

Critical Review:
Do children with Specific Language Impairment have difficulty interpreting auditory emotion cues, as compared to children with typical language development?

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This critical review examines the literature regarding differences between children with specific language impairment (SLI) and children with typically developing language (TLD) in their ability to interpret auditory emotion cues. Six studies, congruent with the search criteria were found. Four were cohort studies and the remaining two were case-control studies. All of these were Level 2b evidence. The literature suggests that children with SLI are impaired in their ability to interpret auditory emotion cues, as compared to children with TLD. The literature also suggests this ability is correlated with age. Clinical implications and recommendations for speech language pathologists as well as for further research are discussed.

Introduction

Social cognition is a broad and complex term, which encompasses many skills including: emotion perception, social problem solving, self cognition, and the ability to take another's perspective (Marton, Abramoff, & Rosenzweig, 2005; Timler, 2003). All of these skills help a person navigate social interactions successfully. Studies have found children with specific language impairment (SLI) have difficulties with many aspects of social cognition. Specifically, these children have difficulty initiating social interactions, accessing on-going interactions, maintaining interactions with others, negotiating, and resolving conflicts (Marton et al.). The exact cause of these difficulties is unknown; however, it is generally accepted that the impaired language of children with SLI is a contributing but insufficient factor to account for these deficits in social cognition (Marton et al.).

Crick and Dodge proposed a social processing model which attempts to explain how children integrate the necessary multiple skills during a social interaction (as cited in Timler, 2003). The first level in this model involves encoding social cues; it is this initial step with which this review is concerned. This level of processing is emotion understanding, or the ability to interpret the emotions of others through their facial expression, tone of voice or other contextual cues in the environment. This emotion understanding is one factor that likely contributes to a person's social cognition (Brinton & Fujiki, 2005).

Prosody, one aspect of emotion understanding, can be defined as "the use of variations in vocal tone or pitch, stress, and timing in speech" (Van der Meulen, Janssen, & Den Os, 1997, p. 155). Prosody has two main functions: grammatical and emotional/affective.

Evidence in the literature demonstrates an intertwining of prosody and language development in children with typical language development (TLD), thus it is important to understand this critical relationship in children with SLI (Van der Meulen et al.).

In one of the first studies to investigate the ability of children with SLI to interpret auditory cues of emotion, Berk, Doehring, and Bryans (1983) found a highly significant difference between their group with TLD and their SLI group (mean chronological age (CA) 8;7). In fact, the TLD group achieved almost perfect scores. This differed from another early study by Courtright and Courtright (1983) which included younger children, aged 3-7 years old.

Search Strategy

Computerized databases, including PubMed and PsycINFO, were searched with the following search strategy: (language impairment) AND ((emotion comprehension) OR (emotion understanding)). The reference lists of articles found in the databases were also searched for relevant literature.

Selection Criteria

Studies included in this review were written in English, with no limits on the publication date. Limits were set to include only children (preschool to age 18) with SLI and no concomitant cognitive impairments. Studies involving children with autism spectrum disorder (ASD) were also excluded. A hallmark feature of ASD is impaired social skills. Numerous studies have been conducted to examine the source of these impairments. The objective of this review was to investigate research on children whose impaired social skills are less overt than those of children with ASD. Studies were limited to those which examined the comprehension of auditory emotion cues. Studies which only looked at the grammatical function of prosody were excluded. Studies which only examined the expression of emotion cues were also excluded, as this review sought to examine the comprehension literature. Finally, there are many studies which examined the comprehension of visual emotion, i.e. facial expression, but these were also excluded as this was beyond the scope of the current review.

Data Collection

The literature search yielded six papers congruent with the search criteria. All of them were Level 2b evidence, per the *Experimental Design-Decision Tree* (2009). Two studies (Boucher, Lewis, & Collis, 2000; Trauner, Ballantyne, Chase, & Tallal, 1993) were case-control studies; the remaining four were cohort studies.

Results

The articles reviewed used different terms to identify the children with language impairment and the control groups. For simplicity, in this review, all groups of children with language impairment are referred to as „SLI and all control groups as „typical language development (TLD). One study identified children for the SLI group through standardized testing (Trauner et al., 1993), while the remaining studies used diagnoses from speech language pathologists or other qualified professionals and/or children who were receiving speech and language services. Additionally, all children with SLI had scores within 1-2 standard deviations of the mean on

various IQ tests and/or had no history of other behavioral, emotional, or other mental impairments. Two studies (Spackman, Fujiki, Brinton, Nelson, & Allen, 2005; and Trauner et al.) included monolingual or native English speaking participants. One study (Van der Meulen, et al., 1997) included Dutch-speaking participants. The remaining three articles (Creusere et al., 2004; Fujiki, Spackman, Brinton, and Illig, 2008; and Boucher et al., 2000) did not specifically report native language characteristics of their participants.

Preschool-age Subjects

Van der Meulen et al. (1997) sought to replicate Courtright and Courtright's (1983) earlier study on the ability of children with SLI to interpret vocal affect (*happy, sad, angry, or afraid*) from a sentence. Participants in the study included 30 Dutch-speaking preschool children with SLI (range of CA 4;4 to 6;11) and a TLD control group. Participants in both groups were divided into 3 groups of 10: 4, 5, and 6 year olds.

The authors reported that although the children with SLI performed more poorly than the children with TLD did, the difference was not statistically significant per an analysis of variance (ANOVA) with repeated measures. Age was found to have a significant main effect. Furthermore, both groups of 4-year-olds scored at a less-than-chance level. This suggests that children's ability to identify vocal affect improves as they develop.

