

**How you read the text matters: Caregiver oral reading prosody during shared reading
relates to children's language skills**

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Abstract

Purpose: Emerging research suggests that caregiver oral reading prosody may be a key feature of shared reading that supports children's storybook comprehension, with potential implications for broader language development. Building on this evidence, the present study investigated whether associations between caregiver oral reading prosody and children's language at the preschool age extend beyond real-time listening comprehension to include broader language skills.

Methods: Forty-one caregivers read a children's book to their child (ages: 4–5 years) as they normally would at home. The caregivers' oral reading prosody (intonation, timing, and loudness features) was examined in relation to children's receptive vocabulary and core language skills. Moderated mediation models then investigated possible impacts of caregiver reading skills and shared reading time on putative links between caregiver oral reading prosody and child language.

Results: Caregiver intonation range positively related to child receptive vocabulary and caregiver inappropriate (i.e., ungrammatical) pausing negatively related to child core language skills. Mediation models revealed that caregiver reading skills indirectly related to child language skills through oral reading prosody. Importantly, the indirect effect linking caregiver reading skills to child receptive vocabulary via caregiver intonation range was moderated by shared reading time, with the strongest effects observed in dyads reporting less shared reading engagement.

Conclusions: Findings illuminate caregiver oral reading prosody as one factor linking caregiver reading skills to child language, with effects through caregiver intonation on child vocabulary most evident in families with limited shared reading engagement. Overall, this research has implications for early language intervention approaches, especially among families of caregivers with reading difficulties and for those with limited shared reading opportunities.

Keywords: preschool language skills, shared reading, caregiver oral reading prosody

Introduction

Prior to the start of formal schooling, the home language and literacy environment sets a critical foundation for young children's language development and, in turn, subsequent academic achievement (Golinkoff et al., 2019; Rowe & Weisleder, 2020). A key aspect of the home language and literacy environment that exposes children to enriched and enhanced language is caregiver-child shared reading. Extensive research highlights how shared reading supports children's language development through exposure to diverse and complex language provided by written text (Bus et al., 1995; Burgess et al., 2002; Montag et al., 2015; Sénéchal & LeFevre, 2002), even when controlling for caregivers' language input outside of shared reading interactions (Demir-Lira et al., 2018). For this reason, shared reading is commonly targeted in caregiver-focused intervention programs aiming to facilitate positive language skill development among children at risk for language and/or reading difficulties (Justice & Ezell, 2000; Towson et al., 2021; Zevenbergen & Whitehurst, 2003). These intervention approaches not only encourage caregivers to read more to their children but also to employ shared reading techniques (e.g., print references, prompting questions) that emphasize important language features in the text (Evans et al., 2008; Justice & Ezell, 2000; Justice et al., 2008; Lepola et al., 2023; O'Fallon et al., 2022). This highlights the importance of examining not just the sheer amount of shared reading, but also *how* caregivers approach reading interactions. Here we propose that the *manner* in which caregivers read the text aloud, via their oral reading prosody, is an understudied, important component of shared reading that supports children's language skill development.

Oral reading prosody refers to the way in which a reader varies their pitch, timing, and loudness when reading aloud. This information is relayed through changes in acoustic features including intonation (i.e., fundamental frequency f_0), duration, and intensity (Breen et al., 2010;

Kim et al., 2021). Prosody is recognized as a salient aspect of oral reading (Kim et al., 2021), and a tacit or implicit factor in how adults approach reading with young children (Lawson, 2012). While not a central focus, some guidebooks and resource materials outlining developmentally appropriate shared reading practices incorporate brief recommendations for oral reading prosody (Reach Out and Read, n.d., Trelease, 2006). This includes recommendations such as, “read in a lively, engaging way” (Teale, 2003, p. 145) and “read fluently and expressively to make the story come alive for your children” (Children’s Literacy Initiative, n.d., para. 24). Yet, there is a lack of evidentiary basis surrounding the role of oral reading prosody as an explicit shared reading technique that may be leveraged to promote children’s language learning experiences during shared reading. Of the limited evidence to date, more “affective” presentation of storybooks among classroom teachers, including whether they varied loudness and timing features of their speech while reading, has been positively associated with preschool-age children’s verbal engagement during classroom reading interactions (Moschovaki et al., 2007). Beyond this work, there is limited research characterizing oral reading prosody during caregiver-child shared reading experiences. Overall, although oral reading prosody is implicitly present in shared reading practices, it remains underrecognized and understudied as a core strategy for enhancing caregivers’ approach to shared reading.

In spoken language, prosody plays a valuable role in conveying linguistic information, expression, and meaning (Cole, 2015; Dahan, 2015). As early as toddlerhood, children are able to leverage prosodic cues in continuous speech streams to effectively decipher lexical and syntactic information (de Carvalho et al., 2016, 2021; Snedeker, 2008). Importantly, caregivers’ use of exaggerated prosody in child-directed speech (CDS) – marked by slower speech, heightened intonation variation, and elongated pauses at grammatical boundaries – is thought to

be one way linguistic input can be provided to young children to facilitate language acquisition (Cox et al., 2023; Nelson et al., 1989; Rosslund et al., 2024; Singh et al., 2002; Spinelli et al., 2017). Beyond attracting and sustaining children's attention to speech input (Nencheva & Lew Williams, 2021; Spinelli et al., 2017; Rosslund et al., 2022), research proposes that the acoustic signals of prosody itself serve as salient perceptual cues that support children's learning of word forms and grammatical structures as their linguistic skills develop in early childhood (Hollich et al., 2000; Ma et al., 2011). For example, intonation contours have been shown to contribute directly to toddlers' word learning by emphasizing linguistically informative moments in speech streams (Nencheva & Lew Williams, 2021). Such effects may be especially relevant as children acquire new language domains and encounter input that challenges the limits of their language competencies throughout early childhood (Foursha-Stevenson et al., 2017; Ma et al., 2011; Tomasello et al., 2000). Considering the abundant emphasis on the benefits of caregivers' speech prosody (i.e., CDS) for supporting children's early language development, it is somewhat surprising that there is such a gap in evidence addressing the relevance of caregiver oral reading prosody in shared reading.

We propose that shared reading is a unique context in which prototypical features of CDS, conveyed through oral reading prosody, support children's comprehension of linguistically rich input and, in turn, promote broader language development. Supporting this view, initial evidence from a digital experimental paradigm suggests that greater intonation variation in an oral (recorded) presentation of a storybook is associated with better listening comprehension among preschoolers (Mira & Schwanenflugel, 2013). Our team subsequently observed complementary effects in a naturalistic context, in which the oral reading prosody of caregivers during shared reading was positively associated with their preschoolers' listening comprehension

(Davison et al., in press). Specifically, caregiver intonation range and appropriate pausing (i.e., pausing at grammatical boundaries) while reading significantly predicted unique variance in their preschoolers' listening comprehension of an unfamiliar storybook, accounting for caregiver education as well as the children's age, broader language comprehension skills, and attention. In this study, caregivers were asked to not engage in extratextual discussion or use print referencing during the reading interaction. A separate study among a cohort of mothers and their toddlers – both late talkers and typical talkers – provided the first evidence that caregiver oral reading prosody not only relates to children's in-the-moment storybook listening comprehension but also to broader language skills, as measured by standardized assessment (Zuk et al., 2025). This finding among mother-toddler dyads is somewhat expected given how pervasive CDS is in toddlerhood (Englund & Buhne, 2006; Rosslund et al., 2024). An open question the present study will address is whether this putative effect of oral reading prosody on children's broad language skills is still observed at the preschool age, a crucial developmental window for children's school readiness (Ricciardi et al., 2021).

