Strategies for Teaching Verbs to Children with and without Language Impairment

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ABSTRACT

The aim of this feasibility study was to extend the current evidence base on intransitive verb learning by evaluating and comparing three strategies (syntactic cues, semantic cues, combined cues) for teaching novel verbs to expand the vocabularies of children with and without language impairment. Twenty-three children with typical development, seven children with developmental language disorder, and eight children with Down syndrome participated in Studies 1, 2, and 3, respectively. They were taught novel, intransitive verbs using syntactic, semantic, and combined cues and then asked to receptively identify and expressively label the novel verbs. Across all conditions, participants learned novel verbs receptively with large effect sizes and participants with typical development and Down syndrome also learned the verbs expressively with large effect sizes. There were no significant differences between conditions. This study extends word-learning research by evaluating not only receptive but also expressive intransitive verb learning to expand one's vocabulary. The results provide positive evidence for three effective strategies for teaching intransitive verbs to children with and without language impairment.

KEYWORDS: word learning, verbs, language impairment, Down syndrome

Learning Outcomes: As a result of this activity, the reader will be able to:
- Describe syntactic cues for teaching intransitive verbs to children with and without language impairment.
- Describe semantic cues for teaching intransitive verbs to children with and without language impairment.
- Explain why children may learn verbs differently than nouns.

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Semin Speech Lang 2023;44:267–286.
DOI: https://doi.org/10.1055/s-0043-1773785.
ISSN 0734-0478.

The importance of word learning and vocabulary skills cannot be overemphasized due to potentially negative cascading effects in academic, community, and home settings for children with difficulties in spoken vocabulary. Vocabulary skills strongly predict a variety of long-term outcomes, including reading, other academic skills, and occupational attainment, for children with and without language impairment (e.g., Cheng & Furnham, 2012; Johnson & Goswami, 2010; Marchman & Fernald, 2008; Qi & Mitchell, 2012). Much of the literature on word learning in children focuses on noun learning, with a growing body of literature that focuses on the importance of verbs and other word classes (e.g., Horvath & Arunachalam, 2019; Jackson et al., 2019). Individuals must use grammar, which includes using correct verbs and verb markers, to be effective, efficient communicators and to succeed in academic contexts. Difficulties with morphosyntax are hallmark characteristics of specific language impairment (SLI) and impede effective communication (Oetting et al., 2009; Rice & Wexler, 1996; Rice et al., 1998). Verb lexical diversity is associated with grammatical development because different verbs necessitate different clausal structures and marking of aspect, tense, and argument (Bock & Levelt, 1994). Children with less diverse verb lexicons have limited experiences with these sentence production features and reduced learning opportunities for mastering varied sentence forms (Hadley et al., 2016). For toddlers with typical development (TD), verb lexicon measures accounted for more variance in expressive syntax than noun measures (Hadley et al., 2016).

Within the English language, there are many different verb types (e.g., transitive and intransitive) and forms (e.g., regular and irregular; Horvath & Arunachalam, 2019). Because of differences in the characteristics of words, one cannot assume that strategies that support noun acquisition support verb acquisition or that strategies that support the acquisition of one verb type will support learning a different verb type. We sought to build upon and extend the current evidence base on intransitive verb (verbs that do not take a direct object) learning in children with and without language impairment. Teachers and clinicians must help children learn verbs and other word classes to expand vocabularies, build sentences, communicate effectively, and succeed academically.

Differences between the Acquisition of Concrete Nouns and Action Verbs

The developmental trajectories and associated input for verbs and nouns differ for young children. Observational studies indicate that children's early expressive lexicons include more concrete nouns than action verbs (Benedict, 1979; Nelson, 1973). Evidence of faster acquisition of nouns than action verbs in experimental contexts for children with and without language impairment has been identified, but not universally (Leonard et al., 1982; Rice et al., 1990; Schwartz & Leonard, 1984; Stelmachowicz et al., 2004; Storkel, 2003). For example, Storkel (2003) suggested that the identified comparable acquisition rate for nouns and verbs in preschool children with TD could be due to controlling for phonological properties not considered in prior studies.

Hypothesized reasons for differences in the acquisition of nouns and verbs address their conceptual nature and variation in input (Gentner, 2006). Action verbs differ from concrete nouns in important ways that influence theories of acquisition and proposed intervention strategies. Often, individuals can hold and manipulate concrete nouns when describing or learning about them. In contrast, actions may be temporally brief, increasing the memory and attention requirements for pairing spoken words with referents. Relatedly, in natural contexts, adults often label concrete nouns while holding or looking at them, but label actions before they occur and offer "much more subtle, complex, and variegated" (Tomasello, 2000, p. 407) cues for verbs than nouns (Horvath & Arunachalam, 2019; Tomasello & Kruger, 1992). In addition, verbs inherently involve nouns. When labeling actions encountered by young children, objects are often present or at least implied. In contrast, nouns can label an object without referring to an action (Camarata & Leonard, 1985).

Language Difficulties in Children with Primary and Secondary Language Impairment

For children with primary and secondary language impairment, certain skills are expected to be more substantially impacted than others. When providing vocabulary intervention for children with language impairment, it remains unclear which strategies optimize intransitive verb learning receptively and expressively. Effective strategies that consider general patterns of strengths and needs based on etiology as well as individual variation for verb learning are needed. In the current project, we first investigated intransitive verb learning strategies in children with TD. We then tested whether those strategies were effective for children with developmental language disorder (DLD; primary language impairment) and Down syndrome (DS; secondary language impairment) because children in these groups (1) often exhibit vocabulary and morphosyntax difficulties, including verb comprehension and use, and (2) are commonly served by speech-language pathologists (SLPs; Chapman & Hesketh, 2000; Hick et al., 2005; Leonard, 2014).

CHILDREN WITH DLD

Given the change in diagnostic terminology, in our review of the relevant research on verb learning in DLD, we note participants' nonverbal intelligence quotients (NVIQs). Historically, the term "SLI" has been used to describe individuals with primary language impairment and NVIQs within the average range (i.e., standard score of 85–115). DLD also describes individuals with primary language impairment but is more inclusive regarding NVIQ levels. Individuals with DLD may have NVIQs as low as 70. All participants with DLD in the current study achieved NVIQs of at least 70. Children with DLD present with oral language difficulties in the absence of other cooccurring conditions (Bishop et al., 2016), and they often have substantial difficulty learning new words (Kan & Windsor, 2010). For children with DLD, morphosyntax skills are expected to be more substantially impacted than other language skills. Additional concerns include slower vocabulary development and poor short-term verbal memory (e.g., Archibald & Gathercole, 2006; Hick et al., 2005).

