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COMPLEX SYNTAX INTERVENTIONS FOR YOUNG
CHILDREN WITH LANGUAGE IMPAIRMENTS

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Structured Abstract

Clinical Question: Do preschool or young elementary school children (ages 4–8 years) with language impairment who receive complex syntax intervention show improvements in syntax relative to a comparison intervention or control condition?

Method: Systematic Review

Study Sources: ERIC, Education Source, PsycINFO, Web of Science, ComDisDome

Search Terms: language impair* OR specific language impairment OR language disorder* AND complex syntax OR complex sentence OR embedded clause* OR dependent clause* OR multiclaue* OR subordinate clause* AND interven* OR treat* OR therap* AND child*

Number of Included Studies: 5

Primary Results:

1. Positive outcomes for improved use of complex syntax forms in preschool and young school-age children across all treatment studies.
2. Positive outcomes for conversation-based and narrative-based treatment strategies including conversational recast, expansion, cloze procedures, and modeling.
3. Faster acquisition of complex syntax forms in conversational recast approach to treatment rather than imitation-based approach to treatment.
4. Limitations across studies included small sample sizes, no randomized controlled study designs, limited use of control or comparison treatment groups, lack of blinding when evaluating outcome measures, inconsistency in complex syntax types targeted, and limited number of intervention approaches.

Conclusions: There are a limited number of high-quality studies of complex syntax intervention for young children with language impairment. Of the five studies included in this systematic review, four were suggestive of a need to change clinical practice, one was equivocal, and none were considered compelling (Dollaghan, 2007). Scaffolding methods (recasts, expansions, cloze procedures, and modeling) appeared to be more effective and efficient than explicit instruction using direct imitation when targeting complex syntax. Methods that target complex syntax in ways that are contingent upon the child's utterance, whether in conversational play, picture descriptions, or interactive book reading, seem to be effective. There is a need for additional intervention studies that compare treatment approaches and specific complex syntax types across the developing language and early language for learning time periods in children with language impairment.

Complex Syntax Interventions for Young Children With Language Impairments

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Clinical Scenario

Sam is a clinical speech-language pathologist who works in a public preschool and elementary school setting. Sam provides speech and language therapy to children ages 4–8 years (preschool through second grade). Sam has many students with language impairments characterized by deficits in morphology and syntax despite otherwise typical development. She knows that these students have specific language impairment (SLI; Leonard, 2014) and recently she heard that these same children are referred to as having developmental language disorder (DLD; Bishop et al., 2016, 2017). In her school, when talking to teachers and parents, Sam uses the term language impairment. *Language impairment* is consistent with terminology used in the Individuals with Disabilities Education Act (IDEA; U.S. Department of Education, 2004).

Many of Sam's students have goals targeting (1) correct use of morphosyntax and (2) increased sentence length. Sam has traditionally focused on targeting morphosyntactic forms (markers of tense and/or agreement, such as past tense *-ed*, third person singular *-s*, auxiliary *be*, and copula *be*) in simple sentence frames (e.g., *The boy walks home*). She has targeted increased sentence length by teaching students to add more descriptive words to their utterances. Sam wonders if there is more she can do to target expanding sentence length, but she wonders if her students need to master morphosyntactic forms in the context of simple sentences before they can work on complex syntax forms. Sam recalls that complex syntax forms include coordinate conjunctions (two clauses conjoined by *and*, *but*, or; e.g., *He walked home and ate dinner*), subordinate conjunctions (two clauses joined by a subordinating conjunction; e.g., *He walked home because he was hungry*), and embedded clauses (a clause embedded within another clause; e.g., *The boy who walked home is eating dinner*).

