Should We Use Telegraphic or Grammatical Input in the Early Stages of Language Development With Children Who Have Language Impairments? A Meta-Analysis of the Research and Expert Opinion

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Purpose: In working with children with language impairments, some clinical scholars and clinicians advocate using input that is simplified to the point of being ungrammatical (telegraphic input), while others advocate simplified but grammatical input. This article considers 2 types of external evidence on this topic.
Method: First, a meta-analysis of relevant research, including intervention studies and processing studies, is reported. Next, 4 experts present their opinions.
Results: Children in the majority of the intervention studies showed no difference in language comprehension based on type of input, although 1 study with very few children favored telegraphic input for language production. In the processing studies, which measured immediate comprehension, children from clinical populations responded inconsistently when listening to the 2 types of input. Children who had typical language, however, favored grammatical input in their responses. Regarding the experts' opinions, 2 suggest that telegraphic input is sometimes warranted; 1, who previously indirectly promoted its occasional use, no longer believes it should be used; and 1 provides reasons why telegraphic input should not be used and may even be harmful.
Conclusions: Empirical findings and expert views are summarized as ways of informing parents of the weak evidence base regarding the best type of input.

Key Words: language disorders, treatment, early intervention

Children's earliest word combinations have been called "telegraphic" because they leave out components of grammar and therefore sound like telegrams of old (Brown, 1973). In telegrams, each letter was extremely costly, thereby encouraging the sender to pare down urgent messages to semantically essential words. Brown (1973) defined children's telegraphic speech as language restricted by length to include only content words (such as nouns, verbs, and a few adjectives and adverbs that are core to semantic meaning), with few or no functor words (including auxiliary verbs, articles,

conjunctions, and prepositions that serve grammatical functions but are less critical to semantic meaning). In English language development, grammatical morphemes (e.g., present progressive *–ing*) are typically completely absent in language production in this stage of development or are produced in fixed routines only. Examples of children's telegraphic speech include *mommy fix, baby table, put floor,* and *tractor go floor* (Brown, 1973, p. 205).

Although the use of telegraphic speech is a normal stage of early expressive language development, whether adults should in turn use telegraphic input (TI)[1] when interacting with children with language impairment who are at the early stages of language acquisition has been long debated. The question is critically important because a major way we foster language development is to manipulate the child's linguistic environment. If TI facilitates children's language development, it presumably should be used in many cases. If it has no effect, its use should be questioned. If it negatively influences development, it should of course be avoided.

There is a plethora of research documenting that the language input to young language-learning children is simplified in many ways. For example, it is lexically less varied, syntactically shorter and less complex, and semantically redundant with both the linguistic and nonlinguistic context (see seminal studies in Snow & Ferguson, 1977). In a similar fashion, when working with children with language impairments, clinicians and clinical scholars would all agree that linguistic input to children who are just beginning to produce single words and simple two- and three-word combinations should be simplified. Exactly how such simplification is achieved, however, is where the disagreement emerges. We basically have two options. We can simplify our input but keep it grammatical, or we can use TI and omit obligatory grammatical functors and morphemes so that only the content words are presented.

The American Speech-Language-Hearing Association (ASHA) requires speech-language pathologists (SLPs) to adopt an evidence-based orientation when making clinical decisions (ASHA, 2004, 2005). Dollaghan (2007) suggests that when SLPs are honestly uncertain about what clinical decision to make, they need to integrate three types of evidence in order to have an evidence-based orientation, including external evidence (from research and expert opinion), internal evidence (from one's clinical practice), and evidence based on patient preferences. The primary goal of this article is to present two levels of external evidence—research studies and expert opinion—in an attempt to shed light on whether we should use TI or grammatical input in our interactions with children with language impairment who are in the early stages of learning language.

To understand all of the issues relevant to the type of input one uses with beginning language learners, it is essential to make clear the types of adult utterances that are generally regarded as telegraphic. Consider a young girl who has a language impairment and is able to produce primarily only one- and two-word utterances. She is intently watching her clinician pretend to feed a doll from a bottle. The clinician might produce any of the following grammatically complete responses:

1. *(Susan is/I'm) feeding the baby.*
2. *(The baby is) drinking milk (from the bottle).*
3. *(This is/Here is) my baby.*

In these examples, optional selections are provided within parentheses. Note that exclusion of parenthetical material yields grammatically acceptable ellipses of speech that are *not* full sentences. Pragmatic and colloquial factors frequently give rise to short fragments like these, and they are certainly found in the language of parents to their children who have typical language development (Cameron-Faulkner, Lieven, & Tomasello, 2003). Thus, depending on the child's developmental level, fragments like *feeding the baby* and *my baby* would be pragmatically, prosodically, and grammatically complete options, even though they are not fully formed sentences.

In contrast, if the adult chooses to produce one element from within the parentheses (e.g., *I, baby, this*) in the above examples, the other items within the same parentheses are generally necessary to make the response grammatically complete. For example, although *This is my baby* would be complete, *This my baby* would be telegraphic. Thus, the following examples would all be telegraphic responses in the same context, even if all the morphemes in parentheses are actually spoken:

1. *(Mommy) feed(ing) (baby).*
2. *(Baby) drink(ing) (milk) (from) (bottle).*
3. *This my baby.*

Over the years, many treatment programs have included TI as one of their intervention strategies. These include older programs, such as the language intervention strategy (MacDonald & Blott, 1974), the language through conversation approach (MacDonald, 1985), the behavioral-psycholinguistic approach to language training (Stremel & Waryas, 1974), and the syntax teaching program (Miller & Yoder, 1972, 1974). More recently, TI has been promoted in the enhanced milieu teaching program (Hancock & Kaiser, 2006) and used in examples in It Takes Two to Talk, the widely used Hanen Program for Parents (Girolametto & Weitzman, 2006; Manolson, 1992).

The clinical populations of children with language impairment with whom TI has been used or advocated include those with cognitive delays, autism spectrum disorders, language impairments, and cleft palate (Girolametto & Weitzman, 2006; Hancock & Kaiser, 2006; MacDonald, 1985; Manolson, 1992; McCauley & Fey, 2006; Miller & Yoder, 1972, 1974; Scherer & Kaiser, 2006; Stremel & Waryas, 1974). These programs recommend TI to children in prelinguistic, one-word, and two-word stages of language development (and sometimes beyond) to increase their language production and/or comprehension.

Given that there are intervention programs that continue to advocate the use of TI, it is important to consider what evidence exists either in support of or against this practice. Unfortunately, there is only a small body of intervention

[1]Throughout this article, we will use the term telegraphic input (TI) to distinguish adult ungrammatical input to children from the stage of language development children go through that has been called telegraphic speech.

research that compares the impact of adult telegraphic and grammatical input on the language development of children with language impairments. We therefore also review a related body of research that concerns how children who are typically developing and those with language impairments respond to, and therefore potentially learn from, two forms of adult input. Because the majority of the studies that included clinical populations have weak internal and external validity, we then turn to the views of four well-established clinical researchers. Although expert opinion is the lowest level of evidence according to Robey (2004), it becomes important to consider in light of the low quality of evidence at other levels.

Method

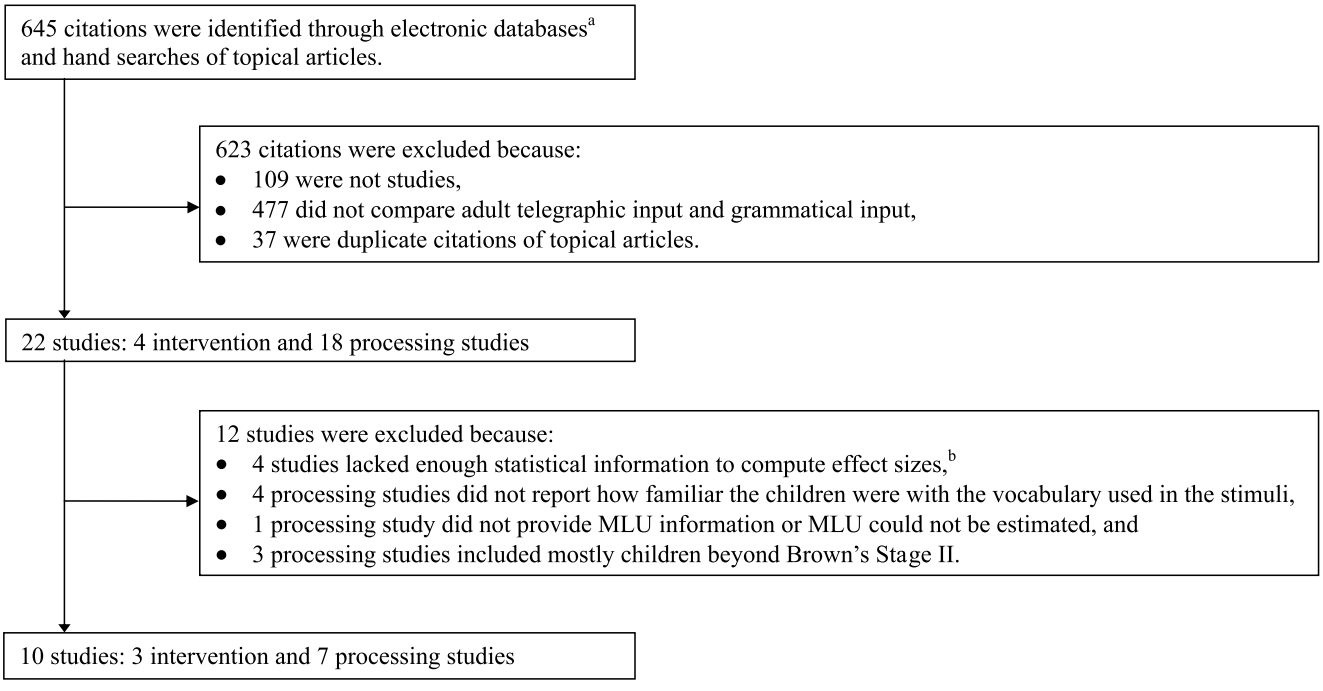
Search Procedures and Inclusion Criteria