In the initial evidence linking caregiver oral reading prosody with children's language skill development, there has yet to be any study to address the potential role of caregivers' word reading and reading fluency skills in this context. Prosody is a core, qualitative marker of fluent reading (Wade-Woolley et al., 2021). The ability to read connected text prosodically – reading with appropriate intonation and loudness variation, placing pauses in locations preceding and following key content or syntactic structure – allows readers to group words into units of meaning and highlight focal information (Breen et al., 2010; Kim et al., 2021; Noordman et al., 1999; Schwanenflugel & Benjamin, 2012). Oral reading prosody is also understood to be intricately linked with the reader's skills (Wolters et al., 2020). Adults with reading difficulties

demonstrate reduced intonation modulation, as well longer and more frequent inappropriate pauses (i.e., ungrammatical) when reading adult-level text when compared to skilled readers (Binder et al., 2013). Therefore, caregivers' reading skills likely impact their oral reading prosody, with important implications for shared reading interactions. Developmental theories further support this view, emphasizing how distal factors such as caregiver reading skills may operate through proximal experiences like shared reading to shape children's language development (Bronfenbrenner & Morris, 2007; Hart et al., 2021; van Bergen et al., 2017). Separate lines of research have shown that caregivers with reading difficulties often engage less in shared reading with their children (Davison et al., 2024; Dilnot et al., 2017; Esmaeeli et al., 2018; Hamilton et al., 2016), underscoring the need to identify strategies to maximize the benefits of these more limited interactions.

Building on accumulating evidence suggesting caregiver oral reading prosody as a specific mechanism through which language exposure may be enhanced during shared reading (Davison et al., in press; Zuk et al., 2025), the present study examines the unique role of caregiver prosody in shared reading while accounting for key caregiver and home language and literacy environment characteristics. We first seek to establish whether oral prosody in caregiver-child shared reading interactions is associated with preschoolers' broad language skills while controlling for child attention, other verbal shared reading techniques, shared reading time at home, and caregiver education. Given that the quantity of children's shared reading exposure at home is a well-established predictor of language skills (Bus et al., 1995; Burgess et al., 2002; Sénéchal & LeFevre, 2002), we further test whether shared reading time moderates associations between caregiver oral reading prosody and child language skills. Thereafter, we examine whether caregiver oral reading prosody mediates relationships between caregiver reading skills

and child language skills. Caregivers' reading skills have been indicated as a highly relevant factor impacting both children's language development and the quality of home language and literacy interactions they experience (Bronfenbrenner & Morris, 2007; Hart et al., 2021; Puglisi et al., 2017; van Bergen et al., 2017). Within this framework, caregiver oral reading prosody may represent a more immediate pathway through which caregivers' reading abilities can influence children's language development in shared reading contexts. In a final step of mediation analyses, we examine shared reading time as a moderator using moderated mediation to determine whether mediation effects vary with the amount of shared reading at home.

Hypotheses are as follows: caregiver intonation range, intensity range, and appropriate pausing will be positively associated with child language skills, while inappropriate pausing will show a negative association (i.e., more inappropriate pausing, lower language achievement). We also hypothesize that shared reading time will moderate relationships between caregiver oral reading prosody measures and child language skills, with stronger associations anticipated among dyads who report less time reading at home. This hypothesis is grounded in evidence that prosodic cues may be especially helpful when children encounter complex and advanced language (Foursha-Stevenson et al., 2017; Tomasello, 2000); in dyads with less shared reading time – and therefore fewer opportunities to engage with language-rich content in children's books – prosodic cues may be particularly relevant for supporting children's acquisition of language provided by book text, relative to dyads with more frequent reading exposure. Lastly, caregiver oral reading prosody during shared reading is hypothesized to mediate links between caregiver reading skills and children's language skills, with shared reading time moderating mediation effects. If this work supports our hypotheses, findings will highlight caregiver oral reading prosody as a distinct and meaningful component of shared reading that contributes

directly to children's language development and serves as a pathway linking caregiver reading skills to child outcomes.

2. Methodology

2.1 Participants

Forty-one caregivers and their children (ages 4 – 5 years) were included in the present study as part of a longitudinal investigation of children's developing language and literacy skills at Boston University. Participants were recruited from the greater Boston area and child participant eligibility, based on caregiver report, included normal hearing (confirmed by audiological testing), full-term birth (gestation >36 weeks), native English speakers, no history of head injury or trauma, neurological or other neuropsychological conditions, and nonverbal cognitive skills with standard scores ≥ 85 , as measured by the Kaufman Brief Intelligence Test – Second Edition (KBIT-2; Kaufman & Kaufman, 2004) Matrices subtest. With the present focus on caregiver oral reading prosody and children's language skills, dyads included in the present analyses engaged in a shared reading interaction using the same children's book, *Forget-Me-Not* (Broad, 2009), as they would typically do at home. A total of 44 dyads participated in this study; however, three dyads were excluded due to not completing the reading interaction ($n = 2$) or missing audio from the reading interaction ($n = 1$). Thus, the final sample included 41 dyads in the present analysis. Child participants ranged in age from 49-70 months [mean age = 58.24 mo., SD = 5.93 mo.], 19 assigned male at birth, 22 assigned female at birth; four male and 37 female caregivers; for further participant demographics, see Table 1). According to caregiver report, 12 out of 41 children in the present cohort were considered at risk for speech-language and/or reading difficulties as they met at least one of the following criteria: (a) had received speech-language therapy services (e.g., in early intervention), (b) caregiver-reported concern for speech-

language skills, and/or (c) had at least 1 first-degree relative (i.e., biological sibling or parent) with reading difficulties. Notably, two participants were still receiving speech-language services at the time of study participation. Prior to participation, caregivers provided written informed consent and children gave verbal assent. All procedures were approved by the Boston University Institutional Review Board (IRB number: 6111E).

2.2 Measures

2.2.1 Caregiver oral reading prosody

Caregivers were asked to read the picture book *Forget-Me-Not* as they normally would at home. Prior to the reading interaction, all dyads confirmed that they were not familiar with the book. All interactions were conducted in the same dedicated testing space, with sound-proofing installation on the door and walls to mitigate background noise. Audiovisual recordings of all sessions were obtained via a PTZ camera and a high-quality hanging ceiling microphone. Dyads sat at the same location, below the microphone, within the testing space for the reading interactions. Praat software (v.6.4.29; Boersma & Weenink, 2020) was then used to extract caregiver oral reading prosody measures from recordings. Book reading utterances were transcribed in Praat TextGrids, with utterances comprising complete sentences as defined by the book text. Transcription was carried out by trained graduate students and inter-rater reliability was assessed on 20% of the sample, resulting in intraclass correlation coefficients $> .90$. In line with prior literature indicating that timing, intonation, and intensity features of caregiver prosody within conversational contexts relates to young children's language skills (Foursha-Stevenson et al., 2017; Ma et al., 2011; Spinelli et al., 2017), the present study quantified intonation, timing, and intensity features of the acoustic signal generated during caregivers' oral reading.

