Critical Review:
Grammatical input versus telegraphic input: Which method is more effective for promoting language production in preschool children with expressive language delay?*

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This critical review examines the current literature to determine the effectiveness of telegraphic input compared to grammatical input for developing expressive language abilities in preschool children with expressive language delay. Four studies were included in this review, totaling 13 preschool children between 24 and 51 months of age with expressive language delay. The research included various single subject experimental designs. Overall, the results support the use of both interventions in clinical practice, dependent on the specific goals of the child. Telegraphic input was found to be more effective at promoting vocabulary development, whereas grammatical input was more effective at promoting increased use of function words, subject-verb-object production and total words.

Introduction

There has been considerable debate in recent years regarding what type of linguistic input is the most beneficial in promoting language acquisition in children who are developing language. Until recently, programs such as the Hanen program and the enhanced milieu teaching program have promoted the use of telegraphic speech in their interventions (Eisenberg, 2014; van Kleeck et al., 2010). Telegraphic input is child-directed speech composed of content words, but lacking in function words and grammatical details (Paul & Norbury, 2012), e.g., "baby eat." This type of input has been thought to make the meaning more accessible to the child and, in turn, result in increased spontaneous production (Bredin-Oja & Fey, 2014). Currently, there has been a shift to promoting the use of more grammatical speech, which contains all required grammatical elements, during language intervention (Paul & Norbury, 2012). Relating back to the previous example, the grammatically correct phrase could be "The baby is eating."

van Kleeck et al. (2010) reviewed three relevant intervention studies (Fraser, 1972; Jones, 1978; Willer, 1974) that examined the effects of telegraphic versus grammatical input on language comprehension and/or language production. There were no significant differences between conditions for language comprehension in all three studies. The only study that examined language production (Willer, 1974) found that children with cognitive delay favored telegraphic input for language production. Four of the authors in van Kleeck et al. (2010) also expressed their expert opinions regarding the use of telegraphic input in intervention. Two of the authors reported rationales supporting the use of telegraphic input in intervention, one indicated no longer believing telegraphic input should be used, and one has always thought it should not be used and could potentially be harmful. The opinions of these authors demonstrate how much debate and uncertainty remains among clinicians regarding what type of linguistic input is the most beneficial.

Linguistic input is believed to play a significant role specifically for children with language impairments (Levitt, 2012). Children with language impairments require more stimulation than normal developing children in order to acquire the skill (Paul & Norbury, 2012). Consequently, it is important to determine what type of linguistic input will promote better language production for these children in order to stimulate progress in intervention. Presently, there is a limited amount of research comparing the effectiveness of different linguistic input on language production of children with expressive language delay (ELD). As Speech-Language Pathologists (SLPs) work closely with this population, it is important that SLPs are educated on the effectiveness of both telegraphic input and grammatical input for children with ELD so they are able to make evidence-based decisions when implementing intervention.

Objectives

The primary objective of this paper is to critically evaluate the existing literature comparing telegraphic input to grammatical input to determine if one method is more effective at promoting language production for children with ELD. The secondary objective is to propose recommendations for future clinical practice and research on intervention programs for children with ELD.

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Methods

Search Strategy

The following computerized databases were searched: CINAHL, Google Scholar, PubMed, PsychInfo, Scopus and the Web of Knowledge. The following search items were used: "telegraphic speech" OR "simplified speech" AND "expanded speech" OR "grammatical speech" AND "intervention" OR "language delay". Reference lists of the articles selected were also searched for further relevant articles.

Selection Criteria

Studies selected for the inclusion in this review were required to compare the efficacy of telegraphic or simplified speech versus expanded or grammatical speech on expressive language of children with expressive language delay. Studies involving children with intellectual disability or studies that examined the effects on comprehension were excluded.

Data Collection

Results of the literature search yielded four single subject experimental designs, including single subject alternating treatments design (3) and multiple baseline across behaviors design (1).

Evidence was evaluated using a scale developed by Logan, Hickman, Harris and Heriza (2008) for single-subject research designs.

