general world knowledge. Within this framework, syntax is situated as a crucial component of the linguistic system and the lexicon, playing a central role in the comprehension of written texts. Syntax facilitates sentence parsing and the construction of propositional meaning, both essential for extracting meaning from print (Perfetti & Stafura, 2014). This framework thus provides a robust foundation for understanding the role of syntax in reading comprehension. From a multilingual perspective, Cummins's Common Underlying Proficiency theory (1979) proposes that multiple languages share a common cognitive linguistic foundation. Learners who develop strong linguistic abilities in their first language (L1) can transfer those skills to support later-learned language development and reading proficiency (Swain & Lapkin, 1995), including competencies such as syntactic awareness. Together, these models underscore the potential for syntactic knowledge acquired in one language to facilitate reading comprehension in another, particularly when cognitive and structural similarities exist between the languages. Figure 1 illustrates a conceptual model of the relationship between syntactic awareness and reading comprehension.

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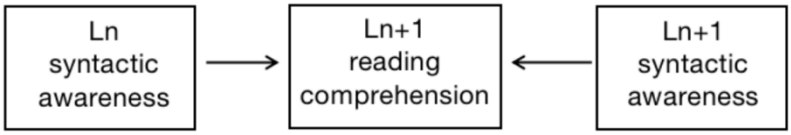

FIGURE 1. The conceptual model illustrating the relationship between syntactic awareness and reading comprehension (Ln = the nth language)

Despite this theoretical foundation, empirical findings on syntactic transfer in reading remain inconsistent. Some studies report significant positive associations between L1 syntactic awareness and L2 reading outcomes (e.g. Siu & Ho, 2020; Spies et al., 2018), while others find null or weak effects (Sohail et al., 2022; Tong et al., 2022). The Linguistic Proximity Model (Westergaard et al., 2022) offers one possible explanation, suggesting that the extent of structural similarity between languages such as in word order, morphological marking, and syntactic constructions, modulates the ease and likelihood of transfer. When languages are structurally closer, syntactic awareness developed in one language is more readily applied to another; when they are more distant, transfer may be less direct and require explicit instructional support. Moreover, the variations of the research results may stem from methodological differences, learner characteristics, or inconsistencies in assessment tools. Compared to research on phonological or vocabulary transfer, the role of syntax in cross-linguistic reading remains under-explored (Siu & Ho, 2020; Tong et al., 2022).

Although prior reviews have advanced understanding of cross-linguistic influences on reading, none have offered a focused synthesis of syntactic transfer to reading comprehension in bilingual or multilingual contexts. A set of influential reviews, including Melby-Lervåg and Lervåg (2011), Yang, Cooc, and Sheng (2017), and Chung, Chen, and Geva (2019), has documented cross-language relations or proposed broader transfer frameworks, yet all three center primarily on phonology, morphology, decoding, vocabulary, or general metalinguistic processes rather than treating syntactic awareness as an independent domain. Similarly, Jeon and Yamashita (2014) examine linguistic correlates of L2 reading comprehension, but grammar is treated as a broad composite, leaving syntactic transfer effects unexamined. More recent work by Tong, Yu, and Deacon (2024) focuses on within-language relations between syntactic awareness and reading comprehension for L1 English and L1 Chinese readers and thus provides no cross-linguistic analysis of syntactic transfer. Collectively, these reviews are constrained by narrow language coverage, the absence of cross-linguistic syntactic analyses, or an emphasis on domains other than syntax.

To date, no systematic review has encompassed studies conducted across diverse bilingual and multilingual contexts, irrespective of whether English is involved, to provide a comprehensive synthesis of cross-linguistic syntactic transfer to reading comprehension across language typologies. Consequently, there is a pressing need for a comprehensive systematic review to resolve these inconsistencies, standardize methodologies, and inform both theoretical development and evidence-based instructional practices in multilingual reading contexts.

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THE PRESENT STUDY

This study addresses the aforementioned gap by conducting a systematic literature review (SLR) of empirical studies published between 2015 and 2025 on the cross-linguistic transfer of syntactic awareness and its role in reading comprehension. In doing so, the review aims: 1) to map emerging research trends, including common research designs, participant profiles, analytical approaches, language pairings and so on, while evaluating the methodological strengths and limitations of the existing literature, 2) to synthesize and clarify the extent and nature of cross-linguistic syntactic transfer to reading comprehension across diverse language contexts, and 3) to identify research gaps and limitations and propose directions for future investigation.

The following research questions guide this review:

1. What characterizes the methodological landscape of current empirical research on syntactic awareness transfer to reading comprehension, specifically in terms of research designs, analytical approaches, and participant characteristics?
2. Which language pairs have been most extensively studied, and which remain underexplored?
3. What is the nature of the relationship between syntactic awareness and reading comprehension across languages?
4. What methodological limitations and research gaps are evident across studies?

METHOD

This review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) to ensure methodological transparency, reliability, and replicability. The search was limited to empirical studies published between 2015 and 2025. The 10-year window was selected to capture the most recent decade of research, reflecting substantial theoretical and methodological developments in the study of syntactic processing within multilingual reading contexts. Notably, since 2015 there has been a marked increase in empirical investigations adopting more sophisticated statistical models (e.g., SEM, multilevel modeling) and incorporating cross-linguistic perspectives. Focusing on this period ensures the synthesis reflects current conceptual frameworks, measurement approaches, and pedagogical implications, while avoiding the methodological inconsistencies and outdated theoretical assumptions prevalent in earlier work.

DATABASES AND SEARCH STRATEGY

The selection of databases was guided by the need for comprehensive, high-quality coverage across the intersecting domains of psychology, linguistics and education. ProQuest was included due to its extensive repository of doctoral dissertations, theses, and peer-reviewed journal articles, thereby capturing both published and grey literature critical to synthesizing empirical findings. Web of Science was selected for its rigorous curation of high-impact, multidisciplinary research, ensuring access to methodologically robust and frequently cited studies across relevant fields.

ERIC (Education Resources Information Center) was chosen as a field-specific database that offers authoritative access to educational research, encompassing peer-reviewed articles, policy documents, and practitioner resources central to the study of language and literacy

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development. Collectively, these databases provide a robust foundation for a systematic and interdisciplinary literature review.

Scopus was not included because its coverage largely overlaps with Web of Science, ProQuest and ERIC. Preliminary scoping searches suggested that it did not yield additional unique studies relevant to our literature review. Its exclusion prevented duplication while maintaining a transparent and comprehensive search strategy.

The search string applied in these three databases included combinations of the following keywords using Boolean operators: ("syntactic awareness" OR "syntactic skill*" OR "syntactic knowledge" OR syntax OR grammar) AND ("reading comprehension" OR "sentence processing" OR "language processing" OR reading) AND ("cross-linguistic transfer" OR "cross-language transfer" OR transfer OR relation*).