Quantification of timing features of caregivers' oral reading prosody included rate and pausing features. For caregiver pausing, pauses were defined as within-utterance periods of silence exceeding 100 milliseconds (Miller & Schwanenflugel, 2008) and coded in a separate Praat tier. Further, pauses were coded as appropriate or inappropriate. Appropriate pauses included those corresponding with book punctuation (e.g., commas, ellipses, quotation marks), marking grammatical boundaries, such as clause-final, phrase-final, direct address, or list pauses (Arcand et al., 2014; Álvarez-Cañizo et al., 2020; Binder et al., 2013). Additional appropriate pauses were identified at predetermined locations corresponding with lists, independent clauses, coordinating conjunctions ("and," "or," "but"), or adverbial conjunctions ("then," "later") which, while lacking punctuation in the text, represented logical phrasal boundaries where readers typically pause (Benjamin & Schwanenflugel, 2010). Furthermore, pauses for narrative emphasis at five designated locations in the book text were identified by two trained research personnel and coded as appropriate, based on prior research demonstrating that emphatic pauses are commonly used during storytelling interactions with children to highlight key words and capture attention (Theune et al., 2006). All other within-utterance pauses were coded as inappropriate (Arcand et al., 2014; Binder et al., 2013).

Since observed reading interactions included conversational interaction occurring outside of caregivers' reading, pauses resulting from child interruptions or caregiver verbal asides (i.e., stopping mid-text to provide the child clarification) were excluded from the analysis. A custom Python script, using the Python library `textgrid` (<https://github.com/kylebgorman/textgrid>) to parse Praat TextGrids, was used to extract caregiver speech rate while reading (syllables/second), appropriate and inappropriate pause durations (seconds), and the number of appropriate and inappropriate pauses from each utterance. Syllable counting was automated through the Python

syllapy library (<https://github.com/mholtzscher/syllapy>), with manual verification. For each participant, rate, appropriate pause duration, and inappropriate pause duration values were averaged across all utterances.

For intonation features of caregiver oral reading prosody, Praat pitch tracking was used to extract f_0 mean and range. A Praat script and Praat pitch tracking were first used to extract all f_0 features by utterance. In accordance with prior literature (Davison et al., in press; Zuk et al., 2025), the Praat pitch window was initially set to 130-400 hertz (Hz) for female caregivers and 70-250 Hz for male caregivers. Audio-visual inspection of pitch tracking was then completed for each utterance by trained research personnel. In instances where pitch tracking issues were detected in an utterance (e.g., jumping, halving, caregiver pitch exceeding the set pitch window) from the automated Praat script output, pitch settings were adjusted to ensure proper pitch tracking before re-extracting final f_0 output via the Praat Voice Report. Final f_0 mean and range values were averaged across all utterances (hereafter referred to as “intonation mean” and “intonation range”). In line with previous literature (Dahl & Stepp, 2023), intonation values were converted from Hz to semitones (ST) for statistical analyses to account for the nonlinear relationship between f_0 in Hz and the perception of pitch. Additionally, the same Praat script was used to extract intensity from caregivers’ oral reading. Specifically, intensity range (decibel (dB) sound pressure level) was tracked for all caregivers’ reading utterances. For each participant, intensity range values (hereafter referred to as “loudness range”) were averaged across all utterances.

2.2.2 Characterization of children’s language skills

Previous studies link caregiver speech prosody in conversational contexts with child vocabulary (Ma et al., 2011; Nencheva & Lew-Williams, 2021) and caregiver oral reading

prosody with children's receptive language skills (Zuk et al., 2025). Therefore, children were evaluated on their receptive vocabulary and core language skills in the present investigation. For core language skills, Core Language Scores from the Clinical Evaluation of Language Fundamentals-Preschool, 3rd Edition (CELF Preschool-3; Wiig et al., 2020) were used. The Core Language Score is a composite score, derived from the Word Classes, Sentence Comprehension, and Expressive Vocabulary subtests, that measures children's general language performance, including their morphosyntactic skills and language comprehension. Receptive vocabulary was evaluated using the Peabody Picture Vocabulary Test, Fifth Edition (PPVT-V; Dunn, 2019), which requires children to identify the image corresponding with an aurally presented vocabulary item out of four provided images.

2.2.3 Characterization of caregivers' reading skills

For assessment of caregivers' reading skills, the following subtests of the Woodcock Reading Mastery Tests Revised, Third Edition (WRMT-III; Woodcock, 2011) were administered: the Word Identification and Word Attack subtests evaluated word-level reading skills of real and nonsense words, the Passage Comprehension subtest captured reading comprehension skills, and the Reading Fluency subtest measured the speed and accuracy of their oral reading of adult-level text. A composite reading score was calculated by averaging standard scores across all four subtests and used for statistical analyses.

2.2.3 Caregiver education

To account for socioeconomic variation in the home language and literacy environment, caregiver education was included as a key covariate in analyses. Caregiver education has been consistently linked to caregivers' home language practices and child language skills, likely reflecting underlying variation in caregivers' language skills and knowledge about

developmental practices (Rowe, 2008, 2018). Caregiver-reported educational attainment was collected through a background questionnaire and then converted into a quasi-continuous scale in years: 12 (high school or GED), 14 (some college), 16 (bachelor's degree), and 18 (graduate degree). This approach is consistent with prior work examining characteristics of the home environment in relation to child language development (Huttenlocher et al., 2010; Zuk et al., 2025).

2.2.5 Shared reading time at home

Given extensive literature repeatedly documenting links between shared reading exposure at home and children's language skills (for review, see Bus et al., 1995), the present study sought to examine whether children's exposure to shared reading at home may moderate prosody–language associations in analyses. Therefore, caregivers responded to four multiple-choice Likert scale items characterizing the duration and frequency of shared reading at home as part of a background questionnaire. The questions documented (a) the frequency of bedtime reading, (b) the frequency of reading sessions other than bedtime, (c) the duration of an average reading session, and (d) the average amount of time spent reading to their child each week. Higher response scores reflected more shared reading engagement, and these scores were averaged to create an establish shared reading time composite score ranging from 0 to 4 used in prior research (Davison et al., 2024; Liu et al., 2024).

2.2.6 Caregivers' use of verbal shared reading techniques in extratextual talk

Previous research has established evidence of the benefits of verbal shared reading techniques (e.g., verbally pointing out elements of book text [i.e., print referencing] and asking questions that prompt the child to say something about the storyline [i.e., prompting questions]) in facilitating children's language skill development (Justice & Ezell, 2000; Lepola et al., 2023).

Therefore, the present study coded and accounted for caregivers' use of verbal shared reading techniques during extratextual talk to test the unique contribution of oral reading prosody while accounting for these alternative markers of shared reading engagement. For characterization of caregivers' use of verbal print referencing and prompting questions, audio recordings of the presently observed caregiver-child shared reading interactions were used. Specifically, caregivers' extratextual utterances were first transcribed into communication units (C-units; Hughes et al., 1997) by trained research personnel. Following transcription, the total number of caregivers' verbal print referencing behaviors and prompting questions about the book text were coded, adapting coding schemes from prior literature (Noble et al., 2020; Lepola et al., 2023; O'Fallon et al., 2022). Verbal print references included utterances related to print, words, letters, or elements of book organization. Prompting questions included utterances in which the caregiver asked a WH- (i.e., who, what, when, where, why questions), recall, open-ended, or distancing question to prompt their child to say something about the book. Following coding, the total number of print references and prompting questions was aggregated to create a score of caregiver shared reading techniques. Further, coding was verified with an inter-rater reliability intraclass correlation coefficient $> .90$ for 20% of the sample.