Results

Single subject experimental research designs are widely used in clinical research to provide a strong basis for establishing causal inference (Kratochwill et al., 2010). In these designs, participants act as their own control for comparison (Kratochwill et al., 2010). The purpose is to determine whether a behaviour has changed after the implementation of an intervention and to examine the evidence of causality (Logan et al., 2008). The four studies examined in this paper include various single subject experimental designs, including three using a single subject alternating treatments design and one using a multiple baseline across behaviors design.

Bredin-Oja and Fey (2014) used a single subject alternating treatment design to examine children's responses to telegraphic and grammatically complete prompts. Participants were five preschool children (ages 30-51 months) with expressive language delay. Analyses revealed no significant difference in the number of responses for each condition. They did, however, find that some of the children used function words almost exclusively in the grammatical condition.

Bredin-Oja and Fey had a small sample size (five participants), which could impact the generalization of the results. However, replication across five different cases meets the standards by What Words Clearinghouse (WWC) in their *Meet Evidence Standards* guidelines (Kratochwill et al., 2010). They used appropriate participant selection criteria that controlled for nuisance variables such as hearing loss and intelligence (IQ). They also reported the Brown's stage (range: early I–II) and mean length of utterance (MLU; range: 1.44–2.10) of each child at the beginning of the study, although they did not specifically report the level of delay for each participant. A difference in mild versus severe expressive language delay could have impacted how a child performed during treatment. Bredin-Oja and Fey used a semi-randomized assignment to determine the alternating order of the conditions, which allowed them to control for order effects. They also controlled for carryover effects by restricting consecutive sessions of the same condition to no more than three. They used well-established tests to measure expressive language including the MacArthur-Bates Communicative Development Inventories (MCDI; Fenson et al., 2007), and their methods were valid and well-detailed for easy replication. However, they did not include baseline data for each participant, which prevents analysis of the stability or variability of the data prior to beginning the intervention. They also altered part of the protocol for the 4th and 5th participants by adding a corrective prompt if the child failed to produce the target response. This was implemented to ensure that the participants did not respond with only a single word, which occurred with the 3rd participant. This could have resulted in a different pattern of responses from the 4th and 5th participants, as compared to the first three participants. Their analysis was appropriate as they used both visual analysis to determine if there was any overlap between conditions, and Single-Case Randomization Tests (SCRT; Onghena & Van Damme, 1993) to test the significance of the null hypothesis. Fidelity of the experimental procedure was 98% and interrater reliability was between 93-98% for each participant. This meets the WWC *Meet Evidence Standards* (Kratochwill et al., 2010).

Overall, Bredin-Oja and Fey provided strong evidence for the effectiveness of both telegraphic speech and grammatical speech in eliciting imitations in children with ELD. They also provided strong evidence in support of the use of grammatical speech in increasing the use of function words in these children.

Levitt (2012) used a single subject alternating treatment design to examine telegraphic and grammatical input on word learning and language productivity. Levitt completed two studies, which included a pilot study

used to ensure adequate treatment fidelity. Participants were two preschool children (ages 30 and 36 months) with expressive language delay. Participant 1 completed the pilot study and participant 2 completed the second study. Analysis of data revealed that both participants were more likely to produce the target vocabulary during telegraphic sessions, but no overall differences were found in their language productivity between conditions.

Levitt (2012) had a small sample size (two participants), which does not meet the WWC *Meet Evidence Standards* (Kratochwill et al., 2010) and reduces the ability to generalize the results. The author used appropriate initial participant selection criteria that controlled for hearing loss. However, only one of the two participants met the full set of criteria. Participant 1 did not meet their full set of criteria as he had an expressive vocabulary of 236 words, where their inclusion criteria included a vocabulary of less than 50 words. This participant was included in the study on the basis that he still demonstrated a mild expressive language delay when compared to children his age. Participant 2 had a mild receptive language delay in addition to a mild expressive language delay, which may have impacted his performance during the intervention. This participant was also determined to have a primary speech sound disorder, which impacted his intelligibility and thus affected the author's ability to transcribe his language sample. As this participant had many other co-occurring factors in addition to ELD, the ability to compare the results to Participant 1 is limited. Comparisons are further restricted as the MLU at the beginning of the study was reported for participant 1 (1.45) however it was not reported for participant 2. Levitt used well-established tests to measure the degree of language delay in the participants, including the Preschool Language Scales–5th edition (PLS-5; Zimmerman, Steiner & Pond, 2011) and the MCDI (Fenson et al., 2007).