There is a small, but growing, literature base on how children with DLD learn verbs. Verb learning studies can focus on varying aspects of verb learning, including but not limited to inferring meaning of syntactic and/or morphological components (e.g., Carr & Johnston, 2001; Eyer et al., 2002) and acquiring root words for verbs to expand one's vocabulary (Riches et al., 2005). Within these verb learning studies, performance of children with DLD has been compared with other diagnostic groups and across different verb types. For example, Carr and Johnston (2001) evaluated the degree to which children with TD and children with SLI can use inflectional morphemes (*-ing*, *-ed*) to infer whether a novel transitive verb denotes an ongoing or completed action. Based on results from twenty-one 3- to 5-year-olds with TD and nine 4- to 5-year-olds with SLI (required to score in normal range for NVIQ), they found that only the group of children with TD (who were younger than the children with SLI) were able to infer the intended meaning of the inflectional morphemes.

A few studies have tested the degree to which children with DLD can learn new verbs to expand their vocabularies. Most of these studies have focused on the use of syntactic bootstrapping. Although the details of syntactic bootstrapping can vary, the general principle is that children can learn new word meanings by identifying the syntactic categories of those words. For example, a child may first recognize that a novel word is a verb because it includes "-ing" at the end. The child then infers that the novel word describes the unfamiliar on-going action because "-ing" denotes an on-going action. As can be seen from the following examples, as compared with children with TD, the children with DLD exhibited greater difficulty attaching meaning to the novel root words for the verbs and that some types of verbs were more challenging than others. Shulman and Guberman (2007) evaluated verb learning via syntactic cues among Hebrew-speaking children with SLI ($n = 13$, mean age = 5;0; NVIQ within the average range), autism ($n = 13$, mean age = 5;7), and TD ($n = 13$,

mean age = 3;8). Children with autism and TD learned the novel verbs using syntactic cues; however, children with SLI did not score above chance levels. Johnson and de Villiers (2009) investigated 4- to 9-year-old children's performance on a verb fast mapping task (learning a word given only minimal exposure). They found that as compared to children with TD, children with SLI (NVIQ reported to be within normal limits) had difficulty using syntactic frames (intransitive, transitive, dative, and complement) to identify the meaning of novel verbs. They also found that for both groups, intransitive verbs were more difficult to learn than transitive verbs and complement structures were the most difficult to learn.

In contrast, Oetting (1999) found that children with SLI (NVIQ reported to be within normal limits) demonstrated the ability to use syntactic cues to interpret verb meaning in transitive and intransitive syntactic frames and performed similarly with age-matched and language-matched controls with TD. Similar to Johnson and de Villiers (2009), verb comprehension was highest when transitive cues rather than intransitive cues accompanied the verbs. Oetting (1999) concluded that children with SLI demonstrated intact syntactic bootstrapping abilities when they did not have to remember specific details about the roles of verbs (i.e., transitive vs. intransitive). In one of the few studies evaluating intransitive verb learning among children with SLI (NVIQ no more than one standard deviation below the mean) and a control group with TD, Riches et al. (2005) explored the effect of frequency and spacing on verb learning. They found that unlike children with TD, children with SLI benefited significantly from frequent (18 rather than 12 presentations) and widely spaced presentations (across 4 days rather than 1 day).

Given the limited number of studies that address how children with DLD learn verbs and which strategies optimize their verb learning as well as the lack of systematic replication, there are still many open questions about these topics. Available studies nearly exclusively focus on syntactic bootstrapping for learning novel words and receptive, but not expressive performance. Greater diversity in learning strategies and consideration of expressive performance is needed to evaluate robust verb learning and to consider not only effectiveness, but also efficiency, of word learning. Strategies other than syntactic bootstrapping may be more effective and/or efficient for children with DLD. Furthermore, only a few studies have explored intransitive verb learning in this population, which may be particularly challenging as compared to learning other word classes for children with DLD (Johnson & de Villiers, 2009) and/or may require different types of teaching strategies relative to other verb types.

CHILDREN WITH DS

Children with DS exhibit varied cognitive and communicative abilities. Although children with DS often experience delays in receptive vocabulary, their receptive skills typically are superior to their morphology and expressive syntax skills. Additional concerns across development are varying degrees of hearing loss, reduced speech intelligibility, and auditory-verbal short-term memory difficulties (Barr et al., 2011; Chapman et al., 1990; Jarrold et al., 2009; Leonard et al., 1999; Maris et al., 2014; Nightengale et al., 2017; Tedeschi et al., 2015). Although evidence is mixed, some researchers suggest that difficulties in these areas negatively impact fast mapping abilities in children with DS.

Children and adolescents with DS did not differ from nonverbal mental age-matched peers in their accuracy receptively and expressively fast mapping novel nouns despite phonological awareness and auditory-verbal short-term memory difficulties in the participants with DS (Chapman et al., 1990; Jarrold et al., 2009). In one of the few studies examining verb learning in this population, adolescents and young adults with DS learned the mapping between a label and transitive action more efficiently given speaker intent (pragmatic) cues rather than grammatical cues (McDuffie et al., 2007). Most successful verb learning occurred when the intended action was presented immediately prior to the probe. Accurate comprehension of novel words correlated highly with syntax comprehension abilities ($r =$ 0.48–0.53). Overall, findings suggest that relative to comprehension, production of novel words is the most vulnerable aspect of fast

mapping for children with DS (McDuffie et al., 2007). Fast mapping difficulties are expected to slow down the development of broader vocabulary, language, and academic skills.

STRATEGIES FOR TEACHING VERBS

The current study compares use of two types of verb teaching strategies that, at least theoretically, could enhance intransitive verb learning for children with and without language impairment: semantic cues and syntactic cues. Semantic cues emphasize a word's meaning. For action verbs, these cues highlight the movement associated with the phonological form. Syntactic cues use principles of syntactic bootstrapping in which children have access to syntactic information to infer verb meaning (Gleitman, 1990).

Semantic Cues

Observing speech-language therapy sessions and reviewing recommended activities on websites quickly reveals the common practice of teaching children action verbs by acting them out. Despite ubiquitous use of this strategy, specific evidence for its effectiveness is not readily available in the literature. Nonetheless, related evidence from general learning theory and embodied cognition suggests that acting out action verbs could improve comprehension and recall. First, different types of instruction yield greater learning benefit for different types of subject matter (Cerbin, 2011). Performing verb actions may be an effective strategy for verb learning because the characteristics of the instructional strategy align with the learning objective—demonstrating the actions. Second, asking the child to perform the target actions provides an opportunity for specific feedback regarding his or her understanding. Benefits of immediate, specific feedback for learning a variety of tasks have been demonstrated (e.g., Black & Wiliam, 1998). Third, adequate motivation is a key component for learning (Bransford et al., 2000). Incorporating performing target actions within functional contexts may increase the child's motivation because accurately performing the action might yield a desired consequence. Last, embodied cognition asserts that sensorimotor processes ground cognition (Ionescu & Vasc, 2014). Evidence that the brain's motor areas are activated during language comprehension tasks suggests active relations between cognitive and sensorimotor tasks at a neural level (Glenberg et al., 2008). It is possible, though untested, that activating motor areas related to semantic information of action verbs by performing the actions could improve verb acquisition by increasing the amount or saliency of input relative to only watching others perform the target actions. Combined, these related bodies of evidence support further evaluation of whether and how semantic cues aid verb learning.