Studies of English-speaking children were located through searches of electronic databases followed by hand searches of the references from relevant articles. See Figure 1 for details of the search procedure and the exclusion criteria. See Table 1 for identified sources of the citations mentioned in Figure 1, a list of search terms used, and databases searched. Although many of the studies reviewed had multiple research questions, only the results of questions related to whether clinicians should use telegraphic as compared to grammatical input are summarized here. Of the 645 identified citations, only 22 studies met the initial inclusion criteria (see Figure 1). Four of these studies were unpublished doctoral dissertations (Beverly, 1999; Jones, 1978; Larson, 1974; Smith, 1973), while the remaining studies were published in peer-reviewed journals. From this initial set of 22 studies, 4 studies were excluded because they included insufficient statistical data to allow for the comparison of their findings to other studies (Kramer, 1977; Loeb & Armstrong, 2001; Page & Horn, 1987; Ruder, Smith, & Murai, 1980).

The intervention studies directly address whether children show greater language gains in comprehension and/or production when adults use telegraphic as compared to grammatical input (Fraser, 1972; Jones, 1978; Willer, 1974), so no additional exclusionary criteria were applied, and all are reviewed.

The remaining studies are not intervention studies. They are concerned with how telegraphic and grammatical input are immediately comprehended by children who are typically developing and by children with moderate to severe cognitive delays (Beverly, 1999; Beverly & Swanson, 2005; Duchan & Erickson, 1976; Eiler, 1975; Fernald & Hurtado, 2006; Gerken & McIntosh, 1993; Kedar, Casasola, & Lust, 2006; Keller, 1982; Larson, 1974; Leder & Egelston, 1981; MacNamara, Carter, McIntosh, & Gerken, 1998; Page & Horn, 1985;

FIGURE 1. Process for identifying studies.



Note. MLU = mean length of utterance.

[a]See Table 1 for search terms and identified sources of these citations. [b]Post hoc criterion requested by the editor.

TABLE 1. Sources of the identified studies.

Electronic databases searched	Total hits	Exclusionary criteria: Not studies	Did not compare adult TI and GI	On topic duplicate articles	On topic articles
Medicine & Health Power Search[a]	30	9	16	1	4
Scopus	123	13	106	2	2
PubMed	110	14	95	0	1
Science Citation Index	10	1	9	0	0
Cochrane Review	1	0	1	0	0
Campbell Collaboration	0	0	0	0	0
ProQuest	15	0	12	0	3
CogNet Library	35	35	0	0	0
Linguistics and Language Behavior Abstracts	15	5	7	3	0
ERIC	6	1	3	1	1
Health & Wellness Resource Center	5	0	5	0	0
Education Research Complete	6	3	2	1	0
Communication & Mass Media Complete	3	1	1	1	0
Applied Social Sciences Index and Abstracts	0	0	0	0	0
National Research Register	1	1	0	0	0
Psychology & Behavioral Sciences Collection	1	1	0	0	0
Total hits using search terms	361	84	257	9	11
Additional search procedures					
Reverse citation search	263	25	220	9	9
Hand search of topical articles	21			19	2
Total hits	645	109	477	37	22

Note. TI = telegraphic input; GI = grammatical input. The following search terms were paired with *children*: (a priori terms) *telegraphic speech*, *short expansions*; (post hoc terms) *telegraphic input, telegraphic models, simplified language input, grammatical input, grammatical speech, grammatical models,* and *adult to child talk* (not paired with children).

[a]This database simultaneously searches the following databases: Medline, Alt HealthWatch, CINAHL, Pre-CINAHL, General Science Abstracts, PsycARTICLES, PsycINFO, Academic Search Complete, Health Source: Nursing/Academic, and Consumer Health Complete.

Petretic & Tweney, 1977; Shipley, Smith, & Gleitman, 1969; Smith, 1973). Eight of these processing studies were excluded from this review. The researchers in four studies did not report how familiar the children were with the vocabulary used in the stimuli (Duchan & Erickson, 1976; Eiler, 1975; Gerken & McIntosh, 1993; MacNamara et al., 1998). These studies were excluded because we do not know whether the differences in the children's responses were due to grammaticality or to differences in their familiarity with the vocabulary used in the stimuli.

The remaining processing studies considered how the type of input affected the language processing of familiar words. One of these studies was excluded because the researchers did not provide mean length of utterance (MLU) information on the children and, given their age ranges, a reliable estimate of the children's MLU could not be made (Leder & Egelston, 1981). Without MLU information, it was not possible to compare the results of this study with the other studies. Three studies were excluded because a majority of the children had MLUs beyond Brown's Stage II (Beverly, 1999; Beverly & Swanson, 2005; Keller, 1982). Children who are beyond Brown's Stage II often produce function words and functional morphemes and so do not speak telegraphically, and this review concerns input appropriate to children who are not producing language or are producing telegraphic language. The second author and a master's student independently determined whether the processing studies met the inclusion criteria. Interjudge reliability was calculated, yielding a Cohen's kappa (Cohen, 1960) of .97.

Description of the Studies

Tables 2 and 3 provide a summary of each study (e.g., age, MLU, population, outcome measures, and results). These studies reported data on children who were prelinguistic or were in Brown's (1973) Early Stage I (MLU: 1.00 to 1.49), Late Stage I (MLU: 1.50 to 1.99), or Stage II (MLU: 2.00 to 2.49). Table 2 summarizes the intervention studies. These studies examined children's language comprehension and/or production gains when provided with adult telegraphic versus grammatical input (Fraser, 1972; Jones, 1978; Willer, 1974). The 67 children who participated in these studies had moderate to profound cognitive delays, ranged in age from 3;7 (years; months) to 15;9, and were prelinguistic or spoke in only one-word utterances (i.e., Early Stage I). The researchers in two of these studies did not assess whether the children knew the vocabulary used in the intervention (Fraser, 1972; Willer, 1974). Jones (1978) included only prelinguistic children who did not know the vocabulary used in the intervention. These three studies meet the criteria of an efficacy study because the researchers attempted to examine the "effects of a treatment under ideal, controlled conditions" (McCauley & Fey, 2006, p. 554).

Robey (2004) summarized six levels of quality and credibility for efficacy studies, with Level I being the highest quality and Level V being the lowest: (a) a sound meta-analysis of various controlled trials with randomization (Level Ia); (b) one well-designed, controlled trial with randomization (Level Ib); (c) either a well-designed, nonrandomized controlled

TABLE 2. Reviewed intervention studies.

Study	Level of EBP	Dosage	Outcome examined	Sample size (*N*)	Population	Age (years;months)	Prelinguistic	MLU: Early Stage I 1.00 to 1.25 (only single words)
Fraser, 1972	II	30 min/day for 2 days	Criterion referenced test	49	Severe to profound CD	3;7–15;9	No difference for comprehension	—
Jones, 1978	II	15 min, 2 times/day, until commands learned	Time to learn commands	8	Severe to profound CD	7;4–13;11	No difference for comprehension	—
Willer, 1974	II	15 min/day, 5 days/week, for 5 weeks	Daily performance, criterion referenced posttests	10	Moderate to severe CD	5;6–13;6	—	Telegraphic for production No difference for comprehension

Note. EBP = evidence-based practice; MLU = mean length of utterance; CD = cognitive delay. "No difference" indicates no statistical differences between groups. "Telegraphic" indicates a statistically significant advantage in favor of TI. Dash indicates that the study did not test children in that particular developmental stage.

study or uncontrolled intervention studies (quasi-experimental studies; Level II); (d) nonexperimental, observational studies with controls (Level III); (e) uncontrolled, observational case studies (Level IV); and (f) the expert opinion of respected authorities (Level V). The Fraser (1972), Jones (1978), and Willer (1974) studies are classified as Level II.