Sam recently attended her state speech-language-hearing association's annual conference and saw a

presentation that discussed complex syntax development. Sam was reminded that in typical language development, children begin to use complex sentence forms soon after they combine words into sentences, typically by age 2–3 years (Arndt & Schuele, 2013; Bloom, Tackeff, & Lahey, 1984; Diessel, 2004; Limber, 1973). The earliest forms of complex syntax produced by young children with a mean length of utterance (MLU) below 3.0 include reduced infinitives (e.g., *I wanna eat*) and simple infinitives (e.g., *I want to go home*). Beyond an MLU of 3.0, children begin to produce a wide variety of complex syntax forms (see Schuele & Dykes, 2005 for a comprehensive review of complex syntax types used by young children). She also learned that children with language impairment tend to have protracted development in their use and mastery of complex syntax forms with a lag of about two years behind typically developing peers (Eisenberg, 2003; Fletcher, 1992; Marinellie, 2004; Schuele & Dykes, 2005).

Sam previously thought that she needed to help her students with language impairment master morphosyntax first and wait until her students were older to target complex syntax. Now she wants to know if any intervention programs are available to effectively target complex syntax in young school-age children. Sam goes to her local university library to conduct a systematic review of the literature.

Background Information

The term complex sentence is used in grammar to refer to a sentence with more than one clause and/or a sentence with a main clause and one or more subordinate (or embedded) clauses (Carnie, 2007; Crystal, 2003). Complex sentences are generally divided into two types: coordinated clauses and subordinate (or embedded) clauses. From a developmental perspective, Diessel (2004) describes a coordinated clause as two simple sentences conjoined into one sentence and a subordinate clause as a simple sentence

that has gradually been expanded into a multiclausal structure. Because speakers don't always talk in sentences, utterances of isolated dependent clauses are also included in complex syntax when thinking about spoken language (Barako Arndt & Schuele, 2013).

The earliest developing multiword utterance is a simple sentence, which contains a subject and predicate without any subordination or embedding (Crystal, 2003; Diessel, 2004). The grammar of young children consists primarily of simple sentences until age 2:0 when complex syntax begins to emerge. In other words, complex sentences emerge alongside increasingly longer simple sentences (Arndt & Schuele, 2013). In a review of the developmental literature, O'Grady (1997) reported that subjectless infinitival phrases, with to omissions (e.g., *I wanna eat*), are the earliest complement clauses to appear in the expressive language of young typically developing children, around age 2 years. Inclusion of infinitival to (e.g., *I want to eat*) is consistent by age 3 (Barako Arndt & Schuele, 2012). Around age 2:6 children begin to use early wh-complement clauses (e.g., *I know who do it*). By age 6 years, typically developing children achieve adult-like mastery of most types of complex syntax. Diessel's (2004) longitudinal study of five typically developing children indicated emergence of complex syntax at age 2:0 in less than 1% of utterances produced, with a steadily increasing proportion use of complex syntax such that by age 4:0 years, complex syntax was used in 14% of all utterances.

Children with language impairment tend to show protracted development of morphology and syntax, lagging behind typically developing peers by about two years, and many times show profile differences in use of tense/agreement markers even when matched to younger typically developing children with the same MLU (Leonard, 2014). The production of complex syntax by children with language impairment tends to emerge between 3:0 and 4:0 years and is characterized by restricted use of verb types, more omissions of obligatory markers (e.g., infinitival to, relative *that* or relative pronouns), fewer types of complex syntax, and overall less proficiency when compared to both age-matched and language-matched peers (Barako Arndt & Schuele, 2012; Owen & Leonard, 2006; Owen Van Horne & Lin, 2011; Schuele & Dykes, 2005; Schuele & Tolbert, 2001). Children with language impairment attempt to use complex syntax at a rate that is commensurate with their language level but tend to make more production

errors than MLU-matched peers (Owen & Leonard, 2006; Schuele & Wisman Weil, 2004).

It is important that children with language impairment have access to productive use of multiple clauses in discourse for clearly communicating complex messages in preschool and, particularly as children enter elementary school. Complex syntax may be more important than morphosyntax to get your message across in academic settings. Many types of discourse require the use of complex syntax (e.g., persuasion, negotiation). Common core state standards for early elementary school (kindergarten through Grade 3) require the ability to use complete and complex sentences in spoken English language arts activities (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010), making the use of complex syntax an important part of curriculum-based intervention.