Despite acting out actions being a common clinical practice, there is limited evidence evaluating the effectiveness of this strategy for verb learning. A number of studies demonstrate that observing iconic gestures facilitates novel verb learning and retention in children with TD and children with SLI (e.g., Aussems & Kita, 2019; Goodrich & Hudson Kam, 2009; Vogt & Kauschke, 2017). However, most of these studies simply involve participants *seeing* iconic gestures that reflect the action, rather than acting out the novel verb themselves. Wakefield et al. (2018) investigated whether 4- and 5-year-old children with TD learned and generalized novel verbs for actions on objects after doing or observing the action (e.g., twisting a knob on an object). They found that children needed fewer teaching trials to learn a verb after doing the movement themselves rather than observing others do the movements. They also found that children later recalled more verbs that they had acted out rather than simply observed (Wakefield et al., 2018).

Syntactic Cues

The syntactic bootstrapping hypothesis posits that children use syntactic structure to infer the meaning of words (e.g., Fisher et al., 2006; Gleitman, 1990; Naigles, 1990). The systematic relation between word meaning and syntactic structure is an important source of additional information when inferring the meaning of verbs. Current research suggests that presenting verbs with syntactic cues

improves comprehension of action verbs. Imai et al. (2008) found that English-speaking children use syntactic structure surrounding verbs to infer the meaning of novel verbs. In this study, 5-year-old children demonstrated novel verb learning only when verbs were presented with the full syntactic structure (i.e., "Look! She is X-ing it") and not when they were presented in a bare frame (i.e., "Look! X-ing"). Given expanded syntactic structures, children with TD as young as 2 years have demonstrated the ability to fast map novel verbs to novel actions (Childers & Tomasello, 2002; Golinkoff et al., 1996). It is important to note that some syntactic frames may be more helpful than others and that more complex linguistic contexts may be particularly difficult for children with language impairment. In some instances, but not all, children with SLI have shown difficulty learning verbs via syntactic bootstrapping, especially for intransitive verbs compared with transitive verbs (Johnson & de Villiers, 2009; Oetting, 1999). Children with SLI also have shown difficulty differentiating transitive and intransitive verbs, indicating a weakness in the use of syntactic rules as a means for learning novel verbs (Shulman & Guberman, 2007).

For semantic and syntactic cues, it is likely that certain characteristics of the target words (e.g., transitive vs. intransitive verb forms) and of individual learners (e.g., age, language level, engagement) influence the cues' effectiveness. Future research will be needed to investigate these possibilities as the evidence base for verb interventions develops.

THE PRESENT STUDIES

In three preliminary studies, we evaluated and compared the effectiveness of semantic cues, syntactic cues, and the combination of semantic and syntactic cues for teaching intransitive verbs to children receptively and expressively. In each study, we addressed two research questions: (1) In each condition (semantic cues, syntactic cues, combined cues), do children learn the novel verbs? (2) Does performance vary by teaching condition? In Study 1, we first examined these research questions in preschool children with TD to demonstrate feasibility of the study procedures. We also addressed an additional exploratory research question in the TD group. (3) Is there a relationship between syntactic comprehension and fast mapping performance in each teaching condition? In Studies 2 and 3, we examined the first two research questions in children with DLD and DS. Data collection for the DLD and DS groups was unfortunately stopped prematurely due to the COVID-19 pandemic; thus, we present preliminary findings for these two groups. We hypothesized that across study groups, children would demonstrate above zero accuracy for each condition (RQ1) and we predicted greater accuracy receptively identifying and expressively labeling novel verbs in the combined cues condition than other two conditions (RQ2). Lastly, in an exploratory analysis with the TD group, we predicted a significant correlation between syntactic comprehension and fast mapping performance receptively and expressively (RQ3). One might expect that syntax comprehension skills (as measured by the Grammatical Morphemes and Elaborated Phrases and Sentences subtests) would relate to the proficiency with which an individual learns the meaning of novel verbs, particularly when the verb is embedded within a sentence. This result would replicate findings from McDuffie and colleagues (2007).

METHOD

All study procedures were approved by the institutional review boards at Vanderbilt University and Baylor University. Parents or legal guardians provided written informed consent, and participants provided verbal or written assent prior to beginning study activities.

Participants

Three groups of children are recruited for the studies: (1) 3- to 6-year-old children with TD, (2) 5- to 9-year-old children with DLD, and (3) 7- to 16-year-old children with DS. The participants were recruited from the metropolitan area of a mid-size city in the southeastern United States and a small city in the south-central United States. The age ranges are designed to reflect groups of children with similar language abilities. The group of children with TD is included to highlight similarities

and differences among children with and without language impairment in the effectiveness of verb teaching strategies. Children who (1) use oral communication as their primary means of communication, (2) are monolingual English speakers, and (3) behaviorally able to attend for 20 minutes with minimal breaks were recruited for each group. Participants must have been monolingual English speakers to ensure that English vocabulary difficulties are not due to limited exposure to English and to avoid multiple phonological systems confounding the equal difficulty of the word sets. Participants were excluded across all groups for the presence of uncorrected vision impairment, motor impairment that prevented the child from completing the study procedures, and any concomitant disorder with an educational impact (e.g., attention-deficit hyperactivity disorder, autism).

For hearing level, participants were required to respond to pure tones at 500, 1,000, 2,000, and 4,000 Hz in one or both ears. To begin, all tones were presented at 30 dB. If a participant failed to respond to a particular frequency at 30 dB, the intensity of the tone was increased until a passing response (two out of three presentations) was obtained and recorded. For NVIQ, children with TD were excluded if they scored more than one standard deviation below the mean (i.e., standard score <85) on the Primary Test of Nonverbal Intelligence (PTONI; Ehrler & McGhee, 2008). The mean internal consistency reliability by age was 0.93 and the mean test–retest reliability was 0.97, as reported in the PTONI manual. Children with DLD and children with DS were excluded if they scored more than two standard deviations below the mean for NVIQ. Participants aged 6 years and older were administered the Test of Nonverbal Intelligence – Fourth Edition (TONI-4; Brown et al., 2010), rather than the PTONI. The TONI-4 is designed for individualized aged 6 through 80 years. The mean internal consistency reliability by age was 0.96 and the mean test–retest reliability by age was 0.86, as reported in the TONI-4 manual. Given the age range of the participants with DLD and DS, all of the children with DS were administered the TONI-4 and all but one with DLD were administered the TONI. For language skills, inclusion criteria for the DLD group included being enrolled in speech-language therapy services for language impairment or scoring at least one standard deviation below the mean on the Structured Photographic Expressive Language Test – Third Edition (SPELT-3; Dawson et al., 2003). The mean internal consistency reliability by age was 0.92 and the mean test–retest reliability was 0.94, as reported in the SPELT-3 manual.