The methods were detailed for easy replication, however the treatment designs differed between the two studies. The first study alternated conditions each session, and the second study completed each condition in separate phases (weeks 1-4 was telegraphic input and weeks 5-8 was grammatical input). Levitt also did not include baseline data for each participant, which prevents analysis of the stability or variability of the data prior to beginning the intervention. It also negatively impacted their results, as it limited their ability to analyze the data for word learning for both participants. Levitt used appropriate visual analysis by examining performance patterns and trends across conditions. No statistical analysis was completed. Fidelity of the experimental procedure was reported and interrater agreement was between 78-100%. The majority of this agreement range meets the WWC *Meet Evidence Standards* (Kratochwill et al., 2010), however it demonstrates inadequate reliability of the outcome variables.

Overall, Levitt provides moderate evidence for the effectiveness of both telegraphic and grammatical speech in eliciting language productivity. Levitt also provides moderate evidence for the effectiveness of telegraphic speech in eliciting target vocabulary.

Loeb and Armstrong (2001) used a multiple baseline across behaviors design to look at short expansion (SE) input and subject-verb-object (SVO) input on SVO production and MLU. SE input consisted of telegraphic speech, while SVO input was grammatically correct. Participants were five preschool children (ages 24-34 months) with ELD or a history of ELD. Analysis of the data showed considerable variability, but the authors concluded that both interventions were effective. Results revealed that MLU increased for all participants in both conditions. The two children in the SVO condition were found to show the most improvements in SVO productions. The one participant in the SE condition who demonstrated large improvements in SVO production had a history of ELD but was considered within normal limits for his age upon beginning the study.

Loeb and Armstrong had a small sample size (five participants), however only three of the five participants were observed to have language impairments at the time of the study. Two of the children were initially diagnosed with ELD but were found to be within normal limits upon beginning the study. They were still included in the study to determine if changes as a result of the current intervention differed from the other children who continued to have language impairments. As there were only three participants with language impairments during the intervention, the generalization of the results is limited. However, replication across three different cases meets the WWC *Meet Evidence Standards* (Kratochwill et al., 2010). Loeb and Armstrong used appropriate participant selection criteria that controlled for nuisance variables such as cognition, motor skills, social and self-help skills. They also controlled for hearing loss, with the exception of one participant who had profound unilateral sensorineural hearing loss. It was not mentioned whether this child was aided during the intervention. Loeb and Armstrong used well-established tests to measure the degree of language delay in the participants, including the MCDI (Fenson et al., 2007) and the Sequenced Inventory of Communicative Development (SICD; Hedrick et al., 1984). The percentile rank from the MCDI was stated

for each participant and severity ranged from mild (15th percentile) to severe (5th percentile) for the children who exhibited an expressive language delay. MLU was also reported for each participant and ranged from 1.22–1.94.

Loeb and Armstrong randomly assigned each participant to either the SVO intervention (2 children) or the SE intervention (3 children). Three baseline sessions were conducted and data was collected for MLU, SVO and controls *in* or *on*. Only the mean scores for each child's MLU over the three sessions was reported, and these were not represented in the graphs. This prevents analysis of the variability and trends of the baseline data for each participant. Their methods were valid and well-detailed for easy replication. Loeb and Armstrong used appropriate visual analysis by examining the trends for SVO, MLU and the control. No statistical analysis was completed. Fidelity of the experimental procedure was reported and interrater agreement was discussed, however reliability was determined by consensus and therefore no values were reported.

Overall, Loeb and Armstrong provide moderate evidence that both SVO and SE interventions are equally effective methods of intervention for increasing MLU. They also provide moderate evidence for the effectiveness of SVO intervention for improving SVO production.