Table 3 summarizes the processing studies. Researchers measured whether comprehension was affected by the type of input for a total of 145 children across all of the studies, either by having the children act out the stimuli with toys, by having them point to pictures of the stimuli, or by tracking their visual attention to the images when listening to the stimuli. Two sets of researchers examined the comprehension of 35 children who were typically developing by having them act out the meaning of sentences presented to them with toys (Petretic & Tweney, 1977; Shipley et al., 1969). These children ranged in age from 1;6 to 2;9 and were in Brown's Early Stage I through Stage II. One study was conducted with 12 children with moderate to severe cognitive delays (Page & Horn, 1985). These children ranged in age from 3;3 to 5;7 and were in Brown's Stage I. The goals of these studies were twofold—to determine whether children comprehend input more advanced than their own language production, and to determine which parts of the linguistic signal they attend to.

Two researchers measured processing by having the children point to one of four pictures after hearing the stimuli. Larson (1974) included 24 children, 12 with typical development who ranged in age from 1;6 to 2;10, and 12 with cognitive language delays who ranged in age from 3;4 to 6;4. An equal number of children in each group could be classified in Brown's (1973) Early Stage I and Stage II. Smith (1973) included 18 children, 9 with typical development who ranged

TABLE 3. Reviewed processing studies.

Study	Stimuli	Outcome examined	Sample size (*N*)	Population	Age (years;months)	MLU: Early Stage I 1.00 to 1.49	MLU: Late Stage I 1.50 to 1.99	MLU: Stage II 2.00 to 2.50
				Clinical populations				
Page & Horn, 1985	Declarative	Acting out	12	CD	3;4–5;7	No difference	No difference	—
Larson, 1974	Declarative	Picture selection task	24	TD	1;6–2;10	Grammatical	—	Grammatical
				CD	3;6–6;4	Grammatical	—	Grammatical
Smith, 1973	Declarative	Picture selection task	18	TD	1;8–2;4	Telegraphic	No difference	Grammatical
				OD	3;8–7;4			
				TD population				
Shipley et al., 1969	Imperative	Acting out	11	TD	1;6–2;9	No difference	Grammatical	—
Petretic & Tweney, 1977	Imperative and declarative	Acting out	24	TD	*M* = 2;3 and 2;9	—	Grammatical	Grammatical
Fernald & Hurtado, 2006	Imperative	Eye gaze[a]	24	TD	1;6	Grammatical		—
Kedar et al., 2006	Interrogative	Eye gaze[b]	16	TD	1;6	Grammatical		—
			16		2;0			

Note. TD = typically developing; OD = oral deaf. "No difference" indicates no statistical differences between groups. "Grammatical" indicates a significant advantage in favor of grammatical input. "Telegraphic" indicates a significant advantage in favor of telegraphic input.

[a]Reaction time. [b]Immediate latency.

in age from 1;8 to 2;4, and 9 who were deaf (and being educated orally) who ranged in age from 3;8 to 7;4. An equal number of children in each group could be classified in Brown's Early Stage I, Late Stage I, and Stage II.

Two sets of researchers measured children's visual attention (i.e., eye gaze) to familiar nouns when presented within grammatical sentences as compared to one of two telegraphic conditions, either as isolated nouns (Fernald & Hurtado, 2006) or within sentences that omitted function words (Kedar et al., 2006). Although these researchers included other stimuli conditions, the grammatical and telegraphic conditions are the only ones discussed in this review. These children were all typically developing and ranged in age from 1;6 to 2;0 and so could be classified in Brown's (1973) Stage I. In these studies, the children saw two images of familiar objects and heard one of the object names within either a telegraphic or grammatical condition. Although more than one measure of visual attention was used in each study, for the purposes of this review, the studies were compared on the most similar measure for which sufficient statistical data had been reported. This measure is the amount of time it took the children to focus on the image of the object named in the stimuli (for Fernald & Hurtado, 2006, reaction time in Experiment 2; for Kedar et al., 2006, immediate latency).

Figure 2 summarizes the two bodies of research by population and by linguistic stage. In the intervention studies, all the children had moderate to profound cognitive delays and lived in institutionalized settings. The processing studies included primarily children with typical language and children with moderate to severe cognitive delays.

Variability

The studies include a great deal of variability in sample size (10 to 49 children), type of research (treatment vs. nontreatment), population (clinical vs. nonclinical), disability (cognitive delay and hearing impairment), outcome measure (expressive language, acting out, picture pointing, and eye gaze), composition of stimuli (inclusion of nonsense words, semantic anomalies, and grammatical and telegraphic utterances), research design (quasi-experimental to randomized controlled trials), overall quality (external and internal validity), dosage and intensity (for the intervention studies), and illocutionary act of the stimulus condition (imperative, declarative, and interrogative).

External and Internal Validity Quality Markers

Each study's internal and external validity was assessed using questions adapted from Dollaghan (2007) that are listed in Table 4. Internal validity concerns whether the observed results from a particular study provide "a true or accurate reflection" of the participants' abilities given that study's outcome measures and procedures (Dollaghan, 2007, p. 28). Internal validity markers include the presence of nuisance variables, randomization (e.g., between groups, stimuli), blinding, an evaluation of the validity and reliability of outcome measures, discussions of interjudge reliability, and the reporting of statistical information (significance tests, effect sizes, and confidence intervals).

External validity concerns whether the observed results from a particular study can be generalized to people who have similar characteristics as the study participants (Dollaghan, 2007). External validity markers include the selection process of study participants, attrition (the number of participants who did not complete a study), and replicability (whether researchers have included enough detail so that someone else could repeat the study and get similar results). Internal validity, then, is closely tied to the external validity marker of replicability. For a study to be replicable, it must have strong internal validity. For this reason, the first and second authors organized the quality markers hierarchically around the external

FIGURE 2. Description of the two bodies of research by population and language stage.

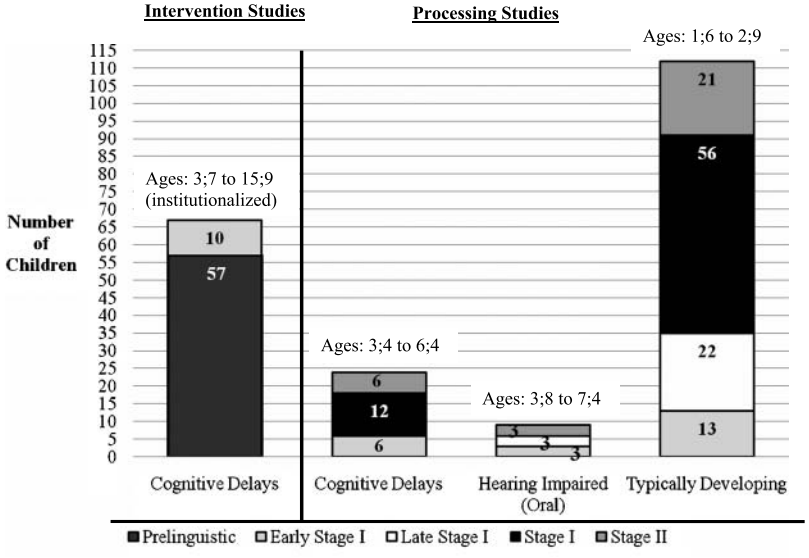


TABLE 4. Questions used to determine external and internal quality.

Quality markers	Questions
Participant selection	Were the children selected randomly from the population?
Attrition <20%	Did the children who began the study complete the study?
Replicability variables	
No nuisance variables	If a study included nuisance variables that could have affected the results, what were they?
Design type	
Statistical analysis	What type of statistical analysis was conducted?
Experimental	Did the researchers purposefully manipulate the child's experience so that they could make systematic observations of the child's behavior?
Random groups	If the study was designed to compare the results from 2 groups of children, were the children randomly assigned to each group?
Outcome measure implemented reliably	
Blinding	1. Were the people implementing the treatment or procedure blinded to the purpose of the study? 2. Were the people coding the data blinded to the purpose of the study?
Outcome measure type	What types of behavioral outcome measures were used?
Type valid and reliable	Did the behavioral outcome measures appear valid for the tasks they were designed to measure?
Stimuli block randomized	Were the stimuli block randomized?
Interjudge reliability	Did the researchers collect data on interjudge reliability?
Statistics	
Test statistic	Did the researchers report statistical significance data or include enough raw data so that significance could be determined?
Effect size	Did the researchers report effect sizes or include enough data so that an effect size could be calculated?
Confidence interval	Did the researchers report confidence intervals or include enough data so that confidence intervals could be calculated?

validity marker of replicability in an attempt to show the relationship between internal and external validity. For example, the presence of nuisance variables and the absence of blinding, randomization of stimuli, and/or discussions of interjudge reliability seriously threaten a researcher's ability to replicate a study and find similar conclusions. The overall quality score, therefore, not only quantifies the number of validity markers a study contains but also reflects the confidence researchers can have in finding similar conclusions if they were to attempt to replicate a particular study in this review.