2.2.7 Child attention

Prosody in CDS is believed to capture and sustain children's attention, helping to direct their focus toward linguistically relevant features and supporting language processing (Spinelli et al., 2017; Nencheva et al., 2021; Rosslund et al., 2022). Therefore, children's visual attention during the shared reading interaction was coded and employed as a control variable within multiple regression analyses to account for variation in children's attention. Specifically, children's visual attention (gaze) during the reading interaction was manually coded from videos

using a five-second, hierarchical partial interval coding scheme, following Liu et al., 2022. The coding scheme recognizes that in a triadic interaction it is appropriate for an individual to direct their attention to both their partner and the shared object. It also distinguishes between brief moments of visual attention (a glance) and sustained attention. The codes for visual attentional behavior range from 0, representing poor attention, to 4, representing sustained attention, for each 5-s interval. A final continuous visual attention score was created by averaging all code values from each 5-s interval of the reading interaction and was verified by an inter-rater reliability intraclass correlation coefficient > 0.9 on 10% of the sample.

2.3 Statistical analyses

Statistical analyses were executed using RStudio (2024.12.1+563; <https://www.r-project.org>) and, for mediation analyses, the PROCESS macro software package in SPSS (Version 29.0.1.0; Hayes, 2017). Kolmogorov-Smirnov tests of normality indicated that all variables met normality assumptions and, therefore, parametric statistics were used in continuous analyses. To account for potential differences in oral reading prosody measures based on caregiver sex, Welch's *t*-tests were first conducted to compare prosody features between male and female caregivers. For caregiver prosody measures that revealed significant sex differences, caregiver sex was included as a control variable in analyses.

To answer our main research question of whether caregiver oral reading prosody relates to preschool-age children's language skills, Pearson correlations were used as an initial step. When significant associations were observed, multiple regression models were employed to examine whether the caregiver oral reading prosody measure continued to significantly relate to children's language skills while controlling for child attention, caregivers' use of verbal shared reading techniques during extratextual talk, shared reading time, and caregiver education. Based

on established links between shared reading time and language development (Bus et al., 1995), and emerging evidence that caregiver prosody relates to preschoolers' listening comprehension (Davison et al., in press), we examined the interaction between shared reading time and oral reading prosody within multiple regression models to clarify their potential interplay. This allowed us to test whether the relationship between oral reading prosody and child language development is moderated by shared reading time, reflecting the possibility that prosodic features are particularly meaningful when children have less exposure to language-rich content in children's books. When significant interaction effects were indicated, a Levene's test for homogeneity of variance was conducted for the prosody measure to assess whether the observed interaction effect might be influenced by differences in variance across different shared reading time levels.

To examine the possible influence of caregivers' reading skills on their oral reading prosody during shared reading, we conducted Pearson correlations to assess whether prosody measures were associated with caregivers' reading skills. In line with this focus, correlations involving caregivers' reading skills were used to guide subsequent mediation models, which were pursued only when significant relationships were identified between (1) caregiver reading skills and caregiver oral reading prosody, and (2) caregiver oral reading prosody and children's language skills. This approach allowed us to examine whether caregiver reading skills were indirectly related to child language skills via caregiver oral reading prosody, consistent with literature suggesting that caregiver skills and attributes can manifest in home language and literacy environment to shape children's language development (Hart et al., 2021; van Bergen et al., 2017). Mediation analyses were run regardless of establishing a direct relationship between independent (i.e., caregivers' reading skills) and dependent variables (i.e., children's language

skills), per guidance that modern mediation models support testing for indirect mediation effects and deem direct effects unnecessary so long as bootstrapping procedures are employed (Shrout & Bolger, 2002). Specifically, simple mediation analyses were conducted for caregiver oral reading prosody measures that were significantly associated with both caregivers' reading skills and a child language skill measure. A nonparametric bootstrapping method was employed by repeatedly sampling from the data to calculate the indirect mediation effect in each sample, with 5000 simulations performed for each mediation model (Preacher & Hayes, 2004).

Following simple mediation analyses, we then tested shared reading time as a moderator of the second stage of the mediation pathway (i.e., from prosody measures to child language skills) specifically in cases where multiple regression analyses revealed a significant interaction between shared reading time and a given prosody measure. This approach was motivated by evidence that prosodic cues may be especially supportive when children encounter complex and advanced language (Foursha-Stevenson et al., 2017; Tomasello, 2000); such support may be particularly relevant for children with less shared reading exposure, a pattern often documented among families of caregiver(s) with low reading abilities (Davison et al., 2024; Dilnot et al., 2017; Esmaeeli et al., 2018; Hamilton et al., 2016). Accordingly, moderated mediation models allowed us to evaluate whether indirect effects of caregiver reading skills on children's language skills via prosody were conditional on the amount of shared reading at home. To facilitate interpretation of the moderated mediation effect, the continuous moderator – shared reading time – was categorized into three levels based on the sample mean and standard deviation. Specifically, scores one standard deviation below the mean were categorized as “low”, those within one standard deviation of the mean as “moderate”, and those one standard deviation above the mean as “high”. This facilitated examination of conditional indirect effects across

meaningful levels of shared reading time. Given prior research establishing positive effects of caregiver education on children's language skills (Rowe, 2008, 2018), caregiver education was employed as a key control in all simple mediation and moderated mediation models. Moreover, all continuous variables were mean-centered prior to analysis to aid interpretation of model coefficients.

3. Results

3.1 Associations between caregiver oral reading prosody and children's language skills

Before conducting correlation analyses, Welch's *t*-tests were performed to assess whether caregiver sex should be included as a control variable in analyses involving caregiver oral reading prosody measures. Results showed that caregiver sex was significantly associated with intonation mean ($t = 3.417, p = .004$). No significant sex differences were found for any other oral reading prosody measures. Therefore, caregiver sex was included as a control variable only in correlation analyses involving intonation mean.

For correlation analyses between caregiver oral reading prosody measures and children's language skills, two significant results were revealed. Specifically, caregiver intonation range positively related to children's receptive vocabulary ($r = .39, p = .014$, see Figure 1, Panel A) while the frequency of caregivers' inappropriate pauses (hereafter "inappropriate pauses") negatively related to children's core language skills ($r = -.48, p = .001$, see Figure 1, Panel B). No other significant effects for children's language skills were observed (for full review of correlation analyses examining caregiver oral reading prosody in relation to children's language skills, see Table 2; see Supplemental Materials for additional consideration of whether caregiver oral reading prosody relates to children's verbal engagement during the observed shared reading interaction; no significant effects were observed).