Participants in all groups were characterized by (1) demographics (e.g., sex, race, ethnicity, and maternal education); (2) receptive and expressive vocabulary measured with the Receptive and Expressive One Word Picture Vocabulary Tests (ROWPVT-4 and EOWPVT-4, respectively; Martin & Brownell, 2011a, 2011b); (3) syntax comprehension measured by the Test for Auditory Comprehension of Language – Fourth Edition (TACL-4; Carrow-Woolfolk & Allen, 2014); and (4) speech accuracy measured with the Arizona Articulation Proficiency Scale – Fourth Edition (Arizona-4; Fudala & Stegall, 2017). The ROWPVT-4 and EOWPVT-4 manuals reported median internal consistency reliability coefficients by the age of 0.97 and 0.95, respectively, as well as test–retest reliability coefficients of 0.97 and 0.98, respectively. The TACL-4 manual reported mean internal consistency reliability coefficients by age ranging from 0.94 to 0.97 and test–retest reliability ranging from 0.71 to 0.85 across the subtests and index score. The Arizona-4 manual reported mean internal consistency reliability ranging from 0.90 to 0.94 for the age range of our participants and test–retest reliability of 0.96. All measures were found to have strong evidence of content, construct, and criterion-related validity. Performance on these descriptive measures did not determine eligibility for the study. The aforementioned data were collected during the first study session which lasted approximately 90 minutes. Participants were given breaks as needed throughout the session.

STUDY 1 PARTICIPANTS: CHILDREN WITH TD

Twenty-three children with TD participated (10 males, 13 females). They had a mean age of 4;11 ($SD = 13$ months; range: 3;0–6;7). Descriptive statistics are displayed in Table 1.

Table 1 Participant characteristics

Characteristic	TD ($n = 23$) M (SD)	DLD ($n = 7$) M (SD)	DS ($n = 8$) M (SD)
Chronological age (months;years)	4;11 (1;1)	7;3 (1;4)	9;9 (2;3)
Nonverbal intelligence quotient	116 (20)	93 (9)	73 (4)
Receptive vocabulary (SS)	118 (8)	86 (8)	64 (7)
Expressive vocabulary (SS)	118 (12)	80 (12)	71 (11)
Syntactic comprehension			
Grammatical morphemes (raw score)	37 (8)	39 (7)	30 (14)
Elaborated phrases and sentences (raw score)	33 (12)	30 (11)	21 (6)
Grammatical morphemes (scaled score)	12 (2)	8 (2)	3 (2)
Elaborated phrases and sentences (scaled score)	12 (2)	7 (3)	2 (1)
Articulation (SS)	98 (7)	80 (19)	62 (18)

Abbreviations: DLD, developmental language disorder; DS, Down syndrome; SS, standard score; TD, typical development.

Parents identified 17 of the participants as white and 6 as more than one race. Regarding ethnicity, parents identified two of the participants as Hispanic or Latino and 20 as not Hispanic or Latino. Information on ethnicity was not provided for one participant. Maternal education level was reported to be a bachelor's degree for eight participants, master's degree for seven, professional degree for seven, and some college for one. All but two children with TD passed the hearing screening at 30 dB for all tested frequencies; the remaining two demonstrated a reliable response at 40 dB for one to four tested frequencies and 30 dB for the other frequencies. The higher intensity was likely needed due to unfamiliarity with the hearing screening task. All participant caregivers reported no hearing concerns.

STUDY 2 PARTICIPANTS: CHILDREN WITH DLD

Seven children with DLD (5 males, 2 females) participated. They had a mean age of 7;3 (SD = 16 months; range: 5;6–9;8). Descriptive statistics are displayed in Table 1. The participants with DLD achieved a mean standard score of 73 (SD = 12) on the SPELT-3. Consistent with the definition of DLD, all participants achieved a NVIQ score of at least 70. Only one participant scored between 70 and 84, with a score of 78. Therefore, six of the seven participants with DLD also meet criteria for SLI.

Parents identified four of the participants as white and one as black or African American. Race was not reported for two participants. Regarding ethnicity, parents identified three of the participants as Hispanic or Latino and four as not Hispanic or Latino. Maternal education level was reported to be some college for two participants, master's degree for two, some high school for one, associate degree for one, and bachelor's degree for one. All children with DLD passed the hearing screening at 30 dB.

STUDY 3 PARTICIPANTS: CHILDREN WITH DS

Eight children with DS participated (2 males, 6 females). They had a mean age of 9;9 (SD = 27 months; range: 7;10–14;2). Descriptive statistics are displayed in Table 1. Parents identified all eight participants as white. Regarding ethnicity, parents did not identify any participants as Hispanic or Latino. Seven participants were identified as not Hispanic or Latino, and ethnicity information was not provided for one participant. Maternal education level was reported to be associate degree for three participants, master's degree for two, bachelor's degree for one, and professional degree for one. Three children with DS passed the hearing screening at 30 dB. The remaining participants demonstrated reliable responses at 35 dB for one frequency, 35 dB for three frequencies, 40 dB for one frequency, and 40 dB for three frequencies, respectively. The mean intensity needed to elicit a reliable response ranged from 30 to 37 dB across all frequencies for both ears for all participants with DS.

Stimuli

NOVEL WORDS

During the second study session, which lasted approximately 45 minutes, participants were taught novel, intransitive verbs (verbs that do not take a direct object) under semantic cues, syntactic cues, and combined cues conditions. Novel verbs eliminate the possibility of prior exposure and enable balanced word sets. All words are one syllable consonant–vowel–consonant (CVC) words because verbs tend to have fewer syllables than nouns and the CVC word shape is early developing (Storkel, 2003). Nine of the 12 consonants included are typically acquired before the age of 4;0 and all are typically acquired before the age of 5;0 (Crowe & McLeod, 2020). In conjunction with relatively early developing consonants, primarily tense vowels that are expected to be in the participants' phonemic repertoires were included, which aids receptive and expressive acquisition (Leonard et al., 1982). Word sets are balanced for phonotactic probability (Lund, 2019; Stoel-Gammon, 2011; Storkel, 2003; Storkel & Hoover, 2010; Storkel & Lee, 2011). The word sets are (a) /getʃ/, /pib/, /wɑm/, and /zod/, (b) /jotʃ/, /kub/, /pem/, and /vɑd/, and (c) /jum/, /tɑtʃ/, /ked/, and /vob/. These sets were randomized to condition by participant and counterbalanced across participants.

The incidences of hearing loss, including permanent and transient hearing loss, are elevated in children with DS relative to the general population (Barr et al., 2011; Leonard et al., 1999; Maris et al., 2014; Nightengale et al., 2017; Tedeschi et al., 2015). For example, children with DS are at elevated risk for otitis media with effusion, which can result in a transient conductive hearing loss (Barr et al., 2011; Maris et al., 2014). To minimize possible effects of hearing loss, the novel words do not contain high-frequency sounds (based on acoustic frequency). Such sounds are more likely to be less audible, inaudible, or distorted to children with hearing loss than lower frequency sounds and influence word learning of children with hearing loss (Niskar et al., 1998; Shargorodsky et al., 2010; Stelmachowicz et al., 2004).

NOVEL ACTIONS

Intransitive action verbs are used because they do not require use of objects or multiple actors and participants can demonstrate them. No mental state (e.g., "think" or "know") or possessive verbs (e.g., "have") were used. Because children with developmental disabilities often exhibit areas of need in motor skills, particularly fine motor skills, we selected salient novel actions that require limited fine and gross motor skills. For equal difficulty across sets, each set includes one single arm action, one single leg action, and two double arm actions. ►**Supplementary Material 1** (available in online version only) provides descriptions with still images of the novel actions.