Effect Size, Adjustments, and Confidence Intervals

A meta-analysis is a way to summarize quantitatively the results from primary research studies with similar outcome measures on a particular topic (Dollaghan, 2007). To determine what statistical procedures to use, we had to determine the kind of statistical model the studies fit. This meta-analysis fits a random effects model because our analysis assumes its results are shaped by both sampling error within the studies and a great deal of variability between the studies (Cooper & Hedges, 1994). Meta-analysis also can be used to synthesize different forms of evidence. For example, meta-analysis can synthesize studies with only the highest levels of quality or credibility—what is referred to as a "best evidence" approach. Meta-analysis also can be used to synthesize the available evidence (Lipsey & Wilson, 2001). We chose to synthesize the available evidence for the intervention studies, because there was almost no "best evidence" on this topic, and there was a total of only three studies. Also, as we strive to move toward evidence-based practice (EBP) in our discipline, it seemed important for clinicians to be aware of both the paucity and weak quality of the research by sharing with them all of the available evidence on this topic. Many may be surprised to learn about the lack of research evidence to guide us in answering this important clinical question. For the processing studies, we did apply exclusionary criteria, and therefore we do not report all of the available evidence. Even with our exclusionary criteria, however, many of these studies still contain a number of validity concerns, as is shown in Table 5.

In a meta-analysis, studies are compared by their effect sizes and confidence intervals. In addition to knowing whether findings in a particular study are statistically significant (this is a yes or no question answering whether the findings are likely different), it is also useful to know the *size* of any observed effects (which asks the question "different by how much"; e.g., Dollaghan, 2007). The effect size basically lets us know if a difference matters on a practical level. Confidence intervals of effect sizes estimate the measurement error surrounding the effect size statistic. So, effect sizes with narrow confidence intervals are more reliable than effect sizes with wide confidence intervals.

Effect size is a name given to a family of methods for measuring the magnitude of a treatment effect. Some, for example, are based on correlations, while others are based on means. The choice of which effect size statistic to use is based on a number of factors, such as the type of design (e.g., repeated measures or independent group designs), the type of data (e.g., dichotomous or continuous), the original type of statistic used to calculate significance (e.g., *t* test, analysis of variance, multiple regression, chi-square), the amount of data reported in the original study for which an effect size is being calculated when the authors did not report one, and so forth. Readers will likely be most familiar with the widely used Cohen's *d,* which determines effect size based on difference

TABLE 5. Intervention studies: external and internal validity quality markers (overall weighted average validity score = 65% or D).

Quality markers	Fraser, 1972 (CD)	Jones, 1978 (CD)	Willer, 1974 (CD)
Participant selection	—	—	—
Attrition <20%	Yes	Yes	Yes
Replicability variables			
No nuisance variables	—[a]	Yes	—[a]
Design type			
Statistical analysis	Dependent *t* tests	Dependent *t* tests	Subject × Treatment ANOVA
Experimental	Yes	Yes	Yes
Random groups	NA	Yes	Yes
Outcome measure implemented reliably			
Blinding	Trainers	—	—
Outcome measure type	Appropriate action or looking	No. of learning trials	Verbal response
Type valid and reliable	—	—	Yes
Stimuli block randomized	—	Yes	Yes
Interjudge reliability	Yes	Yes	—
Statistics			
Test statistic	Calculable[b]	Calculable[b]	Reported
Effect size	Calculable	Calculable	Calculable
Confidence interval	Calculable	Calculable	Calculable

Note. NA = not applicable; ANOVA = analysis of variance. Dash indicates information was not reported or the validity marker was absent from the study.

[a]Did not assess the children's familiarity with the vocabulary used in the intervention. [b]Significance data were reported. Published data were used to calculate significance data.

between two means divided often by their pooled standard deviation.

To choose the effect size for our analysis, we considered the different types of designs and the amount of statistical data available in the studies. The studies under review were published between 1969 and 2006. Except for the unpublished dissertations (Jones, 1978; Larson, 1974; Smith, 1973), the studies published prior to 1985 did not report standard deviations, or mean square errors, which are needed to calculate many types of effect sizes. We therefore chose a contrast *r* effect size (a partial correlation coefficient) to analyze the studies for two reasons. First, contrast *r* can be calculated with only the sample size, degrees of freedom, and reported significance test statistics (Rosnow & Rosenthal, 2003). Second, contrast *r* naturally adjusts for differences in design (repeated measures vs. independent groups; Rosenthal, 1991). A correlation describes the relationship between two variables, in our case, the outcome measures (acting out with toys, verbal response, picture pointing, or eye gaze) and the two types of input (telegraphic or grammatical). Correlations range from 0 to 1. A correlation of 0 indicates that the outcome measure and the type of input are not related. A correlation of 1 indicates that the outcome measure and the type of input are perfectly related.

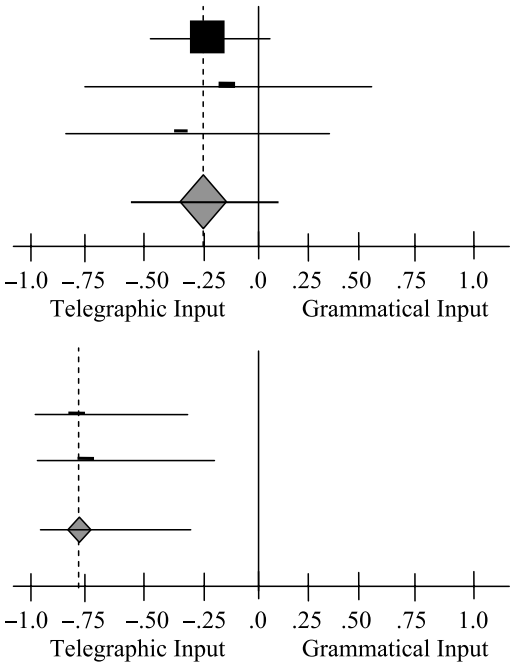
A study with fewer than 30 participants is considered to have a small sample size. With all but two studies containing fewer than 30 participants, we followed convention and adjusted all the effect sizes for small sample size (Durlak & Lipsey, 1991) following Rosenthal's (1991, pp. 21–24) method.

This sample size adjustment and the calculation for 95% confidence intervals could not be made directly on the contrast *r* effect sizes because the *r* distribution becomes skewed as the numbers (i.e., population *r* values) increase. We corrected for the skewed distribution by applying a Fisher's *z* transformation to each effect size before making the contrast *r* calculations, because it is based on a natural logarithmic scale (e.g., Rosenthal, 1991; Rosnow & Rosenthal, 2009). Unfortunately, the *Zr* effect size is difficult to interpret, so we then converted the adjusted *Zr* effect sizes back into contrast *r* effect sizes (Rosenthal, 1991). Although it is somewhat "risky" (Cohen, 1988; Rosnow & Rosenthal, 2009), we evaluated the importance of the adjusted contrast *r* effect sizes using the scale of .20 (low), .50 (medium), and .80 (high; Rosnow & Rosenthal, 2009). A weighted mean effect size was calculated for the intervention studies and for the processing studies (Lipsey & Wilson, 2001). Given the amount and different kinds of variability across studies, the mean effect sizes should be interpreted cautiously (Glasziou, Irwig, Bain, & Colditz, 2001).

We created forest plots for the intervention studies (see Figure 3) and for the processing studies (see Figure 4) to summarize the effect sizes and confidence intervals. A forest plot is a graph that provides a visual display of the strength of the evidence in quantitative studies. The size of each square in a forest plot is a visual indication of the weight (importance) of any given study in a meta-analysis. When synthesizing studies in a forest plot, a statistical analysis (i.e., heterogeneity) is often conducted to estimate the likelihood that the variation in the effect sizes is due to more than just sampling variation (Cooper & Hedges, 1994). We did not conduct heterogeneity analyses because Viechtbauer (2007) has found that analyses based on only five studies result in a high likelihood of finding statistically significant differences (heterogeneity) among studies when none exists (a Type I error).

FIGURE 3. Forest plot of the intervention studies using contrast *r* adjusted for sample size.

Studies	n	Adj r	CI	Validity
Comprehension				
Fraser, 1972 (prelinguistic)	49	–.25	–.49, .04	D
Jones, 1978[a] (prelinguistic)	8	–.15	–.77, .62	C
Willer, 1974 (Early Stage I)	10	–.34	–.80, .36	D
Weighted average adjusted r	**67**	**–.25**	**–.55, .13**	**D**
Production				
Willer, 1974 (Early Stage I)	10			D
Response to questions		–.79	–.95, –.32	
Verbal expression		–.75	–.94, –.22	
Weighted average adjusted r	**10**	**–.77**	**–.94, –.27**	**D**



Note. CI = confidence interval; [a]Unpublished doctoral dissertation.