Given the significant relationships observed between caregiver oral reading prosody measures and children's language skills, multiple linear regression analyses were then conducted to test whether these associations remained significant while controlling for key variables. Controlling for child attention, caregiver education, shared reading time at home, and caregivers' use of verbal shared reading techniques during extratextual talk, caregiver intonation range was a significant, positive predictor of children's receptive vocabulary ($\beta = 2.12, p = .021$). Employing the same control variables, caregiver inappropriate pauses was a significant, negative predictor of children's core language skills ($\beta = -.287, p = .007$). In a next step, we added the interaction term between each prosody measure and shared reading time to the multiple regression models to test for moderation effects. Results indicated significant moderation by shared reading time: the interaction between caregiver intonation range and shared reading time significantly predicted child receptive vocabulary ($\beta = -3.282, p = .047$) and the interaction between caregiver inappropriate pauses and shared reading time significantly predicted child core language skills ($\beta = 2.031, p = .017$). Specifically, at lower levels of shared reading time, the positive association of intonation range and child receptive vocabulary and the negative association of inappropriate pauses and child core language skills were both stronger. The overall final models including the interactions predicted 48% of the variance in children's receptive vocabulary and 34% of the variance in children's core language skills, respectively (for final multiple regression models, see Table 3).

To further examine whether the observed, significant interaction effects in the multiple regression models may have reflected shared variance between shared reading time and prosody variables, we tested bivariate correlations between shared reading time and both caregiver prosody measures. No significant relationships were found (shared reading time and caregiver

intonation range: $r = -.14, p = .387$; shared reading time and caregiver inappropriate pauses: $r = .18, p = .257$), suggesting that the interaction effect was unlikely driven by overlap between these variables. Moreover, when grouping participants based on shared reading time levels (Low = 1.28 [-1 SD], Moderate = 1.89 [mean], High = 2.5 [+1 SD]), Levene's tests indicated no significant differences in variance for intonation range ($F(2, 38) = 1.31, p = .28$) nor inappropriate pauses ($F(2, 38) = 0.13, p = .88$) across groups. These results suggest that the observed interaction effects were not attributable to differences in the spread of prosody measures across shared reading time levels.

3.2 Associations between caregiver oral reading prosody and caregivers' reading skills

For correlation analyses examining relationships between caregivers' reading skills and their oral reading prosody production within the context of shared reading interaction, several significant results were indicated. Specifically, caregiver reading skills significantly related to caregiver intonation range ($r = .50, p = .001$), loudness range ($r = .44, p = .005$), and both the total number of appropriate ($r = -.40, p = .013$) and inappropriate pauses ($r = -.50, p = .001$). Controlling for caregiver sex, caregiver reading skills also significantly related to caregiver intonation mean ($r = .50, p = .001$). No results were indicated for the average duration of caregivers' appropriate ($r = -.11, p = .50$) and inappropriate pauses ($r = -.31, p = .057$), nor reading rate ($r = .21, p = .212$).

3.3 Mediation analyses

With the significant findings indicated in correlation analyses, two simple mediation models were evaluated. The first model included caregiver reading skills as the independent variable, caregiver intonation range as the mediating variable, and children's receptive vocabulary as the outcome variable. The second model included caregiver reading skills as the

independent variable, caregiver inappropriate pauses as the mediating variable, and children's core language skills as the outcome variable. Further, to control for possible effects of caregivers' educational attainment, caregiver education was employed as a control variable in analyses.

In both models, direct relationships between caregiver reading skills and children's language skills were not indicated (caregiver reading skills with children's receptive vocabulary: $c = 0.234, t = 0.551, p = .585$; caregiver reading skills with children's core language skills: $c = 0.248, t = 0.586, p = .562$). Since modern mediation deems direct effects unnecessary (Shrout & Bolger, 2002), indirect effects tested possible effects of caregiver reading skills on children's language skills through oral reading prosody measures. In Model 1A, the indirect effect of caregiver reading skills on children's receptive vocabulary through caregiver intonation range indicated a significant mediation effect ($ab = 0.592$, 95% confidence interval [CI: 0.035, 0.404]; see Figure 2, Model 1A), accounting for caregiver education. Similarly, Model 1B revealed a significant mediation effect with an indirect effect of caregiver reading skills on children's core language skills through caregiver inappropriate pauses ($ab = 0.905$, 95% CI [0.210, 1.657]; see Figure 2, Model 1B), accounting for caregiver education. These findings suggest that caregiver oral reading prosody mediates the link between caregivers' reading skills and children's language skills.

3.4 Moderated mediation analyses

Building on regression findings revealing significant moderation effects of shared reading time on relationships between caregiver prosody and children's language skills, we next examined whether this moderation extended into mediation models. Specifically, we explored whether the indirect effect of caregiver reading skills on children's language skills via oral reading prosody measures varied as a function of shared reading time using moderated

mediation. As such, shared reading time was used as a moderator on path b in both models. There was no moderated mediation effect for child core language skills significant (Index = -0.679, bootstrapped SE = 0.528, 95% CI [-1.669, 0.350]). By contrast, the model with child receptive vocabulary (see Figure 3) revealed a significant moderation effect, such that the association between caregiver intonation range and children's receptive vocabulary varied based on levels of shared reading time ($b = -4.053$, SE = 1.720, $t = -2.356$, $p = .025$, see Figure 4). Conditional indirect effects indicated that caregiver reading skills were significantly associated with child vocabulary through intonation range at low ($ab = 1.183$, 95% CI [0.300, 2.164]) and moderate ($ab = 0.655$, 95% CI [0.155, 1.175]) levels of shared reading time, but not at high levels ($ab = 0.128$, 95% CI [-0.572, 0.716]). The index of moderated mediation was significant (Index = -0.909, bootstrapped SE = 0.513, 95% CI [-2.028, -0.004]), confirming that the strength of the indirect effect via prosody varied by shared reading time. This moderated mediation effect indicates that indirect effect of caregiver reading skills on child vocabulary through intonation range was strongest in homes with less frequent shared reading (full mediation and moderated mediation analysis results are available in Table 4).

4. Discussion

This study sought to address whether caregiver oral reading prosody serves as a distinct shared reading technique associated with preschool-age children's language skills. Results reveal, for the first time, associations between caregiver oral reading prosody and standardized measures of preschoolers' language skills. Specifically, caregivers' use of intonation variation when reading to their child positively related to children's receptive vocabulary, and the more caregivers paused inappropriately while reading negatively related to children's core language skills (i.e., more inappropriate pausing, lower language). Both results were significant when

controlling for key additional markers of shared reading exposure including caregivers' use of verbal shared reading techniques during extratextual talk. Moreover, shared reading time significantly moderated prosody measures in regression models, suggesting a possible compensatory role of prosody in lower-reading exposure contexts. Results also indicate that caregiver oral reading prosody mediates links between caregivers' reading skills children's language skills. Importantly, the indirect pathway from caregiver reading skills to children's receptive vocabulary via caregivers' intonation range in mediation analyses was moderated by shared reading time, such that the effect was strongest in dyads reporting lower levels of shared reading engagement. In sum, this research underscores the role of caregiver oral reading prosody as a distinct and meaningful component of shared reading that may support young children's language skill development, with particular importance in contexts where shared reading time is more limited.