Wolfe and Heilmann (2010) used a single subject alternating treatment design to look at simplified and expanded input on vocabulary and total words produced. The participant was a 25 month old child with a severe expressive language delay. Analysis of the data revealed a slight preference for word learning in the simplified condition, but more total productive words used in the expanded condition.

Wolfe and Heilmann had a very small sample size (one participant) which limits the ability to generalize the results to the rest of the population. This does not meet the WWC *Meet Evidence Standards* (Kratochwill et al., 2010). They used appropriate participant selection criteria and controlled for receptive language abilities. They used well-established tests to measure the degree of language delay in the participant, including the MCDI (Fenson et al., 1993) and the PLS-4 (Zimmerman, Steiner & Pond, 2002). The participant's expressive language skills were in the 5th percentile on the MCDI, indicating a severe delay. MLU was also reported (1.4). Their methods were well-detailed, which allow for easy replication. The conditions were administered in separate phases, with the simplified input condition first, and the expanded input condition administered second. Although they used different words for each condition, they did not control for learning through order or carryover effects from the first condition to the second condition. Wolfe and Heilmann used appropriate visual analysis by examining the trends for target word production and number of total words in each condition. No statistical analysis was completed. Fidelity of the experimental procedure was reported and interrater agreement was 86%. This meets the WWC *Meet Evidence Standards* (Kratochwill et al., 2010).

Overall, Wolfe and Heilmann provide moderate evidence that simplified input is more effective for promoting vocabulary, and expanded input is more effective for promoting more expressive language.

Discussion

The objective of this paper was to critically evaluate the existing literature that compared telegraphic speech to grammatical speech to determine if one method is more effective at promoting language production for children with ELD. Four single subject experimental design studies were reviewed and found moderate to strong evidence to support the use of both interventions in clinical practice. Analysis of the results indicates that the goals for the child with ELD should be considered when comparing the intervention strategies. Telegraphic or simplified speech was found to be more effective at promoting vocabulary development (Levitt, 2012; Wolfe & Heilmann, 2010), whereas grammatical or expanded speech was found to be more effective at promoting increased use of function words, SVO production or total words (Bredin-Oja & Fey, 2014; Loeb & Armstrong, 2001; Wolfe & Heilmann, 2010).

Each of the four studies reviewed presented clear research questions and methods to allow for replication. One of the main limitations is the small sample sizes of each study, which impacts the generalizability of the results to the rest of the population. Additionally, although all of the children included in the studies had an expressive language delay, their delay ranged from mild to severe. This could have impacted each child's performance during the intervention and limits comparisons between participants. Some of the children also had other co-occurring factors that could have also impacted their results and limits the comparisons that can be made between the studies. All of the studies reported the MLU of each participant, with the exception of Levitt (2012). Reporting MLU allows for stronger indication of a child's current level of functioning and in turn, allows for appropriate selection of goals within their zone of proximal development. The MLU for all studies ranged from 1.22–2.10, which indicates that all of the children were in the *putting words together* stage. It also indicates that the children

were in neighboring Brown's stages and therefore their results can be compared more reliably.

Interpretation of overall results is limited by differences in the design and methodology among the four reviewed studies. The omission of baseline data in two of the studies prevents analysis of the stability or variability of the behavior prior to beginning the intervention. It is also difficult to determine if the results were significant due to the lack of statistical measures in all but one study (Bredin-Oja & Fey, 2014).

Conclusion

Despite the shift from using telegraphic speech during language intervention, to promoting the use of more grammatical speech, the current review of the relevant research indicates that both strategies are effective at promoting language production for children with ELD. Further research is needed to determine the effects of each type of linguistic input with this population and if there is a clear advantage of using one type of input over the other.

Clinical Implications

Both telegraphic input and grammatical input were found to be effective strategies to improve language production in children with expressive language delay. When determining what type of input to use during intervention, it is important to keep the child's goals and current level of functioning in mind. Telegraphic speech was reported to be more effective at improving vocabulary or word learning (Levitt, 2012; Wolfe & Heilmann, 2010). Grammatical speech was found to be more effective at promoting increased use of verbal expression and grammatical speech (Bredin-Oja & Fey, 2014; Loeb & Armstrong, 2001; Wolfe & Heilmann, 2010).

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