Because research in children with language impairment tends to focus on morphosyntactic deficits as the hallmark deficit, clinical SLPs and researchers may place more emphasis on the assessment and treatment of morphosyntax rather than complex syntax for children with language impairment (see Ebbels et al., 2014). No systematic reviews are currently available that focus exclusively on complex syntax intervention in young children. Eisenberg (2013) reviewed several treatment methods for grammatical and complex syntax intervention, but she noted that intervention studies are needed to support facilitation methods in-use (based on clinical experience with theoretical support) for which no evidence exists to say the intervention is effective (e.g., juxtapositions; modeling a more complex sentence following the child's production of two simple sentences).

Complex syntax intervention research for young children with language impairment is quite limited; consequently, clinicians may be less apt to work on complex syntax with students who have language impairment. With this systematic review, we seek to examine whether treatment focused on complex syntax in preschoolers and young school-age children with language impairment may improve language outcomes in production of complex syntax.

Clinical Question

To form a question that was clinically relevant to many of the students on her caseload and one that she could

answer with a systematic review, Sam decided to frame her question using the PICO framework. Using this framework, Sam created a question including the population (P), intervention (I), comparison intervention (C), and intended outcome (O). Her question was: Do preschool or young elementary school children (ages 4–8 years) with language impairment (P) who receive complex syntax intervention (I) show improvements in syntax (O) relative to a comparison intervention or control condition (C)?

Search for the Evidence

Studies in this review met the following inclusionary criteria (a) English-speaking participants ages 4–8 years with language impairment as their primary deficit (SLI and DLD), (b) intervention that targeted one or more complex syntax forms, and (c) measured syntax as an outcome. Studies were excluded if the primary focus was on participants with autism spectrum disorder, reading impairment, stuttering, speech sound disorders, intellectual impairment, or acquired language impairment. Sam made sure to include high-quality evidence that represented original research published in peer-reviewed journals. She planned to include any type of primary research evidence (e.g., case studies, experimental studies, randomized control trials).

Sam used several research databases for her systematic review: ERIC, Education Source, PsycINFO, Web of Science, and ComDisDome. To find studies that might answer her PICO question, she used the advanced search features with the following search terms: language impair* OR specific language impairment OR language disorder* AND complex syntax OR complex sentence OR embedded clause* OR dependent clause* OR multiclause* OR subordinate clause* AND interven* OR treat* OR therap* AND child*. Sam used the asterisk following several search terms to capture as many relevant studies as possible (e.g., child* includes any studies that mention child or children). Sam's search yielded 845 possible citations; she excluded duplicate citations and reduced her list to 741 citations. She then applied her search criteria to article titles and abstracts. She eliminated 6 studies that were not written in English, 155 studies that were not original research, 8 studies that were not peer-reviewed (all were dissertations), 498 studies that were not related to treatment, 25 treatment studies that did not investigate complex syntax, 37 treatment

studies that targeted populations who did not have language impairment as their primary deficit, 5 treatment studies that focused on complex syntax forms in languages other than English, and 3 treatment studies that focused on complex syntax forms in children with language impairments who were older than age 8 years. Four studies remained that met Sam's inclusionary and exclusionary criteria. Sam also examined the references from reviews of syntax interventions (Ebbels, 2014; Eisenberg, 2013) and added one additional study. In total, five articles were included in this systematic review (see Table 1).

Evaluating and Appraising the Evidence

The systematic review yielded five peer-reviewed treatment studies that evaluated complex syntax outcomes in children ages 4–8 years. Sam organized summaries of the included studies for easy review in Table 1. She appraised each study using the Dollaghan (2007) critical appraisal of treatment evidence (CATE) guidelines and included her appraisal and clinical practice recommendations in Table 2. Sam reviewed her studies in chronological order to understand the evolution of best practice as presented in the treatment literature.