The present study contributes to a growing body of evidence indicating positive associations between more "expressive" oral reading during caregiver-child shared reading interactions and children's language skills. Specifically, caregivers' intonation use while reading has been positively linked to young children's concurrent receptive language skills, suggesting that intonation features of prosody may facilitate children's understanding of language presented in book reading interactions (Davison et al., in press; Zuk et al., 2025). Directly in line with these findings, this is the first study to specifically link oral reading prosody – particularly, intonation range – with preschool-age children's receptive vocabulary. This finding further aligns with CDS research showing how intonation variation in conversational speech prosody, together with other CDS features, supports children's word learning by highlighting focal words in continuous speech streams (Nencheva & Lew-Williams, 2021; Ma et al., 2011). With shared reading serving

as an aspect of the home language and literacy environment that is infused with more diverse vocabulary than is typically found in everyday conversational interactions (Montag et al., 2015), the present results suggest that expressive reading might bolster children's acquisition of diverse vocabulary provided in reading interactions. Moreover, by controlling for caregivers' use of verbal shared reading techniques during extratextual talk (i.e., print references and prompting questions) in analyses, results point toward a unique contribution of oral reading prosody for children's language learning. Although this approach did not capture the full range of strategies caregivers may use during shared reading, findings provide compelling evidence to suggest that the manner in which caregivers vocally deliver the text, through intonation variation, may play a distinct role in supporting children's language acquisition. Ultimately, future longitudinal and intervention work is necessary to test the causal role of caregivers' intonation variation in supporting children's language growth over time.

The present findings offer novel evidence that fewer inappropriate pauses during caregivers' oral reading is associated with stronger core language skills in children. Prior research suggests that acoustic features of CDS support key components of children's language development as their linguistic skills develop, including their acquisition of grammatically complex sentence structures and advanced vocabulary (Foursha-Stevenson et al., 2017; Nancheva et al., 2021; Hollich et al., 2000). For this reason, we selected a measure of overarching language skills that effectively captured these core dimensions of children's language competence (i.e., the CELF-P3 Core Language Score). Using this measure, the present findings extend prior research demonstrating positive links between caregivers' appropriate (i.e., grammatical) pauses and children's listening comprehension (Davison et al., in press) by further demonstrating that less frequent inappropriate pausing is likewise associated with stronger core

language skills. Given that readers' use of appropriate pauses can signal syntactic units within written text (Kim et al., 2021; Wade-Woolley et al., 2021), inappropriate pauses in caregivers' reading could signal unintentional grammatical boundaries which, in turn, may hinder children's language comprehension. Importantly, hypotheses surrounding how prosody in CDS facilitates children's language development propose that acoustic signals in prosody itself support children's language learning (Hollich et al., 2000; Ma et al., 2011), and also that prosody may attract children's attention to linguistic input (Spinelli et al., 2017; Nencheva et al., 2021; Rosslund et al., 2022). In the current findings, associations between caregiver oral reading prosody and child language were significant when controlling for child attention within the observed reading interaction. While the present study design precludes causal determination of how caregivers' appropriate and inappropriate pausing impacts children's language learning, the inclusion of child attention as a control suggests that acoustic signals of prosody may support language development beyond solely capturing children's attention.

In line with our hypothesis, multiple regression analyses revealed significant interaction effects between shared reading time and oral reading prosody in relation to child language skills. Specifically, associations between intonation range and receptive vocabulary, and between inappropriate pauses and core language skills, were stronger among dyad with lower quantities of reported shared reading at home. These interaction effects complement prior work suggesting that prosodic cues may be especially helpful when children encounter complex and advanced language (Foursha-Stevenson et al., 2017; Ma et al., 2011; Tomasello, 2000). It is possible that when shared reading is infrequent and children have fewer opportunities to engage with the language-rich content found in books, prosodic cues during those limited interactions may become especially important for supporting children's language acquisition. However, the cross-

sectional nature of this study limits conclusions about directionality, and overall levels of shared reading in the present sample of highly educated caregivers may have been relatively high compared to the general population. This may impact the generalizability of the findings and highlights the need for future research to examine these patterns among families with lower levels of shared reading engagement.

In addition to examining caregiver oral reading prosody in relation to preschoolers' language skills, we aimed to understand how caregiver reading skills may contribute to this association. Although shared reading has been linked to child language even when controlling for caregiver reading skills (Grande et al., 2025), converging evidence suggests that the home environment is shaped in part by caregivers' attributes and skills (Bronfenbrenner & Morris, 2007; Hart et al., 2021; van Bergen et al., 2017). Here we expand on research showing relationships between adults' reading skills and prosody production when reading adult-level text (Binder et al., 2013) by showing that caregiver skills impact their prosody production within the context of a shared reading interaction. Mediation models further indicate that caregiver reading skills are indirectly associated with child language skills via oral reading prosody measures. Importantly, the moderated mediation revealed that the strength of the indirect pathway from caregiver reading skills to child vocabulary through intonation range depended on the amount of shared reading at home, with prosody emerging as a particularly relevant mechanism among families who engage less in shared reading. This finding suggests that interventions aimed at enhancing caregivers' use of "prototypical" prosody may be especially beneficial among families of caregiver(s) with reading difficulties as well as limited opportunities for shared reading. Since this study included caregivers with typical reading skills, future intervention research including

caregivers with reading difficulties will be essential to determine whether oral reading prosody may serve as a potentially modifiable clinical target in novel intervention approaches.

Our study has a few important limitations. While the present findings provide valuable insight into how caregiver oral reading prosody may shape children's linguistic experiences in shared reading interactions, it is important to acknowledge the modest sample size and limited demographic diversity of the current caregiver-child dyad dataset, underscoring the need for replication with a larger and more diverse sample. Moreover, this study applied a coding approach grounded in prior research on oral reading prosody (Arcand et al., 2014; Álvarez-Cañizo et al., 2020; Benjamin & Schwanenflugel, 2010; Binder et al., 2013; Theune et al., 2006) to classify grammatical pauses or pauses at expected emphatic locations as appropriate. While this method provided a valuable first step in differentiating appropriate versus inappropriate pause effects, pausing in shared reading is inherently nuanced. Therefore, future work using audio-visual recordings and subjective ratings is needed to better capture the communicative functions of caregiver pausing during shared reading. Relatedly, more localized characterization of reading prosody could shed light on how caregivers vary prosodic features (e.g., loudness variation, rate) within utterances and words to shape their oral reading presentation. Finally, this study solely captured caregiver prosody during a caregiver-child shared reading interaction, raising the question of whether the presently observed oral reading prosody measures may reflect caregivers' overall use of prosody across multiple contexts of the home language and literacy environment. In light of recent evidence showing that caregiver prosody differs by context (DiStefano et al., 2025), further investigation is warranted to determine whether oral reading prosody differs from caregivers' use of broader CDS at home.

5. Conclusion

In summary, the present findings provide evidence to suggest caregiver oral reading prosody as a distinct and meaningful shared reading technique associated with children's language skill development. Specifically, findings reveal that caregivers' intonation and pausing when reading a children's book to their child is associated with children's receptive vocabulary and core language skills. Importantly, shared reading time moderation effects suggest that caregiver prosody may play a particularly important role in supporting children's language skills in families with limited opportunities for shared reading engagement. Further, findings are the first to indicate that caregivers' oral reading prosody during shared reading interactions mediates relationships between caregivers' reading skills and children's language skills. This highlights a need for further investigation of whether oral reading prosody may be promoted among caregivers who themselves struggle with reading difficulties. Future intervention and longitudinal work are warranted to examine these relationships in both research and applied settings, including among linguistically and socioeconomically diverse caregiver-child dyads. Overall, findings from this research carry implications for guiding intervention approaches targeting young children's language skill development, especially among families of caregiver(s) with reading difficulties and for those with limited shared reading opportunities.

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Data Availability Statement

The data sets generated and analyzed during this study are available from the corresponding author upon request and after additional analyses are completed.