INCLUSION AND EXCLUSION CRITERIA

To ensure the relevance and quality of selected studies, the following inclusion and exclusion criteria, shown in Table 1, were applied:

TABLE 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Peer-reviewed or academically examined doctoral/master's theses and dissertations	Non-peer-reviewed and non–examined grey literature
Explicit focus on syntactic awareness and multilingual reading	Studies on phonological, lexical, or semantic variables only
Studies published between 2015 and 2025, and written in English	Studies published before 2015 or written in other languages
Empirical studies	Opinion-based or literature review articles

SCREENING AND SELECTION PROCESS

Following PRISMA's four-stage procedure (identification, screening, eligibility, inclusion), an initial pool of 953 articles was retrieved from the three academic databases: ERIC (n = 105), Web of Science (n = 563), and ProQuest (n = 285). After removing duplicates, 768 unique records remained. These records were then screened by title and abstract, reducing the pool to a smaller subset for full-text review. A total of 58 articles were examined in full, of which 23 studies met all inclusion criteria and were included in the final synthesis.

A flow diagram of the selection process is presented in Figure 2.

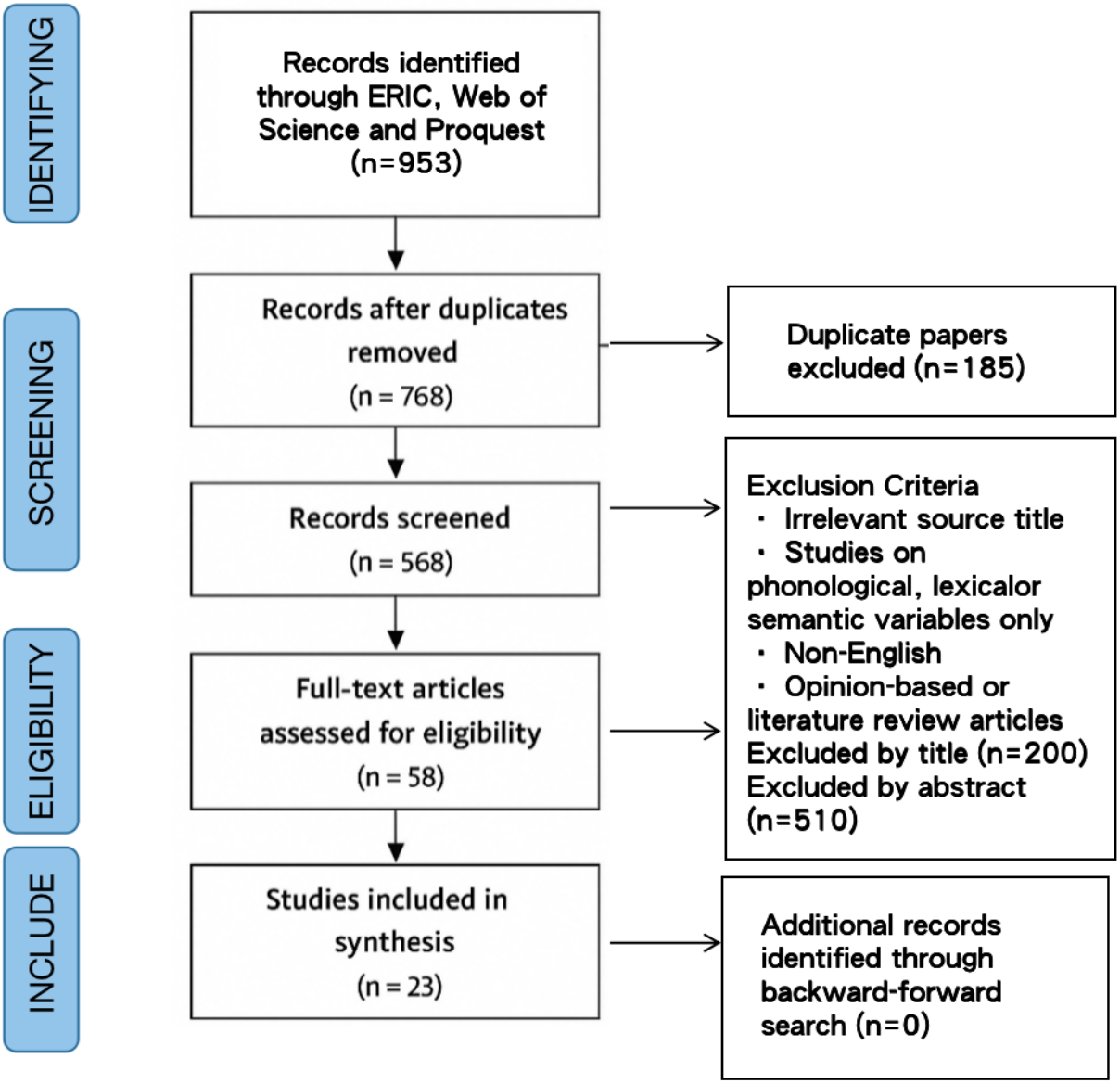

FIGURE 2. A flow diagram of the screening and selection process

DATA EXTRACTION AND ANALYSIS

A thematic content analysis approach was employed to analyze the selected studies. Themes were developed both deductively (based on the research questions) and inductively (emerging from the literature). Coding was performed manually and organized into categories aligned with each of the five research questions. Patterns, contradictions, and recurring themes were identified and documented across articles. To enhance reliability, the coded themes were independently reviewed by a second researcher, who examined the coding for consistency, suggested refinements, and resolved any discrepancies through discussion with the primary coder.

Data from each selected article was extracted using a structured coding form. Information such as research design, analytical method, participant demographics and language pairings was recorded. This systematic extraction enabled the creation of theme-code matrices and the visualization of cross-study patterns. The synthesis results were then organized around the five research questions to guide reporting and interpretation.

RESULTS

This section presents the thematic synthesis of findings derived from 23 empirical studies on the cross-linguistic transfer of syntactic awareness in reading comprehension.

RESEARCH DESIGNS, ANALYTICAL METHODS, ASSESSMENT INSTRUMENTS AND PARTICIPANT CHARACTERISTICS

In recent years, empirical research examining the cross-linguistic transfer of syntactic awareness in reading comprehension has predominantly utilized cross-sectional research designs (*n*=18) (e.g., Baoqi et al., 2020; Chrabaszcz et al., 2022), with limited but notable inclusion of longitudinal approaches (*n*=3) (i.e., Proctor et al., 2017; Siu & Ho, 2020; Spies et al., 2018). Experimental and quasi-experimental designs were rare (*n*=2), with only one evaluating the causal effects of instructional interventions targeting syntactic skills (Altmisdort, 2016; Lam et al., 2015).