Procedures

TEACHING PHASE

Given the substantial literature base demonstrating that multiple repetitions facilitate word learning (e.g., Horvath & Arunachalam, 2019), the examiner (trained graduate student or first author) labeled each target word and performed the corresponding action six times in each condition. She elicited the target word from the participant two times per word per condition and provided feedback on accuracy each time. In the semantic cues condition, the examiner prompted the child to perform the target action twice. In the syntactic cues condition, instead of only saying the target word with the present progressive verb marker, the examiner used two forms of complete sentences while performing the action (i.e., "I am X-ing," and "See. I X."). In the combined cues condition, the examiner prompted the child to perform the target action and consistently used complete sentences with the present progressive verb marker. See ►**Supplementary Material 2** (available in online version only) for details.

TESTING PHASE

Within each condition, the examiner asked the participant to receptively identify each novel verb after teaching two words. After teaching all four items in a condition, the examiner asked the child to identify the last two words and label all four words taught in the condition. Frequent

testing was designed to minimize order effects due to increased memory load as time progressed. Words were administered in a predetermined random order. The lists were generated by automated shuffling of cells in an electronic spreadsheet. The testing probes included videos to present the novel actions consistently across participants.

Receptive probe items were administered immediately after each pair of words was taught. The participant was shown two videos side-by-side via a slideshow on a laptop and asked to select the named novel action (e.g., "Point to X-ing"). The videos played repeatedly to reduce the memory load for recalling the action. The first two items were practice items with real, known actions (e.g., "Point to jumping") to ensure the child understood the task. The examiner provided feedback to the participant for the practice items. The test items followed with the same format except that the examiner did not provide feedback. One repetition of the prompt (e.g., "Show me meebing") was permitted. Three trials per taught novel word were presented for a total of six receptive trials per set. Participants could earn scores from 0 to 6 per set for a total of 0 to 12 for each condition. The examiner was permitted to review the recording if needed to score a participant's responses.

For the expressive probe, participants were asked to watch short videos of the novel actions and label the novel actions. The actor (second author) in the video was consistent across all videos and was not an examiner for any of the participants' teaching sessions. The examiner played the video and then asked, "What is she doing?" As with the receptive probes, the first two items were practice items with real, known actions (e.g., a person jumping). The examiner provided feedback on accuracy to the participant for the practice items, but not the test items. Each novel action was tested once for a total of four test items per set. To score the expressive items, the examiner transcribed the participants' responses using the International Phonetic Alphabet (IPA). The item was scored as correct if the participant produced the word root completely accurately or produced an acceptable articulatory approximation. For example, root words were scored as accurate if the participant produced the word with a functionally equivalent vowel (e.g., /ʊ/ for /u/ or /ɪ/ for /i/) or exhibited use of a phonological error common in young children (e.g., prevocalic voicing) that the participant also exhibited during the eligibility evaluation. Recall that we created novel words with early developing phonemes to increase the likelihood of the participants being able to pronounce the target words. Use of "-ing" was not considered in the scoring criteria. Participants could earn scores from 0 to 4 for each condition.

Participants are given a brief (approximately 4 minutes) break after each testing phase before the next condition's teaching phase. During this break, they were permitted to play independently with developmentally appropriate toys and craft materials (e.g., coloring and stickers).

Procedural Fidelity and Interobserver Agreement

Trained research assistants coded at least 20% of the sessions for procedural fidelity and interobserver agreement (IOA) across examiners and diagnostic groups. The examiner was blinded to which sessions would be coded for procedural fidelity and IOA. All sessions were video recorded. For procedural fidelity, the research assistant determined whether the examiner followed each step of the teaching and testing procedures. These behaviors include providing the correct number and types of labels and elicitations per word and providing feedback only when appropriate. For IOA, point-by-point agreement was calculated for the receptive and expressive probes.

Analysis Plan

This study used a within-participant design in which all participants completed each of the three teaching conditions: syntactic cues, semantic cues, and combined cues. Separate analyses were completed for each diagnostic group. To reduce the number of assumptions about the data in the context of relatively small sample sizes, we used nonparametric analyses. One sample Wilcoxon's signed-rank tests were performed to address whether children learn the novel verbs (RQ1). For receptive performance, one sample Wilcoxon's signed-rank tests were

used to determine whether participants achieved above chance performance (i.e., >50% accuracy) for each condition. For expressive performance, one sample Wilcoxon's signed-rank tests were used to determine whether participants achieved above zero accuracy for each condition. To evaluate differences in performance by condition (RQ2), paired Wilcoxon's signed-rank tests were used to test for differences in fast mapping of verbs receptively and expressively across conditions within each diagnostic group. The nonparametric paired Wilcoxon's signed-rank test is analogous to the paired *t*-test. The *Z*-values generated from the Wilcoxon signed-rank tests are used to calculate effect sizes (*r*; Cohen, 1988; Fritz et al., 2012). For *r*, 0.1 is considered a small effect size, 0.3 is considered medium, and 0.5 is considered large (Coolican, 2009; Fritz et al., 2012).

To evaluate the relationship between syntactic comprehension and fast mapping performance in each teaching condition (RQ3), we calculated Spearman's rho correlations between participant fast mapping performance (receptive and expressive) and syntactic comprehension to determine how language factors relate to fast mapping performance under each condition for the TD group. Syntactic comprehension was measured by raw scores for the TACL-4 Grammatical Morphemes (GM) and Elaborated Phrases and Sentences (EPS) subtests.

RESULTS

Results for the following RQs are described below: (1) In each condition, do children learn the novel verbs? (2) Does performance vary by teaching condition? (3) Is there a relationship between syntactic comprehension and fast mapping performance in each teaching condition?

Procedural Fidelity and IOA

Procedural fidelity and IOA results were consistently high across all examiners and conditions. Overall, the examiners exhibited a mean of 98% (SD = 3%, range: 91–100%) accuracy for procedural fidelity. Average IOA was 97% (SD = 3%, range: 92–100%) agreement.

Study 1 Results: Children with TD

For RQ1, the participants with TD exhibited learning of the novel target words receptively and expressively under all three conditions with large effect sizes, as shown in Table 2. Effect sizes ranged from 0.63 to 0.74 for receptive performance and 0.58 to 0.74 for expressive performance. For each of the three conditions, they receptively identified approximately 9 of the 12 possible words, though variation across participants was notable (see Fig. 1). The participants expressively labeled an average of 0.52 to 0.70 of the four target words. For RQ2, no differences were identified between the three teaching conditions, as shown in Table 3. Effect sizes (*r*) were small.

Based on exploratory analyses for RQ3, receptive performance for the combined cues condition correlated significantly and positively with syntactic comprehension, as measured by both the TACL-4 GM and EPS subtests.