In a series of three studies by Nelson, Camarata, and colleagues (Camarata & Nelson, 1992; Camarata, Nelson, & Camarata, 1994; Nelson, Camarata, Welsh, Butkovsky, & Camarata, 1996), direct imitation and conversational recast approaches to treatment were compared. In each study, the participants were given individualized targets that included morphosyntax, simple syntax, and/or complex syntax. A within-subjects design (assigning some targets to each intervention type) was used to monitor progress due to intervention. The series of studies demonstrated that participants with and without language impairment learned their syntax targets in a spontaneous context faster (with fewer treatment sessions and fewer clinician recasts) in the conversational recast condition. In contrast, elicited productions of the targets were initially learned faster in the direct imitation condition but did not carry over to spontaneous contexts as quickly. Using Dollaghan's (2007) CATE model, Sam concluded that each of these studies was suggestive in both validity and importance; clinicians may choose to shift from direct imitation treatment approaches to conversational recast approaches based on the evidence from each of these studies. Sam concluded that conversational recast is a more effective way to learn and retain new syntactic structures than direct imitation

for many children. She will keep this in mind as she individualizes treatment plans for children on her caseload.

Spooner (2002) conducted a treatment study of two children (ages 6:3 and 9:9), with receptive and expressive language impairment, from a language unit in a mainstream school in the United Kingdom. Only the results of the participant who was age 6:3 were included in this review because the other participant was beyond the age range of this systematic review. The treatment approach was an adapted version of colorful semantics (Bryan, 1997), a picture-based metalinguistic sentence-processing treatment. Treatment aimed to increase the number of verb + arguments used and the complexity of argument structures used in spoken and written language. Relevant to complex syntax, treatment yielded more frequent use of verb + 2- or 3-argument structures and increased use of subordinate conjunctions with 1- and 2-arguments. Additionally, treatment yielded increased use of verb types, reduced use of bare stem (uninflected) verbs, and reduced use of verb + 1 argument structure. Using Dollaghan's (2007) CATE model, Sam concluded that this study was equivocal in validity and importance, and although the study contributed a different approach to intervention, the design and results were not sufficiently compelling to suggest a change to clinical practice. Sam's primary concerns were 1) the case study did not follow multiple-baseline single-subject design, 2) there was no control condition to ensure that changes were due to the intervention rather than other factors, 3) her ability to replicate the treatment with her clients given the available description, and 4) a lack of robust and precise findings. Based on her clinical experience, Sam thinks that providing visual supports and color-coding question prompts may be effective ways to support clients, and she will keep this in mind especially when working on complex syntax targets with her students with receptive language deficits. Sam noticed that the other studies in her systematic review focused on children with only expressive language impairments and she acknowledges that Spooner (2002) helps to fill a gap in the literature on treatment for children with substantial receptive language impairments (Law, Garrett, & Nye, 2004).

Finally, a study comparing treatment dosage using repeated storybook reading within a scaffolded-language structure (RSR-SLS; Bellon-Harn, Byers, & Lappi, 2014) included children with language impairment from Head Start preschool classrooms in the southern United States. Language samples were collected pre- and posttreatment,

using different storybooks than those used in treatment, with a prompt to "tell the story in the book." Language samples were coded and analyzed for production of coordinate and subordinate clauses in narratives. The authors included nominal clauses, relative clauses, and adverbial clauses as types of subordinate clauses (see Scott, 1988 for an overview of this classification scheme). Sam found this study to be particularly helpful because the outcome measures were most related to her PICO question. Using the Dollaghan (2007) CATE, Sam concluded that this study was suggestive in validity as well as importance; clinicians could adopt the RSR-SLS method when working on complex syntax with their preschool-age clients. As a school-based SLP, Sam appreciated that the RSR-SLS treatment uses a literacy-based approach to work on complex syntax.