From an analytical standpoint, regression analysis (*n*=11) and structural equation modelling (SEM) (*n*=8) emerged as the most used statistical tools for identifying syntactic transfer patterns (e.g., Cueva et al., 2022; Proctor et al., 2017), which enabled the identification of predictors and the modelling of relationships among variables. Ten studies used mediation analysis to investigate indirect effects.

When it comes to assessment instruments, reading comprehension was typically assessed using standardized tests (*n*=17) or researcher-developed tests (*n*=16), while syntactic awareness was predominantly measured through researcher-developed grammatical judgment (*n*=4), word order (*n*=8), and syntactic correction tasks (*n*=8). However, considerable variability in instrument choice across studies limits the comparability of findings. Notably, all the instruments were designed for monolingual contexts, with no bilingual tools yet developed for this field.

Participant characteristics critically influence findings and generalizability in syntactic awareness transfer research. The majority of studies (*n*=18) have concentrated on primary-level learners, reflecting the assumption that early exposure is key to literacy development, though this focus may limit understanding of older populations.

In contrast, adult learners, particularly those in higher education, are underrepresented in current research. The four studies in this review (Altmisdort, 2016; Chrabaszcz et al., 2022; Liu, 2022; Tiffin-Richards, 2024) suggest that adults engage in more strategic and reflective syntactic processing, especially in tasks involving grammatical judgment or word order manipulation. These learners also exhibit greater cognitive control in cross-linguistic syntactic transfer. The limited inclusion of tertiary-level, vocational college, and continuing education students highlights a significant gap in understanding how cognitive maturity influences syntactic transfer.

Beyond age, participant educational contexts were predominantly situated in mainstream foreign language programs, where the L2 was taught as a discrete subject (e.g., Siu & Ho, 2015; Tong et al., 2022), particularly in regions such as Hong Kong, Singapore and Mainland China. In contrast, a substantial body of research also examined learners in formal bilingual and immersion

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programs, especially in the United States (e.g., Spanish–English) and Canada (e.g., French immersion), where the L2 functioned as the primary medium of instruction (e.g., Burchell et al., 2023; Kremin et al., 2019).

While mainstream foreign language classrooms, immersion and bilingual education contexts were well represented, heritage learners and students with disabilities appeared in only a few studies (e.g., Chrabaszcz et al., 2022; Liu, 2022), highlighting a lack of demographic and instructional diversity in the current research base.

Table 2 summarizes the key findings related to research designs, analytical approaches, instruments and participants characteristics.

TABLE 2. Key findings related to research question 1

Theme	Code	References
Research Designs	Cross-sectional	Baoqi et al. (2020); Burchell (2019); Burchell et al. (2023); Chrabaszcz et al. (2022); Cueva et al. (2022); Kremin et al. (2019); Liu (2022); Rosenstein et al. (2020); Sohail (2015); Sohail (2022); Sohail et al. (2022a); Sohail et al. (2022b); Siu & Ho (2015); Tiffin-Richards (2024); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)
	Longitudinal	Carrey Siu & Ho (2020); Proctor et al. (2017); Spies et al. (2018)
	Experimental	Altmisdort (2016); Lam et al. (2015)
Analytical Approaches	Regression	Burchell et al. (2023); Chrabaszcz et al. (2022); Cueva et al. (2022); Kremin et al. (2019); Liu (2022); Sohail et al. (2022a); Sohail et al. (2022b); Tiffin-Richards (2024); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)
	SEM	Baoqi et al. (2020); Burchell (2019); Carrey Siu & Ho (2020); Proctor et al. (2017); Sohail (2015); Siu & Ho (2015); Spies et al. (2018); Tong, Kwan et al. (2022)
	Correlational analysis	Burchell et al. (2023); Lam et al. (2015); Liu (2022); Rosenstein et al. (2020); Sohail et al. (2022a); Sohail et al. (2022b); Tong, Deng & Xiuli Tong (2023)
	Mediation analysis	Baoqi et al. (2020); Burchell (2019); Burchell et al. (2023); Carrey Siu & Ho (2020); Sohail (2015); Sohail (2022); Siu & Ho (2015); Spies et al. (2018); Tong, Kwan et al. (2022); Tong, Deng & Xiuli Tong (2023)
	Moderation analysis	Zhao et al. (2025)
Syntactic awareness Instruments	Grammatical judgment tasks	Cueva et al. (2022); Lam et al. (2015); Rosenstein et al. (2020); Tiffin-Richards (2024)
	Grammatical error correction tasks	Baoqi et al. (2020); Carrey Siu & Ho (2020); Sohail (2015); Sohail (2022); Sohail et al. (2022a); Sohail et al. (2022b); Spies et al. (2018); Zhao et al. (2025)
	grammatical multiple-choice question tasks	Altmisdort (2016); Liu (2022)
	Word structure tests	Kremin et al. (2019)
	Sentence formulation tasks	Proctor et al. (2017)
	Word order tasks	Burchell (2019); Burchell et al. (2023); Carrey Siu & Ho (2020); Chrabaszcz et al. (2022); Siu & Ho (2015); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023)

Reading Comprehension Measures	Standardized measures	Altmisdort (2016); Baoqi et al. (2020); Burchell (2019); Cueva et al. (2022); Kremin et al. (2019); Lam et al. (2015); Liu (2022); Spies et al. (2018); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)
	Adopted measures	Sohail (2015); Sohail (2022); Sohail et al. (2022a); Sohail et al. (2022b); Tong, Deng & Xiuli Tong (2023)
	Self-developed measures	Burchell et al. (2023); Carrey Siu & Ho (2020); Chrabaszcz et al. (2022); Cueva et al. (2022); Lam et al. (2015); Liu (2022); Proctor et al. (2017); Rosenstein et al. (2020); Sohail et al. (2022a); Sohail et al. (2022b); Siu & Ho (2015); Tiffin-Richards (2024); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022)
Age and Stage	Kindergarten learners	Lam et al. (2015)
	Primary school learners	Baoqi et al. (2020); Burchell (2019); Burchell et al. (2023); Carrey Siu & Ho (2020); Cueva et al. (2022); Kremin et al. (2019); Lam et al. (2015); Liu (2022); Proctor et al. (2017); Sohail (2015); Sohail (2022); Sohail et al. (2022a); Sohail et al. (2022b); Siu & Ho (2015); Spies et al. (2018); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023)
	Middle or high school learners	Liu (2022); Rosenstein et al. (2020); Zhao et al. (2025)
	Adult Learners	Altmisdort (2016); Chrabaszcz et al. (2022); Cueva et al. (2022); Liu (2022); Rosenstein et al. (2020); Tiffin-Richards (2024)
Educational Context	Bilingual programs	Baoqi et al. (2020); Cueva et al. (2022); Lam et al. (2015); Spies et al. (2018)
	Immersion programs	Burchell (2019); Burchell et al. (2023); Sohail (2015); Sohail (2022); Sohail et al. (2022a); Sohail et al. (2022b)
	subject-based foreign language instruction program	Altmisdort (2016); Baoqi et al. (2020); Carrey Siu & Ho (2020); Rosenstein et al. (2020); Siu & Ho (2015); Tiffin-Richards (2024); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)
	Deaf educational program	Liu (2022)
Participant Diversity	Heritage learner	Chrabaszcz et al. (2022); Lam et al. (2015)
	Deaf learner	Liu (2022)