Results

Quality Assessment

Tables 5 and 6 summarize the internal and external quality markers for the intervention and processing studies. The cells with dashes indicate that either the researchers did not design their studies to meet that particular validity criterion or they did not report the information. In the intervention studies, the biggest threats to internal validity were (a) blinding was not used; (b) the researchers did not assess the children's familiarity with the vocabulary used in the interventions; and (c) the outcome measures lacked validity and reliability. In the processing studies, the biggest threats to internal validity were (a) blinding was not used and (b) interjudge reliability was not discussed or reported. A grade was assigned to the overall quality percentage using a scale of A (90% to 100%), B (80% to 89%), C (70% to 79%), D (60% to 69%), and F (0 to 59%). The weighted average validity grade (weighted by sample size) is indicated in the title of Tables 5 and 6. The validity grade for each study is shown in Figures 3 and 4. The intervention studies received an overall quality rating of D or 65%, while the processing studies received a rating of B or 83%.

Forest Plots

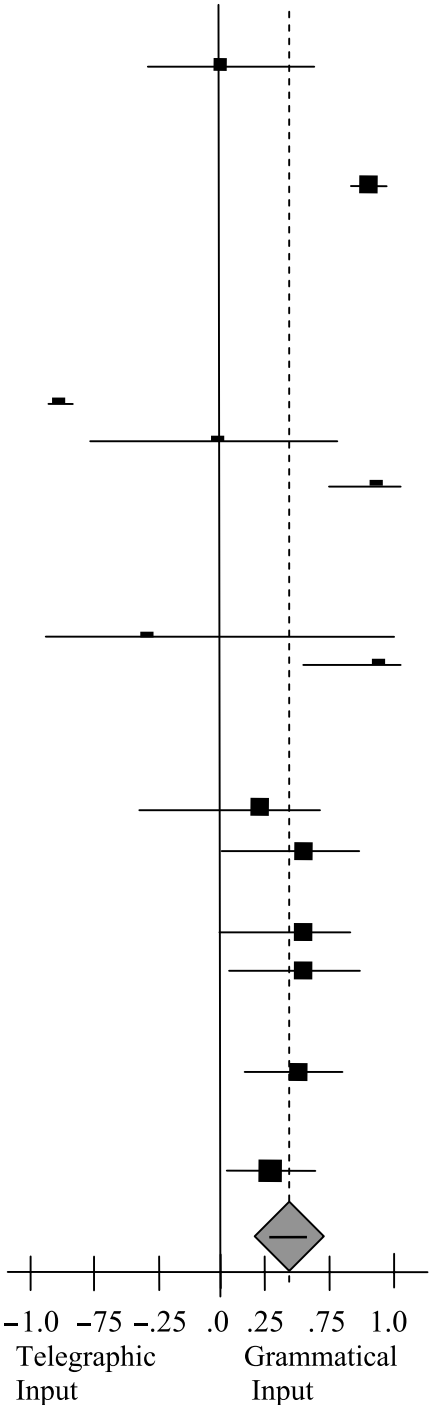
Three forest plots summarize the effect sizes and confidence intervals for the intervention and processing studies. To show contrast *r* effect sizes in forest plots, we assigned a negative sign to effect sizes in which the mean score for the type of input favored TI. The solid black vertical line references the 0 mark and indicates that there is no effect. The rectangles mark the effect sizes and are drawn in proportion to the number of children each study contributes to the total number of children shown on the forest plot. The horizontal lines associated with the rectangles are the confidence intervals for each effect size. When confidence intervals cross the 0 mark, the results are not significant. Effect sizes to the left of the solid line favor TI. Effect sizes to the right of the solid line favor grammatical input. The diamond at the bottom of each forest plot represents the weighted average effect size for the studies. The dotted line extends up through the forest plot and marks the weighted average effect size, allowing for easy visual comparison of a particular effect size to the weighted mean effect size.

The forest plots shown in Figure 3 summarize the intervention studies and are organized according to outcome measure (comprehension and production). For comprehension, children with cognitive delays who were prelinguistic and who were in Early Stage I tended to favor TI (as compared to grammatical input); however, the weighted average effect size of –.25 suggests that these differences were of low practical importance, and the confidence interval indicates that the results were not significant.

Willer (1974) also measured children's production, and his was the only intervention study with significant results.

FIGURE 4. Forest plot of the processing studies using contrast *r* adjusted for sample size.

Studies	n	Adj r	CI	Validity
Stage I: Children with Cognitive Delays				
Page & Horn, 1985 (declarative)	12	.02	−.56, .58	B
Early Stage I and II: Children with Cognitive Delays and Children who are Typically Developing				
Larson, 1974[a] (declarative)	24	.89	.76, .95	C
Children with Hearing Loss (oral education) and Children who are Typically Developing				
Smith, 1973[a] (declarative)	18			C
Early Stage I		−.99	−1.0, −.88	
Late Stage I		0	−.81, .81	
Stage II		.97	.74, 1.0	
Children who are Typically Developing				
Shipley et al., 1969 (Imperative)	11			C
Early Stage I		−.39	−.98, .91	
Late Stage I		.94	.66, .99	
Petretic & Tweney, 1977	24			D
Late Stage I				
Declarative		.23	−.40, .71	
Imperative		.58	.00, .86	
Stage II				
Declarative		.58	.01, .87	
Imperative		.62	.07, .88	
Fernald & Hurtado, 2006 (imperative)	24			A
Stage I		.53	.16, .77	
Kedar et al., 2006 (interrogative)	32			A
Stage I		.39	.04, .65	
Weighted avg adj r	**145**	**.45**	**.31, .57**	**B**



[a]Unpublished doctoral dissertations

TABLE 6. Processing studies: external and internal validity quality markers (overall weighted average validity score = 83% or B).

Quality markers	Page & Horn, 1985 (CD)	Larson, 1974 (TD and CD)	Smith, 1973 (TD and OD)	Shipley et al., 1969 (TD)	Petretic & Tweney, 1977 (TD)	Fernald & Hurtado, 2006 (TD)	Kedar et al., 2006 (TD)
Participant selection	—	—	—	—	—	—	—
Attrition <20%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Replicability variables							
No nuisance variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Design type							
Analysis	RM ANOVA	RM ANOVA	RM ANOVA	Dependent *t* tests	RM ANOVA	RM ANOVA	RM ANOVA
Experimental	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random groups	NA	NA	NA	NA	NA	NA	NA
Outcome measure implemented reliably							
Blinding	—	—	—	—	—	Yes	Yes
Outcome measure type	Appropriate action	Picture pointing	Picture pointing	Touch[a]	Appropriate action	Eye gaze[b]	Eye gaze[c]
Type valid and reliable	Yes	Yes	Yes	—	Yes	Yes	Yes
Stimuli block randomized	Yes	Yes	Yes	Yes	—	Yes	Yes
Interjudge reliability	Yes	—	—	Yes	—	Yes	Yes
Statistics							
Test statistic	Reported	Reported	Calculable[d]	Calculable[d]	Reported	Reported	Reported
Effect size	Calculable	Calculable	Calculable	Calculable	Calculable	Reported	Reported
Confidence interval	Calculable	Calculable	Calculable	Calculable	Calculable	Calculable	Calculable

Note. RM = repeated measures.

[a]Raw data only available on this outcome measure. [b]Reaction time. [c]Immediate latency. [d]Significance data were reported. Published data were used to calculate significance data.

Children in this study had moderate to severe cognitive delays. Willer randomly assigned an equal number of children to a TI treatment and a grammatical input treatment. Although the children in both treatment conditions improved during treatment, only children in the telegraphic treatment showed statistically significant improvement between pre- and posttesting on their ability to respond correctly to grammatical questions and to verbally identify objects, describe actions, and make "prepositional statements" (Willer, 1974, p. 349). The effect sizes for language production indicate that this finding is of high importance. However, these effect sizes are based on the results from only 10 children in Early Stage I (MLU of 1.00 to 1.25) who lived in an institutional setting. Given the differences between settings in which these children lived and how children with cognitive delays are educated today, the results from these studies do not generalize well to current clinical practice. The weighted average effect size for production was .79, and the confidence interval indicates that the results are statistically significant. Given the overall quality score of D, and the small number of children in this one study, the Willer study by itself is weak evidence.

The second forest plot shown in Figure 4 summarizes the processing studies and is organized according to population (clinical and typical) and disability (cognitive delays and hearing impaired). The confidence intervals indicate that some of these results were significant. The results of processing studies that included children with disabilities are inconclusive for children in Stage I but favor grammatical input for children in Stage II. The results for studies of children who are typically developing and in Late Stage I and II also favor grammatical input. The weighted average effect size for all the processing studies was .45, which suggests that the results overall are of medium clinical importance. The confidence interval indicates that it is a significant finding. The overall quality score, as shown in Table 6, is 83% or B.