The Evidence-Based Decision

After reviewing the evidence, Sam concluded that it is appropriate to target complex syntax in young children with language impairment. She is not yet clear on which intervention approaches are most effective for different complex syntax types but she decided that intervention approaches that scaffold her students' utterances with recasts, expansions, cloze procedures, and models in the context of interactive storybook reading or conversational play are likely to be most effective based on the peer-reviewed data currently available.

In her literature search, Sam came across an interesting dissertation study (Curran, 2017) focused on one type of complex syntax: causal conjunctions. The results suggested that preschoolers and kindergarteners with language impairment can learn complex syntax causal conjunctions (e.g., because) while learning science concepts like cause-effect. Sam is particularly interested in making sure her treatment approaches are academically relevant and plans to watch for this study to appear in a peer-reviewed journal article.

Sam attended another session at her state speech-language-hearing association's annual conference that focused on narrative-based language interventions. Although this was not the focus of her current inquiry, she considers a future literature search to examine interventions targeting complex syntax in narratives (see Petersen, 2011). Key words may include storytelling, story grammar, complex language, and causal or temporal microstructure.

As a result of her literature review, Sam continues to work with her students to target morphosyntax and increased MLU using traditional intervention methods, but she will also devote more time in intervention to targeting complex syntax. She plans to use recast and expansion methods in interactive storybook reading and conversational discourse to target emerging and developmentally appropriate complex syntax forms with her students. At her next continuing education event, she plans to look for a workshop or conference session that will provide her with additional training on recast and expansion methods.

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Table 1. Summary of Included Studies

Reference	Study design	Participant description	Intervention design	Treatment strategies	Outcome measure(s)	Main findings
Camarata & Nelson (1992)	Case cohort study. Within-subjects design.	<i>n</i> = 4 (1 female) with expressive-only language impairment. Ages: 4;9, 4;10, 5;1, 5;11.	1:1 direct intervention, 60-min. sessions, 2x/week, for 16 weeks. Treatment order randomized within subject.	Direct imitation vs. conversational recast	Number of clinician presentations of target required before spontaneous use of target syntactic structures.	Faster spontaneous use of target syntactic structures following conversational recast treatment.
Camarata, Nelson, & Camarata (1994)	Cohort study. Within-subjects design.	<i>n</i> = 21 (1 female) with language impairment. Ages 4;0 to 6;10.	1:1 direct intervention, 50-min. sessions, 2x/week, for 12 weeks.	Direct imitation vs. conversational recast	Elicited and spontaneous use of targets.	Earlier spontaneous use in conversational recast therapy but earlier elicited productions in direct imitation therapy
Nelson, Camarata, Welsh, Burkovsky, & Camarata (1996)	Cohort study with between- and within-subject analyses.	<i>n</i> = 7 with language impairment (ages 4;7 to 6;7). <i>n</i> = 7 normal language (ages 2;2 to 4;2). Groups language matched.	1:1 direct intervention, 2x/week for an average of 18.8 sessions.	Direct imitation vs. conversational recast vs. no treatment control targets.	Elicited and spontaneous use of targets. Clinic and home language samples.	Targets absent before treatment learned faster in conversational recast treatment. Targets partially mastered pretreatment generalized to spontaneous speech across all 3 conditions. No between-group differences.
Spooner (2002)	Case study. Pretest/posttest design. No control or comparison group.	Two participants with receptive-expressive language disorder, ages 6;3 (KP) and 9;9 (JM*).	1:1 direct intervention, 30-min. sessions, 2x/week, for 5 months.	Picture supports, color-coded question cards, hierarchy of target syntactic structures, child-initiated picture descriptions.	Standardized language assessments and language sampling measures.	Increased standardized language scores on syntax subtests, improved spontaneous use of argument structure.
Bellon-Harr, Byers, & Lappi (2014)	Cohort study. Pretest/posttest design. No control or comparison group.	<i>n</i> = 12 with language impairment. Ages 4;0 to 5;11.	Participants randomly assigned to a treatment intensity condition: 42 sessions 3x/week for 14 weeks (<i>n</i> = 6: 1 female), or 24 sessions 4x/week for 6 weeks (<i>n</i> = 6: 1 female). 20-min. sessions.	Repeated storybook reading within a scaffolded-language structure (RSR-SLS). Cloze procedures, expansion, and models. Scaffolding followed a child-initiated utterance.	Complex syntax from narrative language samples.	Significant and large effect sizes obtained for posttreatment for increased use of coordinating clauses, subordinating clauses, and words per t-unit. No significant differences between the two intensity conditions.