DOMINANT AND UNDERREPRESENTED LANGUAGE PAIRINGS

A key theme in the literature is the distribution of language pairings examined in syntactic awareness and reading comprehension transfer. Notably, Chinese-English, English-French and Spanish–English pairings have received the most attention in the past decade. These combinations are frequently selected due to their relevance in bilingual education research and the large populations of bilingual learners in countries such as China. Research on Chinese-English bilinguals consistently demonstrates that L1 syntactic awareness, which is predominantly assessed by word order sensitivity and morphosyntactic awareness instruments, facilitates L2 reading comprehension (e.g., Siu & Ho, 2020; Siu & Ho, 2015; Tong et al., 2022, 2023). Research on English-French bilinguals, primarily conducted in immersion settings, consistently demonstrates that syntactic awareness developed in one language can support reading comprehension in the

other, with strong within-language associations and emerging cross-language effects (e.g., Burchell, 2019; Sohail, 2015). Research on Spanish–English transfer demonstrates that syntactic congruence, particularly in word order and inflectional morphology, facilitates positive cross-linguistic effects on reading comprehension. These findings highlight how shared syntactic structures enable Spanish–English bilinguals to apply L1 metalinguistic strategies effectively in L2 reading, supporting their literacy development. (e.g., Cueva et al., 2022; Kremin et al., 2019; Proctor et al., 2017).

In contrast, language combinations beyond these dominant pairs, such as Russian-English, Hebrew-English, Turkish-English and Mandarin–Taiwanese Sign Language, are seldom addressed (i.e. Chrabaszcz et al., 2022; Rosenstein et al., 2020; Liu, 2022), despite offering rich potential for understanding syntactic transfer in typologically distant languages. Table 3 presents the dominant and underrepresented language pairings concerning RQ2.

TABLE 3. Key findings related to research question 2

Theme	Code	References
Dominant Language Pairs	Chinese–English	Baoqi et al. (2020); Carrey Siu & Ho (2020); Lam et al. (2015); Siu & Ho (2015); Tong, Kwan et al. (2022); Tong, Deng & Tong (2022); Tong, Deng & Tong (2023)
	Spanish–English	Altmisdort (2016); Cueva et al. (2022); Kremin et al. (2019); Proctor et al. (2017); Spies et al. (2018)
	English-French	Burchell (2019); Sohail (2015); Sohail (2022a); Sohail et al. (2022b); Sohail et al. (2022c)
Underrepresented Language Pairings	Russian–English	Chrabaszcz et al. (2022)
	Russian-Estonian	Chrabaszcz et al. (2022)
	Turkish-English	Altmisdort, (2016)
	Hebrew-English	Rosenstein et al. (2019)
	German-English	Tiffin-Richards (2024)
	Mandarin–Taiwanese Sign Language (TSL)	Liu (2022)

CROSS-LINGUISTIC RELATIONSHIP BETWEEN SYNTACTIC AWARENESS AND READING COMPREHENSION

The cumulative evidence from the 23 reviewed studies robustly supports a cross-linguistic relationship between syntactic awareness and reading comprehension across diverse language pairings and participant populations, highlighting syntactic awareness as a key metalinguistic skill that facilitates both within- and cross-language reading development.

DIRECTION OF SYNTACTIC AWARENESS TRANSFER

A consistent finding across studies is that L1 syntactic awareness predicts L2 reading comprehension, especially when the two languages share structural similarities. Siu and Ho (2020) demonstrated that word order awareness transferred more readily than morphosyntactic awareness, attributing this to the closer structural alignment between languages. Given the considerable

syntactic overlap between English and Spanish, Proctor et al. (2017) similarly found that Spanish syntactic awareness significantly predicted English reading comprehension across multiple grade levels.

Bidirectional transfer effects have been observed, particularly in bilingual and immersion program contexts. In bilingual contexts, Lam et al. (2015) reported cross-language associations between syntactic awareness and reading comprehension among English–Mandarin bilinguals, with no literacy loss. Similarly, Cueva et al. (2022) found reciprocal transfer between Spanish and English in Grades 1 and 3. In immersion settings, Sohail (2015) demonstrated a shift in transfer patterns: in Grade 1, English syntactic awareness predicted French reading comprehension, while by Grade 3, French syntactic awareness became the stronger predictor for reading comprehension in both languages.

Although L1-to-L2 transfer was the predominant pattern, several studies have explored asymmetrical or reverse transfer. For instance, Siu and Ho (2020) and Zhao et al. (2025) reported significant effects of L1 syntactic awareness on L2 reading comprehension, with little evidence of reverse transfer—likely due to the instructional dominance of the L1. However, partial evidence of L2-to-L1 (backward) transfer has been observed in studies such as Spies et al. (2018) and Altmisdort (2016), particularly when learners had developed strong L2 reading strategies.

Overall, the directionality of syntactic awareness transfer appears to be asymmetrical, shaped by multiple factors such as relative language proficiency, amount of exposure, and instructional emphasis.

MODERATING AND MEDIATING FACTORS IN TRANSFER

While some studies examined direct effects, others investigated contextual variables that mediate or moderate cross-linguistic transfer of syntactic awareness. L2 syntactic awareness and word reading were the most tested mediators. Sohail (2015) found that the mediating role of French syntactic awareness varied by grade level, while Burchell (2023) reported that French word reading partially mediated the relationship between English syntactic awareness and French reading comprehension. Regarding moderation, only Zhao et al. (2025) identified L2 proficiency as a significant moderator of transfer between L1 and L2 reading comprehension, though syntactic awareness was treated as part of L2 proficiency rather than as a separate construct. Table 4 outlines the principal findings associated with RQ3.