Conclusion From the External Research

The results of processing studies are compelling for children who are typically developing. However, for children from clinical populations, this body of research is not convincing for a number of reasons. As was already mentioned and as shown in Tables 5 and 6, several factors contribute to low overall external and internal validity of the studies that included children from clinical populations. Furthermore, the sample sizes were often very small and the outcome measures and scoring procedures were sometimes problematic. The definitions of grammatical input and TI in the processing studies also sometimes varied quite dramatically from the kinds of input clinicians would realistically provide to children with language impairments (e.g., input containing nonsense words or semantic anomalies). Also, it may be problematic to generalize from populations of children who are typically developing to those with language impairments.

In summary, in the intervention research, only one very small study of children with moderate to severe cognitive delays had significant results. This study showed that children in both treatment conditions improved, but only children in

the telegraphic treatment showed significant gains in their response to questions and verbal expression (they did not show gains in their comprehension). On the contrary, grammatical input was favored overall in the processing studies (relevant to children's comprehension of input). Given the small amount of research designed to examine the effects of telegraphic versus grammatical input in clinical populations, the overall weakness of that research, and the lack of consistent findings favoring either type of input, we clearly cannot base the clinical use of TI with young children with language impairments on research findings to date. We move, then, to look at the opinions of the experts.

Expert Opinions on the Clinical Use of TI

The views of four of the authors of this article on the use of TI in language intervention are presented below. Two (Miller and Kaiser) present the ways in which they have used and continue to use TI along with some of their rationales. One author (Weitzman) who previously promoted some use of TI indicates why she no longer believes it should be used, and the fourth (Fey) provides his reasons for his long-held view that TI is not likely to be clinically productive and may even be harmful.

When, How, and With Whom to Use TI: Two Views

Jon Miller

In the early 1970s, David Yoder and I proposed using TI as part of our language intervention programs for children with cognitive challenges (Miller & Yoder, 1972, 1974). TI was proposed as part of the general theoretical framework recapitulating normal developmental milestones as intervention content, recognizing the need to highlight the language feature to be processed in comprehension as the first step in mastery. This approach was unique at the time, when most language intervention programs for children with cognitive impairments used operant conditioning approaches that focused only on the form of words and sentences produced, while ignoring meaning as well as the role of language comprehension. A developmental approach recognized that children learned language in a stepwise progression following a predictable sequence reflecting their knowledge of the world and experience with oral language.

Universals of language learning were developed articulating the child's language-learning strategies. One notable rule—new forms first express old functions; new functions first express old forms (Slobin, 1973, p. 184)—directs us to select intervention content that requires the child to learn only one new thing at a time, a syntactic form or semantic meaning. The role TI plays in this context is to limit the amount of new information and to focus attention on the new element to be processed. In the following, I review the frameworks of these early intervention programs to place our proposal to use TI in context, and then discuss what I might recommend now in light of more than 30 subsequent years of research on typical and disordered language.

In our Syntactic Teaching Program (STP), we proposed that adult input should involve (a) reducing syntax to TI, (b) expanding and modeling child utterances, and (c) talking to the child as much as possible about things happening at the moment. We proposed using TI to (a) reduce adult syntax to the level of child's syntactic code, (b) facilitate the child's induction of the latent structure, and (c) work through the early stages of typical language development (from single-word utterances, to word strings, to early syntactic constructions).

STP was based on three assumptions: (a) children need something to say (knowledge of the world), a reason to say it (intentionality), and a way to say it (language competence); (b) comprehension precedes production; and (c) environmental manipulation is needed to provide increased experience with the concepts necessary for comprehension and expression using language. The idea was that clinician input should initially be telegraphic, but as the child began to use syntactic constructions, the clinician should transition to using fully grammatical sentences when expanding and modeling utterances.

In 1974, an Ontogenetic Teaching Strategy (Miller & Yoder, 1974) was developed to address the needs of children who resided in residential facilities and had limited or no verbal language, but were more advanced in their cognitive development. Our challenge with these children was their lack of intentionality, followed by their lack of experience with spoken language. Their experience with adults was limited to basic caretaking, with language models provided only if the staff cared to talk to them at all. Remember this was prior to the Education for all Handicapped Children Act (1975) requiring equal access to education, which prompted these institutions to return residents to their families and communities.

We developed the Ontogenetic Teaching Strategy program based on the principles of (a) teaching language in context, (b) determining the content from typical development, and (c) determining sequence by the frequency expressed by typical children (we assumed that this reflected the environmental experience of young children) and the order of acquisition in typical children (we assumed this reflected the order of difficulty). The program format focused on manipulating the children's experience with objects and events and the language used to encode them. The goal was to bring language and experience together into a structured teaching program. For example, if you wanted to teach the child to say *ball,* you would first introduce a ball by sitting on the floor with the child and rolling the ball to her or him while saying *ball* each time. Then, you would gesture to the child to roll the ball back, saying *ball.* Once the routine was established, the clinician required that the child say *ball* before rolling the ball back to the child. This typically required only a few trials. Then the input could be expanded to *roll ball, throw ball,* and so forth. This approach looked very much like what today is called Milieu Teaching, which will be discussed by Ann Kaiser in the next section.

Our view of language input was that it should be one level more advanced than the child's stage of production (e.g., for a child at the one-word production stage, the clinician would use one- to two-word input). We also believed that the clinician should always work from the child's level of comprehension to production. Within this framework, we proposed using TI for the early stages of language development. Also, parents, teachers and community contacts could use TI to facilitate comprehension.

My view of using TI in language intervention programs at the present time is summarized in the following statements. It can be used within a teaching program to control language complexity by putting emphasis on specific elements to be learned (e.g., lexical, semantic, or syntactic). Using TI does not apply to expansions of children's utterances. TI should not be used in everyday communication that provides general language experience within the context of ongoing daily activities. We need to continue research on the role of adult language directed to children with specific reference to the child's level of language comprehension.

Ann Kaiser

In spite of the controversy surrounding the use of TI, there are instances in which I believe its use is appropriate and effective in early language intervention. In the following section, I discuss a rationale for the use of TI, summarize an approach to early intervention that specifically includes TI, and, finally, discuss the instances within the proposed intervention framework when TI is not recommended.

Why use TI? First, I assume that TI maps early semantic relationships, such as agent + object, agent + action, or attribute + object, but does not include morphological markings for verb tense or agreement, the progressive verb form *–ing,* plurality, or articles such as *the* or *a*. So, full adult grammar is constrained while maintaining word order rules and emphasizing the key agents, actions, attributes, or locations. Second, I assume that the reduction in complexity provides appropriately simplified input for the child who is in the early stages of language learning. Key to this second assumption is the notion that the purpose of providing simplified input is to make it easier for the child to imitate the utterance in his or her own production, and that child practice with production will facilitate acquisition of the form (see Willer, 1974). This assumption is consistent with those early language interventions that include specific, elicitive prompts.

Use of TI in enhanced milieu teaching. Enhanced milieu teaching (EMT) is a naturalistic early language intervention with conceptual roots in both social interactionist and behavioral theories of language learning (Kaiser, 1993). EMT is composed of three broad components: (a) environmental arrangement to promote child engagement and child requesting; (b) responsive interaction, which includes balanced verbal and nonverbal turn taking, modeling, expansions and semantically related feedback for child utterances; and (c) milieu teaching prompts for child language production practice (elicitive modeling, mand-model, time delay, and incidental teaching).

In EMT, TI is used in three ways for children who use predominantly single words or are transitioning to two-word utterances. First, the interventionist models simple two-word examples of key semantic relations as part of her or his responsive interaction with the child. Second, she or he may expand the child's single-word utterance by responding with a two-word utterance (e.g., *ball* followed by *roll ball*) that maps these relationships. Third, the interventionist prompts the production of two-word utterances using elicitive modeling, manding and modeling, time delays, and incidental teaching. These prompting episodes may begin with a two-word model (*Say, roll ball*) or with a request for the child to make a choice using two words (*Tell me what you want. Blow bubbles or play puzzle?*). Alternatively, the interventionist offers a corrective two-word model when the child produces a single word in response to a model, mand, or time delay.