* Excluded JM because age is beyond the scope of this systematic review.

Table 2. Critical Appraisal of Treatment Evidence (based on Dollaghan, 2007)

	Camarata & Nelson (1992)	Camarata et al. (1994)	Nelson et al. (1996)	Spooner (2002)	Bellon-Harn et al. (2014)
1. Plausible rationale?	Y	Y	Y	Y	Y
2. Experimental study?	Y	Y	Y	Y	Y
3. Control group/condition?	Y-	Y-	Y	N	Y-
4. Randomization?	Y-	Y-	Y-	N	Y
5. Prospective methods & participants?	Y	Y	Y	Y	Y
6. Representative sample retained pre- and posttreatment?	Y	Y	Y	Y	Y
7. Clearly described & accurately implemented treatment?	Y	Y	Y	Y-	Y
8. Valid and reliable measurements used?	Y	Y	Y	Y	Y
9. Outcomes evaluated with blinding?	UR	UR	UR	N	N
10. Were findings robust; nuisance variables did not distort findings?	Y-	Y-	Y-	N	Y-
11. Statistically significant findings?	Y	Y	Y	UR	Y
12. Adequate statistical power?	NA	NA	NA	N	NA
13. Clinically important findings?	Y	Y	Y	Y-	Y
14. Precise findings?	Y-	Y-	Y-	N	Y
15. Substantial cost-benefit advantage?	Y	Y	Y	UR	Y-
Total points*:	20	20	21	12	23
Validity?	suggestive	suggestive	suggestive	equivocal	suggestive
Importance?	suggestive	suggestive	suggestive	equivocal	suggestive
Clinical bottom line:					
Camarata & Nelson (1992)	Clinicians may responsibly choose to move away from imitation-based treatment toward recast-based treatment but some may not. Contribution: comparison of two treatment methods. Primary concerns include small sample size and less precise findings relative to complex syntax intervention.				
Camarata, Nelson, & Camarata (1994)	Clinicians may responsibly choose to move away from imitation-based treatment toward recast-based treatment but some may not. Contribution: comparison of two treatment methods. Primary concerns: unclear if analysis was completed by blind coders, 6 participants did not follow the group trends (3 learned only in the imitation condition and 3 learned only in the recast condition), and difficulty determining which approach was most beneficial to complex syntax vs. morphosyntax or simple syntax targets.				
Nelson, Camarata, Welsh, Butkovsky, & Camarata (1996)	Clinicians may responsibly choose to move away from imitation-based treatment toward recast-based treatment but some may not. Contribution: comparison of two treatment methods. Primary concerns: small sample size, unclear if coders were blind to treatment condition, high variances and reduced statistical power yielded medium effect sizes between treatment conditions, and difficulty discerning treatment effects specific to complex syntax vs. morphosyntax or simple syntax targets.				
Spooner (2002)	No need to consider changing current clinical practice.				
Bellon-Harn, Byers, & Lappi (2014)	Clinicians may responsibly choose an interactive book-reading approach to target complex syntax but some may not. Contribution: outcome measures that directly examined two categories of complex syntax (coordination and subordination). Primary concerns: small sample size, lack of control or comparison treatment group (comparison treatment intensity condition), treating clinicians also collected pre- and posttreatment outcome measures, and no measures of carryover posttreatment.				

Note. *Points: 2 = evidence meets the criterion in all respects (Y); 1 = evidence meets the criterion in some but not all respects (Y-); 0 = evidence does not meet the criterion (N), unable to rate (UR), or not applicable (NA).