TABLE 4. Key findings related to research question 3

Theme	Code	References
Transfer Direction	L1→L2 Direct	Burchell (2019); Burchell et al. (2023); Carrey Siu & Ho (2020); Kremin et al. (2019); Proctor et al. (2017); Rosenstein et al. (2020); Sohail (2022); Sohail et al. (2022a); Tiffin-Richards (2024); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)
	Bidirectional	Baoqi et al. (2020); Cueva et al. (2022); Lam et al. (2015); Sohail (2015); Sohail et al. (2022b); Siu & Ho (2015); Tong, Kwan et al. (2022)
	L2→L1 Reverse	Altmisdort (2016); Spies et al. (2018)
	L2→L3	Sohail et al. (2022a)

	Dominant language→heritage language	Chrabaszcz et al. (2022)
	Taiwanese Sign Language → Chinese	Liu (2022)
Moderators & Mediators	L2 syntactic awareness (mediator)	Burchell (2019); Carrey Siu & Ho (2020); Sohail (2015); Siu & Ho (2015); Tong, Deng & Xiuli Tong (2023)
	word reading (mediator)	Burchell (2019); Burchell et al. (2023); Sohail (2022); Tong, Kwan et al. (2022)
	vocabulary (mediator)	Burchell (2019); Burchell et al. (2023); Sohail (2015)
	L2 reading comprehension (mediator)	Spies et al. (2018)
	word identification (mediator)	Sohail (2015)
	English metalinguistic awareness (mediator)	Baoqi et al. (2020)
	L2 proficiency (moderator)	Zhao et al. (2025)

METHODOLOGICAL LIMITATIONS AND RESEARCH GAPS IN CROSS-LINGUISTIC SYNTACTIC TRANSFER RESEARCH

The final theme emerging from the synthesis of 23 studies concerns methodological limitations and research gaps in cross-linguistic syntactic awareness transfer. A primary concern is the lack of standardized, bilingual, and psychometrically validated assessment tools (Chrabaszcz et al., 2022; Proctor et al., 2017; Tong, Kwan et al., 2022). Many studies rely on monolingual or researcher-developed instruments, often without reliability and validity evidence (e.g. Siu & Ho, 2020; Sohail et al., 2022a), which limits cross-study comparability and the generalizability of findings.

Research design constraints further impede progress. The literature is dominated by cross-sectional designs, which can reveal correlations but cannot establish causality or capture the developmental trajectory of syntactic transfer (Baoqi et al., 2020; Liu, 2022). Longitudinal studies are rare (Liu, 2022; Siu & Ho, 2020), and experimental or intervention-based designs are even less common (Rosenstein et al., 2020; Sohail et al., 2022b). Additionally, small sample sizes which were often drawn from single classrooms, reduce statistical power (Burchell et al., 2023; Cueva et al., 2022; Lam et al., 2015), while limited analytical approaches constrain the depth of insights, such as Burchell (2019) and Lam et al. (2015). The absence of control variables in many studies further restricts the ability to isolate the effects of L1 syntactic awareness on L2 reading comprehension (Proctor et al., 2017; Sohail et al., 2022b).

There are also notable representation gaps. The participant pool is skewed toward children in mainstream foreign language programs and immersion settings (Burchell, 2019; Lam et al., 2015), with adult learners, heritage speakers, and learners in vocational or higher education contexts largely excluded. Language coverage is similarly narrow, heavily favoring combinations such as Chinese–English, Spanish–English, and French–English (Burchell et al., 2023; Lam et al.,2015), with typologically distant pairs (e.g., Arabic–English, Korean–English) rarely examined. Furthermore, limited attention has been paid to back transfer (L2 to L1) (Burchell et al., 2023; Sohail et al., 2022b) and to the socioeconomic diversity of samples (Lam et al., 2015; Sohail, 2015), both of which may critically shape transfer patterns. Table 5 summarizes key limitations and gaps relevant to RQ4.

TABLE 5. Key findings related to research question 4

Theme	Code	References
Measurement Validity	No bilingual measurement	Proctor et al. (2017); Sohail (2015); Tong, Deng & Xiuli Tong (2023); Tong, Kwan et al. (2022)
	Lack of reliability and validity	Carrey Siu & Ho (2020); Kremin et al. (2019); Rosenstein et al. (2020); Sohail et al. (2022a); Tiffin-Richards (2024); Siu & Ho (2015)
	No standard measurement	Sohail (2015); Sohail (2022); Siu & Ho (2015); Tong, Deng & Tong (2022)
Research Design Constraints	Cross-sectional research constraint	Liu (2022); Sohail et al. (2022a); Sohail et al. (2022b); Tong, Deng & Tong (2022)
	Lack of experimental research	Rosenstein et al. (2020); Sohail et al. (2022b); Tong, Deng & Xiuli Tong (2023)
	Small sample size	Burchell et al. (2023); Cueva et al. (2022); Lam et al. (2015); Spies et al. (2018); Tong, Deng & Tong (2022); Tong, Deng & Xiuli Tong (2023)
	Analysis constraint	Burchell (2019)
Representation Gaps	Age constraint	Burchell (2019); Lam et al. (2015)
	Language coverage	Burchell et al. (2023); Lam et al. (2015)
	Back transfer	Altmisdort (2016); Burchell et al. (2023); Proctor et al. (2017); Sohail et al. (2022b); Spies et al. (2018); Spies et al. (2018)
	Lack of social status of the sample	Sohail (2015); Sohail et al. (2022a); Lam et al. (2015); Sohail (2015)
	Lack of longitudinal research	Burchell et al. (2023); Carrey Siu & Ho (2020); Liu (2022); Sohail (2015); Tong, Deng & Xiuli Tong (2023); Zhao et al. (2025)

In accordance with the four research questions outlined above, a matrix-style summary (see Appendix) has been developed to correspond to each RQ.

DISCUSSION

The present review encompassed 23 studies, the majority of which adopted cross-sectional designs and employed regression or SEM to investigate the relationship between syntactic awareness and reading comprehension. Syntactic awareness was typically assessed using word-order, grammaticality judgment, or syntactic-correction tasks, while reading comprehension was measured via standardized or researcher-developed tests. The available evidence is predominantly drawn from three specific language pairs (i.e. Chinese–English, Spanish–English, English–French) and primarily involves primary-school learners. Notably, there is limited representation of adult populations, heritage speakers, or languages with greater typological distance. While a number of studies reported significant cross-language associations, others documented weak or non-significant effects after controlling for vocabulary or decoding skills.