Table 2 Receptive and expressive fast mapping performance by condition and group

	TD				DLD				DS			
Condition	**M (SD)**	***p***	***Z***	***r***	**M (SD)**	***p***	***Z***	***r***	**M (SD)**	***p***	***Z***	***r***
Receptive												
Syntactic cues	8.73 (3.26)	<0.01	3.12	0.65	10.29 (2.21)	0.02	2.41	0.91	8.75 (3.11)	<0.05	1.97	0.69
Semantic cues	8.91 (3.54)	<0.01	3.02	0.63	10.14 (2.67)	0.03	2.22	0.84	9.50 (2.93)	0.03	2.18	0.77
Combined cues	9.04 (2.75)	<0.001	3.55	0.74	10.00 (2.24)	0.03	2.21	0.84	9.38 (2.07)	0.02	2.38	0.84
Expressive												
Syntactic cues	0.61 (0.58)	<0.001	3.50	0.73	0.86 (0.90)	0.06	1.86	0.70	0.75 (0.71)	0.03	2.12	0.75
Semantic cues	0.52 (0.73)	<0.01	2.76	0.58	0.43 (0.79)	0.18	1.34	0.51	1.00 (0.93)	0.02	2.33	0.82
Combined cues	0.70 (0.63)	<0.001	3.56	0.74	0.71 (1.11)	0.10	1.63	0.62	1.38 (1.41)	0.02	2.26	0.80

Abbreviations: DLD, developmental language disorder; DS, Down syndrome; TD, typical development.
Note: The possible range was 0 to 12 for receptive scores and 0 to 4 for expressive scores.

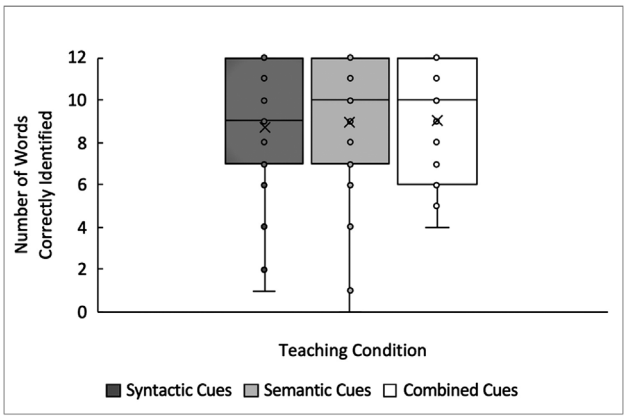

Figure 1 Receptive performance by teaching condition for children with typical development. The box and whiskers plot displays the group median for the condition by the horizontal line through the box. The top end of each box represents the upper quartile, and the bottom end represents the lower quartile. The maximum and minimum scores for participants are shown by the "whiskers" that extend above and below the box,

Table 3 Comparative performance across conditions by diagnostic group

	TD				DLD				DS			
Condition	ΣR_-	ΣR_+	*Z*	*r*	ΣR_-	ΣR_+	*Z*	*r*	ΣR_-	ΣR_+	*Z*	*r*
Receptive												
Semantic–syntactic	86.5	103.5	0.34	0.07	3.5	2.5	0.27	0.10	6.0	9.0	0.41	0.14
Combined-syntactic	69.0	84.0	0.36	0.08	8.0	7.0	0.14	0.05	7.0	14.0	0.74	0.26
Combined-semantic	102.5	87.5	0.30	0.06	5.0	5.0	0.00	0.00	8.5	6.5	0.27	0.10
Expressive												
Semantic–syntactic	44.5	33.5	0.46	0.10	3.0	0.0	1.34	0.88	0.0	3.0	1.41	0.50
Combined-syntactic	18.0	27.0	0.58	0.12	6.0	4.0	0.38	0.14	0.0	6.0	1.63	0.58
Combined-semantic	45.0	75.0	0.94	0.20	3.5	6.5	0.56	0.21	0.0	3.0	1.34	0.47

Abbreviations: DLD, developmental language disorder; DS, Down syndrome; TD, typical development.

See Table 4 for details. Expressive performance for the syntactic cues condition correlated significantly and positively with syntactic comprehension, as measured by both TACL-4 subtests. Expressive performance for the combined cues condition also correlated positively with scores on one TACL-4 subtest.

Study 2 Results: Children with DLD

For RQ1, the participants with DLD exhibited learning of the novel target words receptively, but not expressively, for all three conditions with large effect sizes. Effect sizes ranged from 0.84 to 0.91 for receptive performance. Expressively, the participants did not demonstrate performance significantly above zero. Still,

Table 4 Correlations between fast mapping performance and syntactic comprehension for children with typical development

Condition	GM	EPS
Receptive		
Syntactic cues	0.36	0.29
Semantic cues	−0.18	−0.08
Combined cues	0.55**	0.51*
Expressive		
Syntactic cues	0.45*	0.72**
Semantic cues	0.29	0.16
Combined cues	0.36	0.44*

Abbreviations: * = $p < .05$; ** = $p < .01$. EPS, elaborated phrases and sentences subtest on the Test for Auditory Comprehension of Language (TACL-4; Carrow-Woolfolk & Allen, 2014); GM, grammatical morphemes subtest on the TACL-4.

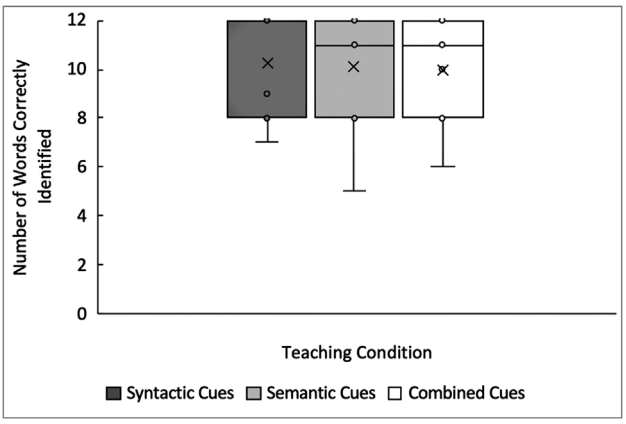

Figure 2 Receptive performance by teaching condition for children with developmental language disorder.

this small sample achieved large effect sizes expressively (i.e., 0.51 to 0.70). See Table 2 for details. For each of the three conditions, they identified approximately 10 of the 12 possible words, with notable variation across participants (see Fig. 2). The participants labeled an average of 0.43 to 0.86 of the four target words across conditions. For RQ2, no differences were identified between the three teaching conditions (see Table 3). However, none of the participants with DLD achieved higher accuracy for labeling the target words in the semantic condition than the syntactic condition, as indicated by the 0 value for ΣR_+ for the semantic–syntactic comparison.