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Table 1. Descriptive Information

Child Age (months)	58.24 (5.93)
Child Biological Sex (M:F)	19:22
Child <i>CELF</i> Core Language Score (SS)	111.58 (14.58)
Child <i>PPVT</i> Receptive Vocabulary (SS)	114.21 (15.69)
Child Attention (Range: 0 – 4)	2.14 (0.19)
Child Verbal Engagement	
Utterances (number)	25.73 (18.17)
Words (number)	53.22 (42.88)
Child Race (%)	
White/Caucasian	25 (61%)
Black/African American	3 (7%)
Asian	3 (7%)
More than one race	10 (25%)
Caregiver Biological Sex (M:F)	4:37
Caregiver Education (%)	
Partial college (at least one year)	2 (5%)
Undergraduate degree (college)	10 (24%)
Graduate degree	29 (71%)
Caregiver Reading Skills (SS)	105.31 (5.62)
Caregiver Oral Reading Prosody Measures	
Intonation Mean (Hz)	227.16 (35.51)
Intonation Range (Hz)	189.43 (52.51)
Rate(syllables/s)	4.18 (0.46)
Appropriate Pauses (total #)	19.95 (10.42)
Mean Appropriate Pause Duration (s)	0.31 (0.07)
Inappropriate Pauses (total #)	6.07 (4.35)
Mean Inappropriate Pause Duration (s)	0.29 (0.12)
Intensity standard deviation	8.40 (1.01)
Additional Shared Reading Characteristics	
Print References & Prompting Questions (total #)	10.93 (8.52)
Shared Reading Time (Range: 0 – 4)	1.89 (0.61)

Note: mean (standard deviation); CELF and CTOPP scores reflects age standardized scores; M = Male; F = Female; SS = Standard Scores; Hz = Hertz; s = seconds.

Table 2. Correlation analyses between caregiver oral reading prosody and child language skills

	Child Vocabulary	Child Core Language
Intonation Mean	-0.02 ⁺	0.03 ⁺
Intonation Range	0.387	0.190
Rate	-0.014	0.257
Appropriate Pauses	-0.002	-0.160
Appropriate Pause Duration	-0.310	-0.200
Inappropriate Pauses	-0.271	-0.482
Inappropriate Pause Duration	-0.131	-0.266
Intensity Range	0.163	0.121

Note: Pearson *r* value shown for each correlation; ⁺correlations controlling for caregiver sex; significant *p*-values are bolded.

Table 3. Multiple regression models

	<i>coefficient</i>	<i>standardized coefficient</i>	<i>SE</i>	<i>t</i>	<i>p</i>
DV: Child Receptive Vocabulary					
Intercept	-103.923		53.140	-1.966	.059
Child Attention	4.762	0.057	11.970	0.398	.693
Shared Reading Time	45.947	1.768	20.282	2.254	.031
Shared Reading Techniques	-0.252	-0.110	0.312	-0.810	.424
Caregiver Education	5.614	0.417	1.859	3.021	.005
Intonation Range	8.207	1.313	0.312	2.677	.012
Intonation Range*Shared Reading Time	-3.282	-2.021	1.590	-2.064	.047
DV: Child Core Language					
Intercept	119.833		42.418	2.825	.008
Child Attention	3.792	0.048	11.203	0.339	.737
Shared Reading Time	-4.912	-0.205	5.890	-0.835	.410
Shared Reading Techniques	0.110	0.063	0.235	0.468	.643
Caregiver Education	0.086	0.007	1.740	0.050	.961
Inappropriate Pauses	-5.313	-1.601	1.595	-3.331	.002
Inappropriate Pauses*Shared Reading Time	2.031	1.242	0.812	2.502	.017

Note: model for child receptive vocabulary $R^2 = .478$, adjusted $R^2 = .380$, $p < .001$; model for child core language $R^2 = .435$, adjusted $R^2 = .33$, $p < .001$; significant p -values are bolded; DV = dependent variable.

Table 4. Mediation and moderated mediation models

	<i>coefficient</i>	<i>standardized coefficient</i>	<i>SE or BootSE</i>	<i>t</i>	<i>p</i>	<i>Bootstrapped CI</i>
Child Receptive Vocabulary						
Model (1A)						
<i>c</i> : CareRead→ChVocab	0.234	0.085	0.425	0.551	.585	[-0.630, 1.098]
<i>a</i> : CareRead→IntRange	0.224	0.500	0.069	3.273	.003	[0.084, 0.364]
<i>b</i> : IntRange→ChVocab	2.639	0.431	0.992	2.660	.012	[0.618, 4.659]
<i>c'</i> : CareRead→ChVocab	-0.357	-0.130	0.449	-0.796	.432	[-1.272, 0.558]
Indirect Effect						
<i>ab</i> : CareRead→IntRange→ChVocab	0.592	.216	0.092			[0.035, 0.404]
Model (2A)						
<i>c</i> : CareRead→ChVocab	0.234		0.425	0.551	.585	[-0.630, 1.098]
<i>a</i> : CareRead→IntRange	0.224		0.069	3.273	.003	[0.084, 0.364]
<i>b</i> : IntRange*SRTime→ChVocab	-4.053		1.720	-2.356	.025	[-7.566, -0.540]
<i>c'</i> : CareRead→ChVocab	-0.710		0.442	-1.598	.121	[-1.609, 0.196]
Conditional Indirect Effects						
<i>ab</i> : CareRead→IntRange→ChVocab						
Low SRTime	1.183		0.473			[0.300, 2.164]
Mod SRTime	0.655		0.262			[0.155, 1.175]
High SRTime	0.128		0.317			[-0.572, 0.716]
Child Core Language						
Model (1B)						
<i>c</i> : CareRead→ChCore	0.248	0.100	0.422	0.586	.562	[-0.612, 1.106]
<i>a</i> : CareRead→InPause	-0.408	-0.532	0.111	-3.670	<.001	[-0.633, -0.182]
<i>b</i> : InPause→ChCore	-2.221	-0.688	0.538	-4.133	<.001	[-3.315, -1.128]
<i>c'</i> : CareRead→ChCore	-0.658	-0.266	0.411	-1.599	.119	[-1.494, 0.179]
Indirect Effect						
<i>ab</i> : CareRead→InPause→ChCore	0.905	0.366	0.378			[0.210, 1.657]
Model (2B)						
<i>c</i> : CareRead→ChCore	0.248		0.422	0.586	.562	[-0.612, 1.106]
<i>a</i> : CareRead→InPause	-0.408		0.111	-3.670	<.001	[-0.633, -0.182]
<i>b</i> : InPause*SRTime →ChCore	1.665		0.848	1.965	.059	[-0.065, 3.395]
<i>c'</i> : SRTime→ChCore	-0.783		0.395	-1.982	.056	[-1.590, 0.023]
Conditional Indirect Effects						
<i>ab</i> : CareRead→InPause→ChCore						
Low SRTime	1.208		0.586			[0.128, 2.381]
Mod SRTime	0.812		0.377			[0.147, 1.636]
High SRTime	0.415		0.357			[0.300, 1.161]

Note: results control for caregiver education; standardized coefficients not available for models with moderators;

letters (*a, b, c, c', ab*) indicate model path; significant *p*-values are bolded; moderation effects reflect shared reading time levels at sample mean \pm 1 standard deviation (SD; Low = 1.28 [-1SD], Moderate (Mod) = 1.89 [mean], High = 2.5 [+1SD]); SE = Standard Error; Boot = Bootstrapped; CI = Confidence Interval; CareRead = Caregiver Reading Skills; IntRange = Intonation Range; ChVocab = Child Vocabulary; SRTime = Shared Reading Time; ChCore = Child Core Language; InPause = Inappropriate Pauses.