These discrepant transfer findings may be attributed to linguistic differences as well as methodological variations in research design, assessment instruments, and analytical approaches. The field remains dominated by cross-sectional designs (18 out of the 23 studies), which limits insights into developmental trajectories or causal pathways of syntactic transfer, echoing earlier concerns raised in transfer studies but revealing a more severe imbalance than previously

documented. Longitudinal studies, though only three in number, consistently identified changes in transfer patterns over time (e.g., shifts in directionality or the emergence of mediating effects), demonstrating that such designs provide insights that cross-sectional work cannot capture and syntactic transfer is far more dynamic than earlier models assumed (Proctor et al., 2017; Siu & Ho, 2020; Spies et al., 2018). The analytical techniques also differed in sophistication. While many studies relied on multiple regression to identify predictors of reading comprehension, this approach often lacked adequate control for multicollinearity among syntactic, lexical, or decoding variables, making it difficult to isolate unique syntactic effects (Burchell et al., 2023; Chrabaszcz et al., 2022). This limitation is less acknowledged in prior literature reviews. Findings from studies using SEM or mediation frameworks, however, challenge the primacy of strong direct effects. By uncovering substantial indirect effects through mediators, these models indicate that the influence of syntax may be more complex than previously assumed, and that some earlier claims of its strength likely stemmed from the constraints of simpler analytical techniques. Equally concerning is the limited alignment of assessment tools across languages. Many instruments, such as grammatical correction or grammatical judgments, were originally developed for monolingual English readers and later adapted with minimal cross-linguistic calibration (Cueva et al., 2022; Lam et al., 2015). The reliance on monolingual, researcher-developed syntactic tasks in nearly all studies introduces limitations that constrain cross-study comparability. These methodological disparities illustrate that differences in findings across the literature are not solely attributable to linguistic factors, but also reflect the research design, analytical and assessment tools choices employed, underscoring the need for greater methodological coherence in future research.

Another limitation pertains to the homogeneity of study samples and tools. The literature is dominated by research on primary school students in immersion contexts, primarily in North America and Asia, with sparse representation from adult learners, heritage speakers, or learners in low-resource environments (Chrabaszcz et al., 2022; Liu, 2022; Tiffin-Richards, 2024). The lack of diversity in age, language background, and sociocultural context undermines the generalizability of findings.

A consistent pattern observed across the reviewed studies is the predominance of three language pairings: Chinese–English, Spanish–English, and English–French. This distribution aligns with earlier reviews in the domain of bilingual literacy (Chung et al., 2019). Furthermore, the underrepresentation of typologically diverse language pairs, such as Russian–English, Hebrew–English, Turkish–English, and Mandarin–Taiwanese Sign Language, highlights a significant gap in the current literature. These understudied pairings offer valuable contexts for examining the theoretical boundaries of syntactic transfer, yet they remain largely unexplored. Importantly, this gap appears more substantial than previously indicated in earlier systematic reviews, which rarely treated syntactic transfer as an independent construct.

This systematic literature review confirms with substantial empirical support that syntactic awareness is a key metalinguistic construct contributing meaningfully to reading comprehension in bilingual and multilingual learning environments. Syntactic awareness enables language learners to process and interpret the grammatical architecture of sentences, which is essential for reading comprehension, serving as a direct connection to the understanding of written texts (Cain, 2007; Perfetti, 2014). Across languages, syntactic skills may be a universal operating principle that underlies reading comprehension between the two languages (Tong et al., 2024). Tong et al. (2022), for instance, found that syntactic awareness in both Chinese and English significantly contributes to reading comprehension within each language, with evidence of cross-linguistic transfer from Chinese syntactic awareness to English reading comprehension, particularly among learners with

higher English proficiency. Proctor et al. (2017) similarly reported that syntactic skills in Spanish significantly predicted English reading outcomes. These findings affirm the centrality of syntactic awareness across linguistic contexts and support reading models such as the Reading Systems Framework (Perfetti, 2014) and the Simple View of Reading (Hoover & Gough, 1990) in which syntax serves as an essential role in reading comprehension. Nevertheless, the ability to transfer syntactic knowledge across languages is influenced by several critical variables, most notably linguistic proximity. According to the Linguistic Proximity Model (Westergaard et al., 2017), the greater the structural similarity between the two languages, the higher the probability of successful and automatic transfer. French–English bilinguals, for instance, show more robust syntactic transfer than their Chinese–English counterparts due to similar language structure (Burchell, 2019; Siu & Ho, 2015; Sohail et al., 2022; Tong et al., 2022). Conversely, when learners engage with languages that differ syntactically, such as Chinese, a paratactic language, versus subject-prominent English, a hypotactic language, they may misapply L1 syntactic rules to L2 input, leading to comprehension breakdowns. In such cases, cross-linguistic transfer may not occur unless reinforced through explicit instruction. This observation reinforces the importance of pedagogical scaffolding in settings where language pairs are structurally distant. Theoretical models must therefore account for structural congruence, and instructional context as co-determinants of transfer outcomes.

Despite recognition of its importance, L2 proficiency as a factor influencing syntactic transfer remains inadequately theorized and insufficiently operationalized in the literature. Alderson's (1984) argue that L2 readers need to attain a sufficient level of L2 proficiency before their L1 reading skills can effectively contribute to enhancing L2 reading. Among the 23 selected studies, only Zhao et al. (2025) examined the moderating effects of L2 proficiency. However, their measurement relied on vocabulary knowledge and L2 syntactic awareness, which may not fully capture participants' overall language proficiency. The interpretation of cross-language transfer patterns remains constrained by the absence of adequately fine-grained assessments of L2 proficiency in existing research. Moreover, this review brings to light several mediating variables that have been overlooked in previous literature reviews, such as word reading, L2 syntactic awareness, vocabulary knowledge, metalinguistic awareness, word identification, and L2 reading comprehension. The scope of these mediating factors has rarely been acknowledged in earlier reviews, indicating that syntactic transfer may function through indirect and complex pathways rather than through direct or linear processes. This perspective reveals a more complex picture of syntactic transfer to reading comprehension.

CONCLUSION

This review synthesizes findings from 23 empirical studies on the cross-linguistic transfer of syntactic awareness to reading comprehension, yielding six key themes: (1) Research designs and assessment instruments are predominantly cross-sectional, employing regression or SEM analyses, with diverse syntactic awareness tasks (e.g., grammatical judgment, syntactic correction) and reading comprehension measures (standardized tests, researcher-developed passages); (2) Participant contexts are largely limited to primary-grade immersion learners, with minimal representation of adult or heritage learners; (3) Language pairings are dominated by Chinese–English, Spanish–English, and English–French, while typologically distant combinations (e.g., Russian–English, Hebrew–English) remain underexplored; (4) Patterns of transfer show robust

L1-to-L2 influence, with evidence of both within- and cross-language effects in immersive contexts, and asymmetrical transfer favoring the dominant language in heritage settings; (5) Mediating variables include word reading, L2 syntactic awareness, metalinguistic awareness, vocabulary, and word identification, while L2 proficiency has been identified as a moderator; (6) Methodological limitations include the scarcity of longitudinal or intervention studies, reliance on monolingual instruments, and underrepresentation of diverse learner profiles.