TI for specific populations of language learners. Although EMT has been shown to be effective with a wide range of children with language disabilities, often it is used with children who have significant intellectual disabilities (Kaiser & Trent, 2007). However, it should be noted that we have never directly compared TI to fully formed utterances within the EMT, so we do not have evidence regarding whether the TI component has contributed to our overall significant findings with EMT. In most of our studies, child participants were between 2½ and 5 years of age, had significant cognitive disabilities (IQ range = 60–75), were less than 60% intelligible, and had MLUs below 2.0. Because study entry criteria required only modest language skills (10 productive words, verbally imitative), many children were in the early stages of learning language. The specific characteristics of this population of children—language abilities, intellectual functioning, and speech intelligibility—suggest the need for simplified models of language and prompting production. When children have very limited vocabulary (fewer than 50 words), single- and two-word utterances provide intensive modeling of concrete, referential vocabulary for agents, objects, actions, and locations. When children have moderate vocabularies (50–100 words) and are transitioning from single-word to two-word productions, use of TI is used in modeling and production practice with early pivot-grammar type combinations and then with more generative two-word combinations. In my view, simplifying language input in this way to emphasize vocabulary and early word combinations is important for this particular population of children who are challenged in making the transition into early generative language use.

When is TI not ideal? I do not recommend using TI at all times during interactions with young language-learning children, even those children just described as benefiting from EMT, which contains TI as a component. Indeed, few adults can carry on a conversation with a child using only TI and maintain a sensible and meaningful exchange. In addition, as children acquire two- and three-word semantic relationships in their productive language, adults should quickly adapt their language to provide models in advance of the child's production.

Thus, I qualify my recommendations for the use of TI in the following ways:

1. Use TI in focused interactions such as EMT to teach vocabulary and two-word semantic relationships.
2. Let the child's progress guide the duration and intensity of using TI. If the child is having difficulty combining two words, model simple forms and track progress carefully. Prompt production, expand single-word utterances to two-word combinations, and model these forms when it is natural and meaningful to do so in interactions.
3. Balance adult input so that overall MLU is within the child's range (child MLU plus 3–4 words/morphemes). Do not constrain language to the extent that verbal interactions are not reasonably natural and meaningful. Do

not eliminate all modeling of early morphological markers for verb tense, plurality, present progressive *–ing,* articles, and so forth.

4. For typically developing children, or children with typical intellectual abilities, TI may not be necessary or may be useful for a very short period of time in early development. If a child is rapidly acquiring new multiword utterances, there is little need for TI.

Reasons for Not Using TI and Alternative Ways to Simplify and Highlight Input: Two Views

Elaine Weitzman

It Takes Two to Talk—The Hanen Program for Parents is a well-known, indirect service delivery model of language intervention for toddlers and preschoolers with language impairment. The use of TI is not addressed explicitly in the It Takes Two to Talk parent guidebook (Pepper & Weitzman, 2004). However, throughout the book, it is suggested that parents keep their responses short. For example, the description of how to follow a child's lead by making a comment includes the following guidance: "Another way to follow your child's lead is to make a short comment that matches what your child is doing or saying at that very moment. A comment can be just one or two words or a short sentence. Use simple clear language" (Pepper & Weitzman, 2004, p. 40). While most of the dialogue balloons in the guidebook's pictorial illustrations show parents using grammatical sentences, there are some examples of TI. For example, an illustration of "Expand your child's message" shows a child pointing to a faucet and saying, "On," and the mother responding, "On … water on."

Based on the inclusion of examples of TI in It Takes Two to Talk materials, TI might be assumed to be a fundamental component of this intervention, but there is no reason why this must be the case. To see why this is so, some description of the program is helpful. This program provides parents with approximately 16 hr of group training, and three individual video feedback sessions, on how to facilitate their child's language development in naturalistic contexts and maximize the child's daily opportunities for communication development. The program is run by a Hanen-certified SLP (Girolametto & Weitzman, 2006) and is supported by resources such as a leaders guide, a teaching DVD, and a parent guidebook (Pepper & Weitzman, 2004).

Parents learn to apply responsive interaction strategies consistently to their everyday interactions with their child. Program content is taught in a highly interactive, experiential manner, with strategies being given concrete, user-friendly names to make them easier to remember and apply. The strategies parents learn are divided into three clusters: (a) child-centered strategies designed to encourage child initiations (e.g., observe, wait and listen, and follow the child's lead); (b) interaction-promoting strategies designed to facilitate balanced, extended turn-taking episodes (e.g., match your turns to your child's turns, ask questions that keep the conversation going, and cue your child to take a turn); and (c) language-modeling strategies designed to facilitate receptive and expressive language development (e.g., give your child a word, and expand your child's message; Girolametto & Weitzman, 2006; Pepper & Weitzman, 2004).

Fey, Long, and Finestack (2003) suggest that when clinicians model target forms using TI, they do so to "eliminate potentially distracting elements" (Fey et al., 2003, p. 10) and to highlight the relationships between content words. Despite the logic behind this approach, there are cogent reasons for avoiding the use of TI. Bedore and Leonard (1995) proposed that prosodic, morphological, and syntactic features of adult speech provide important cues for children regarding linguistic boundaries, grammatical classes of words, and possible meanings of words. TI strips these important cues. Fey et al. (2003) argue that TI may deprive the child of exposure to more complex linguistic models within his or her range of comprehension, thereby limiting learning opportunities. Indeed, as shown in our introductory review of the research in this article, there is no evidence that TI facilitates the comprehension of linguistic input.

Alternatives to TI in It Takes Two to Talk. When considering how best to facilitate parents' use of appropriate language models, a versatile strategy in It Takes Two to Talk, called Highlight Your Language (Pepper & Weitzman, 2004), seems to address all the experts' recommendations. Highlight Your Language promotes the use of grammatical models in short phrases and sentences. It also includes the application of "therapeutic prosody" (Gerken & McGregor, 1998, p. 45), which is characterized by increased pitch variability, increased loudness, and a slower rate of speech (Reuvers & Hargrove, 1994). These same features have been shown to facilitate word learning by children with specific language impairment (Weismer, 1997; Weismer & Hesketh, 1996, 1998).

The introduction to the Highlight Your Language strategy states that "it's not just *what* you say to your child that helps her learn language, but *how* you say it. Making the words that you add stand out—highlighting them—helps her [the child] understand them and, in time, learn to say them" (Pepper & Weitzman, 2004, p. 92). The strategy is broken down into four components called "The Four Ss," which consist of *S*ay less, *S*tress, Go *S*low, and *S*how, followed by Repeat, Repeat, Repeat, the latter relating to the use of focused stimulation (Fey, Cleave, Long, & Hughes, 1993). For example, in the It Takes Two to Talk DVD, a scene showing a father playing "Bury the Bucket" in the sandbox with his child illustrates how the father uses "Expand" and "The Four Ss" to facilitate two-word utterances:

Dad: *Bucket* (picks up bucket)

Child: *Bucket*

Dad: ***Bury*** *the bucket* (digs a large hole in which to bury the bucket). *Daddy*'s *going to* ***bury*** *the bucket.* (Buries the bucket under the sand) ***Where's*** *the* ***bucket****?*

Child: *Where?*

Dad: *Where?* ***Where's*** *the* ***bucket****?*

In this example, the father uses both phrases and sentences that are well formed and grammatical, even though some are incomplete. In addition, he uses buildups and breakdowns, which provide opportunities for frequent, concentrated models of specific targets. These are the types of non-TI adult responses that are recommended as part of It Takes Two to Talk. In light of the arguments against the use of TI with children who have language impairment (Bedore & Leonard,

1995; Fey et al., 2003), which I find compelling, future editions of the program resources will require further revision along these lines to ensure that language-modeling strategies are placed in the context of simple, well-formed, grammatical utterances.

Marc Fey

The argument I present stresses three facts about language learning and language-learning problems, and shows how, based on these facts, TI can be seen to *degrade* rather than *upgrade* the language models available to children. Therefore, it is not likely to make grammatical development more tractable. In fact, over a period of weeks or months, it could significantly restrict that development.

Fact 1: Grammatical morphology poses special problems for children with language impairment. The majority of children with language impairment, including those with specific language impairment and Down syndrome, are known often to have significant difficulties in aspects of language content and use. The most significant delays of English-speaking children with language impairment, however, typically lie in the acquisition and use of grammar, especially production of grammatical morphology (Bedore & Leonard, 1998, 2001; Chapman, 1999; Chapman, Seung, Schwartz, & Kay-Raining Bird, 1998; Eadie, Fey, Douglas, & Parsons, 2002; Leonard, Camarata, Brown, & Camarata, 2004; Leonard, Camarata, Pawlowska, Brown, & Camarata, 2006; Leonard, Miller, & Gerber, 1999; Rice & Wexler, 1996).

To facilitate language development among children with such language impairments, it would seem most reasonable to put these problematic features of grammar on display in the input from the earliest stages of learning. This would ensure that they are included frequently and clearly and, wherever possible, highlighted in speech to children with impaired language (Bedore & Leonard, 1995; Fey et al., 2003). Instead, TI strips utterances of the very syntactic and morphological detail that these children have special difficulties in acquiring.

Fact 2: Sparse or optional presentation of morphosyntactic features makes those features more difficult to acquire. It is well known that key features of language are represented differently in the surface forms of different languages. Furthermore, it is now well accepted that features which occur frequently and consistently in a language will generally be acquired earlier in that language than in another language in which the same feature is optionally or sparsely represented (Dromi, Leonard, & Shteiman, 1993; Fletcher, Leonard, Stokes, & Wong, 2005; Tomasello, 2003).