Study 3 Results: Children with DS

For RQ1, the participants with DS exhibited learning of the novel target words receptively and expressively for all three conditions with large effect sizes. Effect sizes ranged from 0.69 to 0.84 for receptive performance and 0.75 to 0.82 for expressive performance across conditions. See Table 2 for details. For each condition, the participants identified approximately 9 of the 12 words, with notable variation across participants (see Fig. 3). The participants labeled an average of 0.75 to 1.38 of the four target words across conditions. For RQ2, no differences were identified between the three teaching conditions (see Table 3). Yet, none of the participants with DS achieved higher accuracy for labeling the target words for the syntactic condition than the semantic condition, as indicated by $\Sigma R_- = 0$ for the semantic–syntactic comparison. Similarly, none of them achieved higher accuracy for labeling the target words in the semantic or syntactic condition than the combined condition, as indicated by $\Sigma R_- = 0$ for the combined-syntactic and combined-semantic comparisons.

DISCUSSION

Study 1 Discussion: Children with TD

The findings from Study 1 demonstrated that the procedures for teaching intransitive verbs were feasible. The preschoolers with TD learned the verbs receptively and expressively, with large effect sizes across all conditions ($r = 0.58$–0.74). This finding is consistent with past research in children with TD that evaluated verb learning using syntactic cues (see Cao & Lewis, 2022 for a review). Past research has also shown that children with TD learn transitive verbs that followed standard verb morphology (e.g., *tiffing*) using semantic cues (i.e., performing the action; Wakefield et al., 2018). Our findings extend this past work by demonstrating that children with TD can utilize a similar semantic cue strategy to also learn intransitive verbs, not only receptively but also expressively. Despite not observing significant differentiation between the three teaching conditions, the study's framework and procedures can be utilized for continued study of intransitive verb

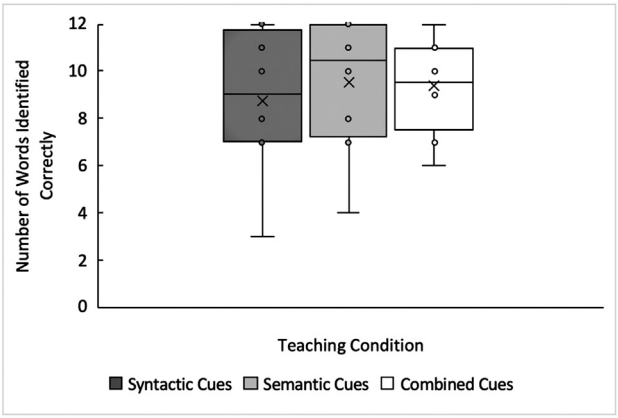

Figure 3 Receptive performance by teaching condition for children with Down syndrome.

learning to expand one's vocabulary receptively and expressively.

We hypothesized that participants with strong syntactic comprehension, as measured by the TACL-4 GM and EPS subtests, would benefit from the verb learning cues that incorporated syntactic bootstrapping (syntactic and combined cues). Although children's syntactic comprehension has not often been assessed in studies of syntactic bootstrapping, our findings are consistent with the few studies that demonstrate moderate correlations between syntactic comprehension and fast-mapping in children with TD (Chapman et al., 2006; McDuffie et al., 2007). In a group of 18 preschoolers with TD, Chapman et al. (2006) reported moderate correlations between receptive fast mapping of nouns and the TACL GM and EPS subtests ($r = 0.46$ and 0.44, respectively). They also found that expressive fast mapping was moderately correlated with only the TACL EPS subtest ($r = 0.48$) and not the GM subtest. We similarly did not observe a significant correlation between the expressive fast mapping in the combined condition and the GM subtest. In their group of 19 children with TD (aged 3–6 years), McDuffie et al. (2007) observed moderate correlations between receptive fast mapping of nouns and bare stem verbs (i.e., "I'm gonna ___ the stars.") and the TACL GM and EPS subtests ($r = 0.59$ and $r = 0.44$, respectively). Our results indicate a similar pattern which may suggest that children with TD need a particular level of syntactic comprehension to benefit from the verb learning cues, specifically in the combined cues condition. It is interesting to note that across studies, syntactic comprehension was more strongly correlated with or only significantly correlated with expressive fast mapping as compared with receptive fast mapping. In general, receptive language learning typically precedes and is less challenging than expressive language learning. As such, syntactic comprehension, and particularly a child's proficiency with syntactically based word relations, seems helpful for the more challenging expressive learning as compared with receptive learning.

Study 2 Discussion: Children with DLD

Upon demonstrating proof-of-concept in Study 1, we replicated the findings in Study 2. Children with DLD ($n = 7$) receptively learned the verbs, demonstrating large effect sizes across all conditions ($r = 0.84$–0.91). Our findings align with Oetting (1999) who found that children with SLI used syntactic cues to learn novel intransitive verbs but contrast with studies demonstrating that children with SLI experience difficulty harnessing syntactic bootstrapping to learn novel verbs (e.g., Johnson & de Villiers, 2009; Shulman & Guberman, 2007). Our findings also address a gap in the literature by providing evidence that children with DLD learn intransitive verbs, at least receptively, by performing the actions or in combination with syntactic cues. Expressive

verb learning was more challenging, and performance was not significantly above zero for the small DLD group ($n = 7$). The discrepancy between receptive and expressive verb learning in the DLD group matches the gap in their vocabulary skills as well, with stronger receptive than expressive vocabulary skills. This often reported difficulty with expressive language as compared with receptive language in DLD (e.g., Gordon et al., 2021; McGregor et al., 2007), which aligns with our findings, has potentially important implications for intervention. SLPs should consider incorporating an explicit focus on expressive language in intervention. Furthermore, for children with weaknesses in expressive language, it may be helpful to probe their receptive understanding of skills targeted expressively (Bishop, 2017). In some instances, a weakness in both receptive and expressive language may be identified, which would thus necessitate intervention for both. However, in other instances, a child may present with a strength in receptive understanding and a weakness in expressive production, which could lead to a more tailored approach focused on supporting their expressive language skills.

Study 3 Discussion: Children with DS

Similar findings from Study 1 were replicated in Study 3. Children with DS ($n = 8$) learned the verbs receptively and expressively with large effect sizes (rs = 0.69–0.84). This finding is compatible with and extends McDuffie and colleagues' (2007) results, in which 20 adolescents and young adults with DS learned novel transitive verbs receptively. Unlike McDuffie et al. (2007), the children with DS in our study did learn the word expressively based on our preliminary findings. The improved expressive performance may be the result of a higher frequency of verb presentations (six vs. two presentations) and/or eliciting a production of the novel verb and/or action across the conditions. In children with DS, expressive language is often delayed relative to receptive language and NVIQ (Chapman & Hesketh, 2000; Loveall et al., 2016); however, the DS group not only learned the words receptively but demonstrated relatively strong expressive verb learning as well. Additionally, further inspection of the effect sizes for receptive verb learning in the DS group reveals at least some differentiation in performance between conditions. Although still large, the smallest effect size was observed for the syntactic cues condition ($r = 0.69$) and the largest effect size was observed for the combined cues condition ($r = 0.84$). Based on these findings, children with DS may benefit most from word learning approaches that incorporate multicomponent teaching methods.