Taken together, these findings point to several promising directions for future research. Methodologically, validated, multilingual instruments and more demographically diverse samples will be essential for strengthening the generalizability and ecological validity of findings. Future research could consider adopting longitudinal, experimental, and mixed-methods approaches to establish causal trajectories, capture both statistical trends and rich contextual insights, triangulate findings, validate bilingual assessment tools, and include more diverse populations (e.g., adult and heritage learners). In addition, expanding the range of language pairings, particularly those that are typologically distant, will be crucial for determining the extent to which syntactic transfer operates across structurally diverse linguistic contexts. The use of psycholinguistic measures (e.g., eye-tracking, processing time) may also illuminate the cognitive mechanisms underlying syntactic transfer. Pedagogically, this review underscores the need to move beyond decontextualized, rule-based grammar instruction and to integrate syntactic awareness into meaningful reading activities. Strategically leveraging learners' first language through contrastive analysis can enhance both syntactic and metacognitive awareness. Teacher preparation programs should equip educators to identify syntactic challenges, adapt instruction to learners' linguistic profiles, and actively support cross-linguistic transfer. Exploring these directions might contribute to refining theoretical models such as the Linguistic Proximity Model and the Common Underlying Proficiency framework, while informing instructional and assessment practices that draw on syntactic skills to support bilingual or multilingual reading development.

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APPENDIX

Matrix-formatted summary table for each research question

Study	Research Design	Analytical Approaches	Syntactic awareness Instruments	Reading Comprehension Measures	Language Pair	Age/ Stage	Educational Context	Participant Diversity	Transfer Direction	Moderators / Mediators	Methodological Limitation	Representation Gaps
1. Altmisdort (2016)	Quasi-experiment	t-test; Levene's test	A standard reading test including grammar multiple-choice questions part	A standard reading test	Turkish-English	University students	Undergraduate university setting in Turkey; One group received L2 English reading instruction	/	L2→L1	/	Syntactic awareness not measured independently	L2 transfer effects on L1
2. Baoqi et al. (2020)	Cross-sectional study	SEM	Adapted orally and written grammatical correction task	A standard English reading test; An adapted Chinese reading test	Chinese-English	Primary 3 children	Government-run schools in Tianjin and Singapore	/	L1→L2; L2→L1 Within and cross	English metalinguistic awareness (mediator)	Cross-sectional study does not warrant firm causal relationship	Include Home language use in research
3. Burchell (2019)	Cross-sectional study	SEM	A developed word order correction task	A standard English reading test; Translated French reading test	English-French	Grade 2 children	Young bilingual and trilingual children enrolled in French immersion programs in Canada	/	Within and cross L1→L2	Word reading, French syntactic awareness; receptive vocabulary (mediator)	Floor Effect in French Syntactic Awareness Measure; Lack of Proficiency-Sensitive Items	Replicate the design with older age groups to capture developmental shifts; conduct a more fine-tuned analysis to evaluate the mastery of different syntactic features
4. Burchell et al. (2023)	Cross-sectional study	Correlational analysis;	Adapted word order correction tasks	Translated reading comprehension test	English–French	Grade 2 children	Bilinguals learning French as an additional language in	/	Within and across languages L1→L2	Within French: word	Small sample size for control variable and	The impact of L1–L2 proficiency

		Hierarchical stepwise regression;		from a standard Canadian reading comprehension test			Canadian French immersion programs			reading and vocabulary (mediator); Across languages: French word reading (mediator)	mediation analysis; the difficult level of French syntactic awareness Instrument is not appropriate to Grade 2 children	over time on the cross-language transfer; the back-transfer (from the L2 to the L1); include more ELL students whose L1 is not English
5. Carrey Siu & Ho (2020)	Longitudinal study	Measures ANOVAs; SEM	Adapted English and Chinese word order test and grammar correction test with validity	Developed Chinese and English reading comprehension with validity	Chinese-English	Grade 1and Grade 3	Receive education in mainstream primary schools in Hongkong	/	L1→L2	L2 syntactic awareness (mediator)	Lack of randomized controlled trials to verify research result; low reliabilities of vocabulary measures	Lack of longitudinal studies in pairs of dissimilar languages
6. Chrabaszcz et al. (2022)	Cross-sectional study	ANOVA, linear-mixed effects	A self-developed word order sentence matching	A self-developed oral Russian sentence-picture matching task	Russian-English; Russian-Estonian	Adult (Mean age:26.75)	English-dominant participants accept education in the U.S. most of their lives; Estonian-dominant participants were born in Estonia and never lived in Russian-speaking countries	Heritage speakers	Dominant language (English) → heritage language (Russian)	/	No standardized measurement	No previous study on this topic on heritage speakers
7. Cueva et al. (2022)	Cross-sectional study	Hierarchical multiple regressions	Self-developed Spanish and English grammatical judgement tasks with validity	A standard Spanish comprehension test; an adapted English	Spanish-Englsih	Grade 1 and 3 of secondary school	Native Spanish speakers receiving a Spanish–English bilingual	/	L1→L2; L2→L1	/	Small sample size; Narrow grade range; Lack of mediation analysis	/

				reading comprehension test with validity			education in Spain					
8. Kremin et al. (2019)	Cross-sectional study	Linear regression	Standard Spanish and English word structure tests	Standard Spanish and English word reading tests	Spanish–English	Children (mean age [Mage] = 9.80 years)	English and Spanish-English bilinguals, raised and educated in a Midwestern U.S. town	Heritage speakers	L1→L2;	/	The syntactic tests may not well assess the participants' syntactic knowledge	/
9. Lam et al. (2015)	Quasi-experiment	T-test; correlational analysis	Self-developed orally and written grammar error detection tasks in En glish and Chinese with validity	A standard English letter-word identification test; an adopted Chinese character reading test	English-Chinese	Students from JK, Senior Kindergarten (SK, age approximately 5-6 years), Grade 1 (age approximately 6-7 years), and Grade 2	Children in the experimental group were in the Mandarin language bilingual program in Canada. Children in the comparison group attended English-only public Schools and Chinese heritage language classes	Heritage speakers	Within and across languages Heritage→ L2 L2→ Heritage	/	The sample size is relatively small; take into account the effects of other related skills; the analytical approaches are too simple	Expand language pairs and participant's Grade; lacked socioeconomic diversity of the sample
10. Liu (2022)	cross-sectional study	Pearson correlation; hierarchical regression analysis; MANOVA	Grammatical multiple-choice question tasks selected in two government-funded assessments.	A self-developed Chinese Reading Comprehension with validity. (in study 1); A standardized Chinese Reading Comprehen	Taiwanese Sign Language -Chinese (mandarin)	Age ranges from6–50 years (study 1: ages 14–50 years; study 2: ages 6–13 years)	Deaf people in deaf community and deaf schools in Taiwan	Deaf children, deaf youth and deaf adult	Taiwanese Sign Language →Chinese (mandarin)	/	Cross-sectional study doesn't show causal relationship; the age range is too wide;	Robust longitudinal methodology is lacked in this cohort