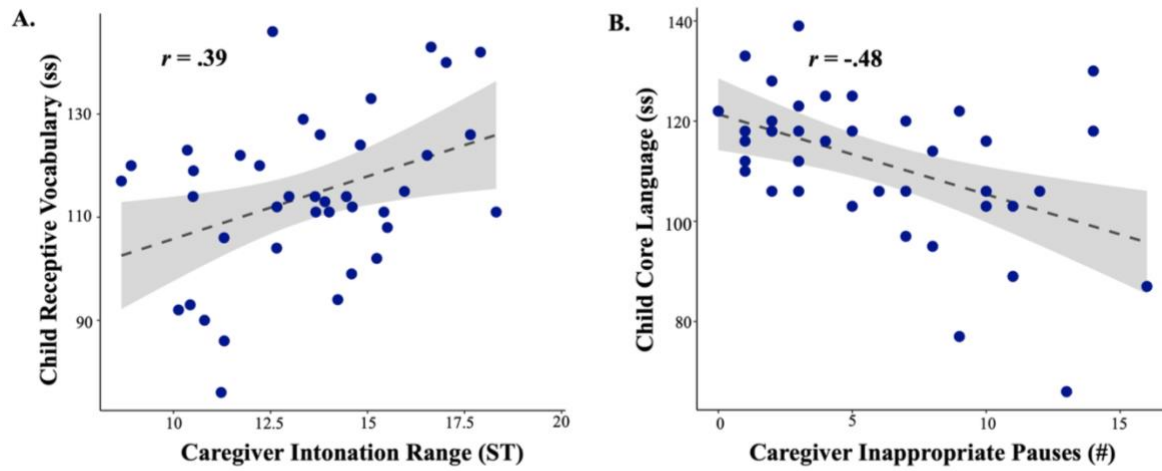


Figure 1. Scatter plots depicting correlations between (A) caregiver intonation range in semitones (ST) and child vocabulary standard scores (ss) and (B) the total number of caregivers' inappropriate pauses and child core language skills.

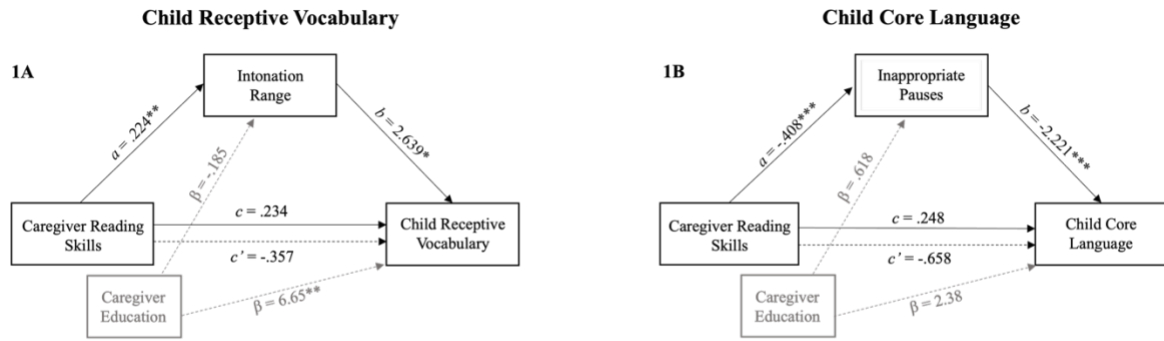


Figure 2. Simple mediation models of caregiver reading skills on child language skills mediated by caregiver oral reading prosody measures. Path coefficients reflect unstandardized values. Significant paths are indicated by $*p < .05$, $**p < .01$, $***p < .001$.

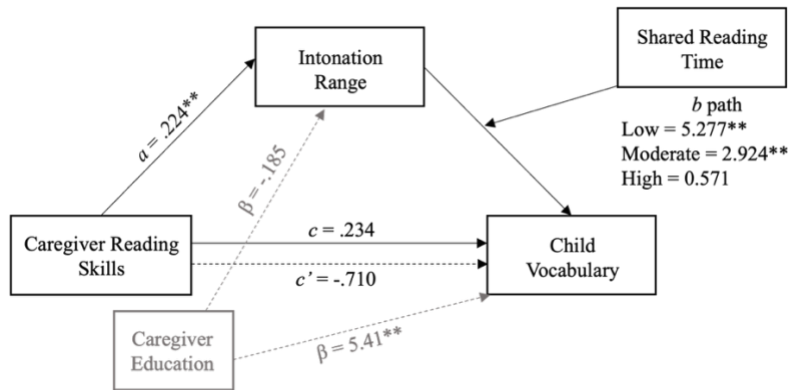


Figure 3. Moderated mediation model of caregiver reading skills on child receptive vocabulary mediated by caregiver intonation range with shared reading time as a moderator on the intonation range effect. Significant paths are indicated by $*p < .05$, $**p < .01$, $***p < .001$. Moderation effects were conducted using shared reading time levels for the sample mean and ± 1 standard deviation (SD) from the sample mean (Low = 1.28 [-1 SD], Moderate = 1.89 [mean], High = 2.5 [+1 SD]).

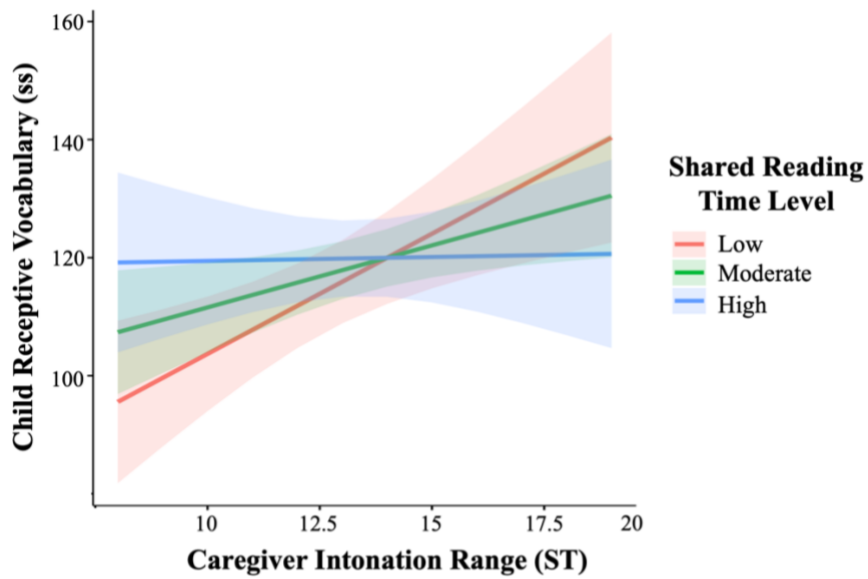


Figure 4. Moderation of the effect of caregiver intonation range in semitones (ST) on child vocabulary standard scores (ss) across shared reading time levels. Shared reading time levels are the sample mean and ± 1 standard deviation (SD) from the sample mean (Low = 1.28 [-1 SD], Moderate = 1.89 [mean], High = 2.5 [+1 SD]).