GENERAL DISCUSSION

Although there is a growing body of literature on how children learn verbs, there remains to be limited evidence on which strategies are optimal for teaching verbs, particularly for intransitive verbs which may be more difficult compared to other word classes (Johnson & de Villiers, 2009). To address this gap in the literature, we evaluated and compared the effectiveness of semantic cues, syntactic cues, and the two types of cues combined for teaching intransitive verbs to children with and without language impairment. We evaluated both receptive and expressive performance, which contributes to the current literature base that primarily focuses on receptive performance. Expressive verb learning proved to be challenging as compared to receptive verb learning, especially within the DLD group. Our results offer evidence that SLPs can use syntactic, semantic, or combined cues to support verb learning. No significant differences between teaching conditions were found for receptively identifying or expressively labeling the novel verbs. Importantly, findings from Study 1 were replicated in the preliminary data in Studies 2 and 3. These replicated findings support the feasibility of the presented procedures, which can be adapted for continued study of intransitive verb learning receptively and expressively. Further investigation with larger samples of children with DLD and DS is warranted.

We hypothesized that children would demonstrate greater accuracy identifying and labeling novel intransitive verbs in the combined cues condition than the semantic and syntactic cues conditions. However, we did not

observe significant differences in verb learning between the three study conditions. The lack of significant differences may be due to a small sample size, especially for the DLD and DS groups, and/or a true lack of differential response to the conditions. A lack of differentiation between conditions may be due to overlapping characteristics or potential contamination across conditions. In particular, many participants attempted to perform the actions during the syntactic condition. When this occurred, the examiner prompted the participant to "sit with a quiet body and watch." In doing so, we attempted to minimize having the child act out the action which was the key feature of the semantic and not syntactic cues condition. The participants varied in the degree to which they inhibited such actions when prompted to do so, resulting in potential contamination across conditions. Though limited, past research demonstrates that children more easily learned novel verbs when they carried out the actions rather than only observing the action (Wakefield et al., 2018).

Limitations and Future Directions

Before discussing the implications of these findings in more detail, we acknowledge several factors that limit the strength of the conclusions that can be drawn from the preliminary study findings and inform future work in this area. First, due to our small sample sizes in the DLD and DS groups, we are underpowered to detect an effect of the size observed between conditions and were not able to conduct the exploratory analysis examining individual differences that may correlate with task performance. Future studies with larger sample sizes are necessary, particularly given the known variability in performance of children with disabilities (Lederberg & Spencer, 2009). Second, the study design only permitted evaluation of a limited aspect of word learning—fast mapping following a relatively brief teaching session. Future research could incorporate a testing phase the following day to assess whether participants are able to maintain a similar level of performance for receptive and expressive verb learning. The study was also limited in that only verbs presented in the bare stem or with the inflectional morpheme-*ing* were evaluated, as is most common across the literature on verb learning (e.g., Oetting, 1999; Shulman & Guberman, 2007). Future research could evaluate children's ability to learn intransitive verbs across various morphological forms (e.g., *meeps*, *meeping*). Third, we did not observe any significant differentiation between the three teaching conditions. Continued study of verb learning should explore how to further differentiate the strategies to identify optimal strategies for teaching verbs. Fourth, only monolingual English speakers were included in the current study to minimize the influence of limited exposure to English on verb learning and to avoid multiple phonological systems confounding the equal difficulty of the word sets. However, because SLPs serve many bilingual and multilingual children (e.g., Thordardottir, 2010), it is important to include children from culturally and linguistically diverse backgrounds. As a next step, a follow-up study is currently underway to replicate this study with children who are bilingual English-Spanish speakers.

Fifth, scoring of participant responses on the expressive verb trials was limited to dichotomous scoring of either correct or incorrect (after accounting for established articulation errors). Rather than only scoring productions with 100% of the phonetic features produced correctly as correct, future research should incorporate phonological precision scoring (e.g., Gordon et al., 2021). Phonological precision scoring allows each response to be scored based on the total percentage of phonetic features produced correctly relative to the target form (Edwards et al., 2004). For example, a participant who labels the novel verb "/wɑm/" as "/wɑb/" would receive partial credit. Finally, though there was a lot of variation in participant performance, we did not see enough differentiation to determine whether individual differences in syntactic comprehension are correlated with verb learning across the three teaching conditions. Future research should continue to explore whether there are individual characteristics (e.g., language skills, executive functioning) that predict the optimal strategy for verb learning for any given child or whether they will benefit from any or all of the strategies.

Strengths

Several strengths of this series of studies should be noted. First, word sets across conditions were balanced on numerous key characteristics because balanced word sets is of utmost importance for the study's internal validity. Similarly, the novel actions were balanced for movement type and the word sets were counterbalanced across participants. Additionally, the examiners demonstrated consistently high procedural fidelity and IOA across conditions. This level of rigor adds to the feasibility and replicability of the study procedures.

Clinical Implications

The findings from these studies provide unique contributions to the existing body of evidence regarding effective strategies for teaching verbs to children with and without language impairment. Several implications for researchers, SLPs, and other related professionals emerge from our findings. For researchers, the framework and study design implemented in the current study provide an avenue for continued study of intransitive verbs, which are often overlooked. To support verb learning, SLPs and educators can use syntactic and semantic cues, either alone or in combination. Because we do not yet know the optimal strategies for teaching verbs, clinicians can implement these different strategies and closely monitor progress to determine which strategy or combination of strategies works best for verb learning in each individual client. It is also essential to keep in mind that receptive verb learning is important, but not necessarily sufficient to support expressive verb learning, and thus children will likely benefit from explicit instruction for both receptively identifying and expressively labeling novel words.

CONCLUSION

This study expands the word learning research beyond nouns by establishing a framework and evaluating three strategies for teaching intransitive verbs to children with and without language impairment. The results indicate that children can learn verbs utilizing the protocol for teaching intransitive verbs using semantic, syntactic, and combined cues. Because components of this study are exploratory given the current state of discovery for teaching verbs to children with and without language impairment, future replication is warranted. The current findings can be utilized to inform future research on verb learning.

CONFLICT OF INTEREST

None declared.

ACKNOWLEDGMENTS

We gratefully acknowledge the contributions of the following individuals: Megan Saylor and C. Melanie Schuele (research consultants) and Kaley Birchfield, Thalia Furman, Alexandra Maxwell, and Kathleen O'Neal (student research assistants). We thank the participants and their families for making this study possible. This research was supported by the U.S. Department of Education Preparation of Leadership Personnel Grant H325D140087 and, in part, by Vanderbilt CTSA Award no. UL1TR000445 from the National Center for Advancing Translational Sciences as well as a Baylor University Undergraduate Research and Scholarly Achievement Research Grant.

NOTE

This research was supported by the U.S. Department of Education Preparation of Leadership Personnel grant (H325D140087) and in part by Vanderbilt CTSA Award no. UL1TR000445 from the National Center for Advancing Translational Sciences and a Baylor University Undergraduate Research and Scholarly Achievement Research Grant. The content is solely the responsibility of the authors and does not necessarily represent the official views of the U.S. Department of Education or the National Center for Advancing Translational Sciences. Both authors read and approved the final manuscript. The authors have no conflict of interest to disclose. This study is registered at ClinicalTrials.gov (NCT03441685).

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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