				sion Test for screening students with reading comprehension difficulties								
11. Proctor et al. (2017)	Longitudinal study	SEM	Adopted English and Spanish paralleled picture-prompted sentence formulation tasks	Adapted from 3 reading comprehension tests with reliability	Spanish-English	Grade 2-5 children	Bilingual children in English-only mainstream classrooms across public schools in the United states with varying levels of language support services and with Spanish as their primary home Language	/	L1→L2	/	No control variables; no bilingual instruments	More sociolinguistic factors should be included
12. Rosenstein et al. (2020)	Cross-sectional study	Confirmatory factor analyses; correlational analysis	Self-developed grammatical judgement task without validity	Self-developed reading comprehension test without validity	Hebrew-English	Junior high, high school, postsecondary and university students	Receive middle socioeconomic education in Isreal	/	L1→L2	/	The syntactic awareness instruments is embedded in the reading comprehension test;	Lack of intervention studies.
13. Sohail (2015)	Cross-sectional study	SEM	Adapted grammatical error-correction task without validity	Adopted French text reading comprehension	English-French	Grade 1 and Grade 3 children	Educated in French immersion public school in Canada	/	Within- and cross-language L1→L2 L2→L1	L2 syntactic awareness; L2 word identification;	Lack of standardized bilingual assessments	Lack of longitudinal study; restricted range of the socioeconomic status

										L2 vocabulary (mediator)		of the samples
14. Sohail (2022)	Cross-sectional study	MANOVA	Adapted grammatical error-correction task (visual and aural)without validity	Adopted French word and text reading comprehension	English–French	Grade 1 children	Received all school instruction in French in French immersion public school in Canada	/	Within- and cross-language L1→L2	L2 word reading (mediator)	Reading comprehension is measured only in French; no standardized reading measures available for the French immersion population	/
15. Sohail et al. (2022a)	Cross-sectional study	Pearson correlation; Hierarchical regression	Adopted grammatical error-correction task (visual and aural)with reliability	Adopted English passage comprehension test with reliability ; translated paralledFrench passage comprehension test with reliability	English–French	Grade 3	Enrolled in a Canadian French immersion program in which all academic instruction is in French	/	Within- and cross-language L1→L2 L2→L3	/	Causational relation cannot be determined; French syntactic awareness measure's reliability is low; socioeconomic status	/
16. Sohail et al. (2022b)	Cross-sectional study	Pearson correlation; Hierarchical regression; Commonality analysis	Adopted grammatical error-correction task (visual and aural)with reliability	Adopted English passage comprehension test withreliability; translated paralledFrench passage comprehensiontest with reliability	English - French; Russian/ Spanish/ Chinese/ Hebrew/ Serbian/ Azerbaijani/ Hungarian/ Korean -French	Grade 3	Enrolled in a Canadian French immersion program in which all academic instruction is in French	/	Within- and cross-language L1→L2 L2→L1	/	Lack of intervention design to explore causal and temporal relations between these skills; causal relations cannot be determined; lack of a measure of working memory to rule	Lack of L2 →L1 transfer

											out its effects	
17. Siu & Ho (2015)	Cross-sectional study	SEM	Adapted word order correction task and morpho-syntactic correction task with reliability in both Cantonese and English	Self-developed sentence and passage comprehension with reliability in both Cantonese and English	Cantonese-English	Grade 1 and Grade 3	Receiving the local standardized school curriculum in local primary schools in Hong Kong	/	Within- and cross-language L1→L2 L2→L1	L2 syntactic skills (mediator)	Chinese vocabulary measures are not standard; incorporating expository passages in future comprehension test for older cohorts	
18. Spies et al. (2018)	longitudinal experiment	SEM	One part of a standard literacy measurement: usage mistakes correction test	One part of a standard literacy measurement (with reliability) to measure students' ability to answer questions about a picture as well as written sentences and stories.	Spanish-English	Grades 1–3	Receive bilingual education in the United States	/	L2→L1	L2 reading comprehension (mediator)	English and Spanish proficiency were not calculated; the models (both for treatment and con-troll) did not consider the influence of decoding skills on language or reading comprehension; the absence of classroom-level variables and sample size	Few studies have examined L2 to L1 transfer
19. Tiffin-Richards (2024)	Cross-sectional study	Linear mixed-effects models	Self-developed grammaticality judgement task without reliability and validity	Self-developed grammaticality judgement task without reliability and validity	German-English	Adult undergraduates	German L1 speakers studying education at the University of Würzburg in Germany	/	L1→L2	/	No separate instrument used to measure reading comprehension; Artificial Reading Task; limited	/

20. Tong, Deng & Xiuli Tong (2022)	Cross-sectional study	Multivariate regression. MANOVA; MANCOVA	Self-developed word order task with reliability in English and Chinese	Self-developed Chinese passage reading comprehension test and a standard English comprehension test with reliability	Cantonese-English	Grade 4	native Cantonese speakers who learned Chinese and English as core subjects in Hong Kong mainstream primary schools	/	within- and cross-language L1→L2	/	syntactic scope; No standardized reading comprehension difficulty screening tasks; sample size is relatively small; the causal relationship between variables can not be assessed	Explore whether poor comprehends' syntactic weakness is task-specific.
21. Tong, Kwan et al. (2022)	Cross-sectional study	SEM	Adapted orally and visually word order tasks without validity and reliability in Chinese and English	An adapted Chinese passage reading Comprehension without validity; a standard English passage reading comprehension	Chinese-English	Grade 4	Chinese–English bilingual children attending local mainstream primary schools in Hong Kong	/	Within- and cross-language L1→L2 L2→L1	Word reading (mediator)	The type of syntactic awareness task is limited; Chinese syntactic awareness measure should be presented in written; lack of perfectly paralleled instrument	Frame syntactic awareness within other oral language skills; need more mediation and control measures;
22. Tong, Deng & Xiuli Tong (2023)	Cross-sectional study	Correlational analysis, Hierarchical regression	Self-developed Chinese and English audible and visual word order tasks with reliability	Adopted Chinese passage reading comprehension test and a standard English comprehension test	Cantonese-English	Grade 4	Learned English as an L2 while studying in a Cantonese, Cantonese–English, or English medium of instruction in Hongkong	/	Within- and cross-language L1→L2	English syntactic awareness (mediator)	Unequal measure of Cantonese and English prosody;	Lack of examining the mediating role of syntactic awareness across different types of syntactic

				with reliability								measures; rigorously controlled, large-scale longitudinal and intervention studies are needed
23. Zhao et al. (2025)	Cross-sectional study	Hierarchical regression	Adopted grammar error-correction task with reliability	Passage reading section of the district-standard English and Chinese examination paper with reliability	Chinese-English	Grade 12 (high school)	Learned English as a compulsory subject for about 9 years in a public senior high school in eastern China	/	L1→L2	L2 proficiency (moderator)	More predictors of L2 reading comprehension should be investigated; more comprehensive measures are needed to assess L2 proficiency	Lack of longitudinal research