Based on these observations, a reasonable principle of language intervention would be to ensure from early on that children with language impairment hear sparsely represented forms in appropriate contexts as frequently and consistently as possible in the contexts in which their use is obligatory. Yet, use of TI with young children often works directly against this principle. By combining telegraphic models from intervention contexts (e.g., *Daddy* ***drive*** *car*) with nontelegraphic models of language forms from typical ambient models (e.g., *Daddy* ***drives his*** *car*), providers of TI may take sparsely represented but obligatory syntactic and morphological constructions, like the third person singular morpheme in English, and make them appear optional to the child. Given what we know about sparseness and optionality in language learning, it's difficult to see how this could facilitate development, and it may make these forms considerably more resistant to learning than would otherwise be the case.

Fact 3: Children utilize prosodic, morphological, and syntactic cues to process and learn new words and grammatical constructions well before they produce those same forms in their own speech. Readers who readily accept my clinical conclusions from the first two facts I have presented may still have difficulty accepting the position that grammatical features removed in TI might actually be useful to children in learning new content words, especially verbs, and the basic syntactic constructions that are built around them. There is considerable evidence, however, that function words and inflections can provide cues to a novel word's grammatical form class and even word meaning well before the time these forms appear in children's productions (Behrend, Harris, & Cartwright, 1995; Golinkoff, Hirsh-Pasek, & Schweisguth, 2001; Hohle & Weissenborn, 2003). This is likely to be especially important for verbs. For example, typical 2-year-olds respond to nonsense words, like *fliff,* as if they are verbs when they are heard with *–ing* (e.g., *Watch me fliffing*) and as nouns when they are preceded by determiners, like *the* (e.g., *Watch the fliff*), even when the physical conditions in which the children experience the words are identical (Golinkoff et al., 2001). Thus, the linguistic context can facilitate the child's analysis of otherwise ambiguous aspects of word meaning and grammatical function.

The important question is "Can and do young children use this information?" Although it is not always clear which cues they are using and whether the cues are primarily syntactic or semantic (Tomasello, 2003), there is compelling evidence that typical children can utilize the structure and content of sentences in which they hear novel verbs to map the meanings and syntactic properties of those verbs (Gleitman, 1994). What happens when clinicians and parents remove this material from the input they provide their child? We don't know the answer to this question, but in my view, we shouldn't prescribe TI without exploring its potentially negative consequences.

Conclusion. I have presented some reasons for clinicians and the parents they serve to reconsider their use of TI to children and youths with language impairment, and my recommendation remains not to use TI whenever there are grammatically complete options available. This being the case, it is reasonable to ask, "What type of input is most likely to suit ideally the needs of children with language-learning problems?" In the end, we don't know what the best (or most harmful) verbal response to a child is in any given context and set of circumstances. Based on developmental studies of input to date, however, I believe that input will be well suited to the communication moment and to the child's broad developmental needs when adults (a) follow the child's attentional foci and interests; (b) wait for the child to communicate, intentionally or otherwise; (c) use grammatically and prosodically complete utterances (including statements, questions, and even imperatives) that are relevant to the child's attentional foci and contingent upon the child's communications acts; and (d) are responsive to indications that the child does or does not understand their verbal messages. These recommendations are, in principle, the same as those found in most focused and

general stimulation language interventions, such as It Takes Two to Talk. However, these guidelines do not preclude the use of elicitive prompts, as are used liberally in EMT and many other intervention models, nor do they require children to respond to such prompts with grammatically complete responses that are beyond their production capabilities. They only require that adult requests for repetition be clausally or phrasally complete, as in the following example of a child in the early stages of multiword use:

Child: *Ball.*
Adult: *Say, throw the ball.*
Child: *Throw ball.*
Adult: *Okay, I'll throw the ball.*

Adults who follow these guidelines with their very young children are likely to produce lexically and relationally simple, but grammatically well-formed, utterances that are highly redundant in their structure and content, as is characteristic of language to typically developing 2-year-olds (Cameron-Faulkner et al., 2003). As children grow older and their communications become more complex, adult input will naturally become topically more variable and more semantically and grammatically complicated. For children with language impairments, SLPs and well-trained parents can make use of specific verbal responses, like conversational recasts (Camarata & Nelson, 2006; Cleave & Fey, 1997) and elicitive prompts (Hancock & Kaiser, 2006), to influence grammatical development in specific target areas. In my view, though, there is little to be gained and possibly much to be lost by presenting these input acts in grammatically ill-formed packages.

Conclusions From Expert Opinion

These scholars clearly diverge in their opinions regarding the clinical use of TI. Although Miller and Kaiser disagree with Weitzman and Fey on the use of TI, all of these experts agree that the evidentiary record to date does not adequately guide clinicians who need to make a decision about the use of TI. And our authors who do advocate for the use of TI do so with a number of qualifications. These include that it should probably not be used with all children, should only be used within a restricted language development window, and, even within that window, should not be used all the time.

So where does this leave clinicians? Some might conclude that, given the lack of compelling research evidence coupled with the lack of consensus among the experts, they simply cannot use EBP in making decisions regarding the use of TI. As noted at the beginning of this article, however, that external evidence (research and expert opinion) makes up only one of three parts of any proper evidence-based decision. In the next section we offer suggestions on how clinicians might approach the issue of whether to use TI given this broader perspective on EBP.

Directions for EBP

Dollaghan (2007) suggests that to adopt an EBP orientation in working with young children, the service provider should integrate external evidence (i.e., research results and expert opinion) with both evidence internal to clinical practice (i.e., based on nonexperimental data they have collected in clinical practice) and third-party evidence that reflects the fully informed preferences of the patient (or in this case, a child's caregivers). Dollaghan refers to the integration of these three sources of evidence as "E^3BP," reminding us that the evidence addressed in this article, research results and expert opinion, constitutes only one category of evidence necessary for conducting EBP.

Clearly, the research evidence does not provide unequivocal guidance regarding the use of TI, and caregivers need to be apprised that this is the case in order to be "fully informed." As such, the SLP would need to share with them that (a) there are very few studies relevant to this topic, (b) the quality of the studies that included clinical populations is considered weak by modern research standards, and (c) of studies with significant findings, those that have evaluated children's language comprehension have consistently supported the use of grammatical input over TI. Studies that have examined the intervention effects of TI and grammatical input have generally yielded no differences between input types. However, in one small study with weak validity (Willer, 1974), TI yielded significantly greater effects on measures of children's production than did grammatical input.

The SLP should also tell the caregiver that experts disagree on whether to use grammatical input or TI with children with language impairments who are in the very early stages of language development. They should know that no experts suggest that TI be exclusively used, and one expert believes that it could in fact be detrimental to a child's language learning because it exposes the child to language that is ungrammatical.

The SLP should also share with parents any clinical evidence he or she may have gathered regarding the effective or ineffective use of either grammatical input or TI with previous clients similar to the current client for whom this clinical decision is being made. Such evidence should be based on actual data kept during intervention, and not on "a sense" that one or the other type of input "seemed" or "did not seem" effective. This provides one more reason why it behooves us to keep careful data on our clients during intervention.

Once caregivers are armed with this information, the SLP should listen carefully to their concerns and preferences, and then use her or his individual clinical expertise to guide the choice that is made regarding the type of input to use with this particular client. Regardless of which choice is ultimately made, it will be important to keep careful data of the child's responses to the language input used with him or her. This should include data on responses related to both comprehension and production. If the initial choice is shown to be ineffective following a dosage that has typically been effective with similar types of clients, switching to the alternate type of input and again keeping careful data might be warranted.

In reviewing the research and explaining expert opinions on whether to use TI with children with language impairments who are in the very early stages of language learning, it becomes very clear that more research is needed on this topic. Clinical scholars currently committed to using TI with certain clients might consider putting that belief to the test by employing a single-subject ABAB alternating treatment research design, in which TI (treatment A) and grammatical input (treatment B) are used alternately, and careful data are collected

on different aspects of the child's language in response to both types of input, both in terms of language comprehension and production.

It would be important to remember, however, that data on a child's quality and level of interaction during specific intervention sessions would not directly address the larger question of how the type of input would affect language development over time. Nonetheless, single-subject research falls within the first of the five phases in treatment outcome research described by Robey and Schultz (1998) and represents an essential step in determining whether this issue even warrants further study. If children from clinical populations show an important difference in how they respond to intervention based on type of input in single-subject studies, then it would make sense for researchers to invest the time and money to conduct clinical trials to answer the larger question. Given that the language we use and encourage parents to use is one of the primary clinical tools to foster the language development of young children with language impairment, it is imperative that our discipline develop a convincing evidence base to guide us in making the most effective choice on this issue.

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