Strengths of Van der Meulen et al.'s (1997) study included reliable and valid methods. The authors included data on inter-rater reliability, the only study in the review to do so. Appropriate statistical analyses were performed. Despite the relatively high level of evidence, due to the lack of a significant difference between the SLI and TLD groups, this study offered only suggestive evidence that children with SLI were impaired in their ability to identify vocal affect cues. However, the presence of a main effect of age and the less-than-chance performance of both groups of younger participants, Van der Meulen et al.'s study offered compelling evidence for a correlation between accurate affect identification and age.

One hypothesis concerning children with SLI's impaired ability to interpret auditory emotion cues is that the linguistic structure is the source of difficulty, not the prosody itself. Therefore, Creusere et al. (2004) investigated this source of difficulty by controlling for linguistic content. The authors also examined how children performed when facial and vocal emotion cues (of *happy, mad, sad, and*

surprised) were presented simultaneously. The study included one group of 26 preschool children with SLI (mean CA 5;1) and one group of children with TLD. Creusere et al. investigated performance on four blocks of stimulus cues (three relevant to this review): (1) an auditory presentation of an utterance with all linguistic content removed leaving only prosodic information, so that the utterance sounded muffled (2) presentation same as (1) with a video of facial expression and (3) the control block—auditory presentation of an utterance with a video of facial expression.

A subset of items was analyzed by conducting a mixed ANOVA, with group as the between-subjects factor and cue as the within-subjects factor. Main effects for both language group and cue were found. Total scores for the SLI group were lower than for the TLD group. Looking at specific blocks of cues, children with SLI performed significantly poorer than did children with TLD on control block 3. Pearson correlation coefficients indicated that both the SLI and TLD groups performances on block 2 (prosodic information and facial expression) correlated to their chronological age. This was the only significant age correlation for the SLI group, while the TLD group's total affect score was also correlated to age. In both groups the younger participants (CA 4;0-4;2) had more difficulty with the prosodic information only (block 1), although both groups as a whole performed above chance level.

Strengths of the study included valid test measures and appropriate statistical analysis. Limitations of the study included the omission of a second stimulus control block of an auditory utterance only. Secondly, subjects responded with a forced-choice question, thus increasing the chances of guessing correctly. This differed from the other studies which all used a variation of a picture-pointing response. Finally13()] T TJETB043(s)-8(in)-4(g)6()-327(t)-10(h)-5(e)-3

age children with SLI have impairments in interpreting auditory affect cues.

Fujiki et al. (2008) also examined this ability in school-age children with SLI. The authors investigated the skill in a more naturalistic situation than the other studies by using a short narrative in place of a single utterance. Fujiki et al. also studied the identification accuracy of specific emotions (*happy, angry, sad, and fear*). The study included two groups, one group of 19 children with SLI (mean CA 9;1) and one TLD control group. The authors attempted to control for linguistic structure by constructing the narrative to be within the language skills of the SLI group and providing a familiar school context.

A 3-way mixed analysis of covariance (ANCOVA) was performed, with nonverbal IQ as the covariate. Main effects for language group and emotion were found. As a group, the children with SLI performed more poorly than the TLD group did. Descriptive statistics also demonstrated the poorer performance by children with SLI. The authors performed correlations to determine if age or general language abilities of the participants were related to their ability to identify each of the four emotions. Once Bonferroni adjustments were made, no correlations were significant. This differed from Van der Meulen et al. (1997), Creusere et al. (2004), and Spackman et al. (2005) who found correlations between identification accuracy and age.

The authors concluded that their results did not indicate that children with SLI had an overall impairment in their ability identify vocal affect, but rather they had difficulty identifying certain emotions (i.e. *fear* and *sad*). However, due to sound methodological procedures and appropriate statistical analyses their results offered compelling evidence that children with SLI are impaired in their ability to identify vocal affect, as compared to children with TLD. No significant correlations for age were found, so results are equivocal regarding the increase in ability to identify vocal affect with age.

The last study, by Boucher et al. (2000) assessed the possibility of a cross-modal impairment as an explanation, or contributing factor, in impaired ability to match vocal-to-facial affect (*happy, sad, disgust, fear, anger, and surprise*) in children with autism. The experiment included two control groups, one comprised of 19 school-age children (mean age 9;35) and one comprised of 19 school-age children (mean age 9;1) who were matched for nonverbal IQ.

A review of six articles revealed that in all studies, except Van der Meulen et al. (1997), children with SLI performed significantly more poorly on auditory emotion identification tasks than did children with TLD. This poor performance was observed in children from 4 to 12 years old. This poor performance also occurred across a range of test stimuli. Three studies used single utterances, one used a short narrative, one used musical excerpts, and one used utterances and prosodic information. This decreased ability was observed even in studies which attempted to control for the language impairments in children with SLI by controlling the linguistic structure of the stimuli. This poor performance across age ranges and test stimuli provides evidence that children with SLI are impaired in their ability to accurately identify auditory affect cues, a skill that likely contributes to their overall social cognition.

All of the studies reviewed provided a relatively high level of evidence, Level 2b, which is close to the *gold standard* experimental level. Thus, these studies taken together offer compelling evidence that children with SLI do have an impairment in their ability to accurately identify auditory emotion cues as compared to children with TLD.

Furthermore, Van der Meulen et al. (1997), Creusere et al. (2004), and Spackman et al. (2005) found that all younger participants, both SLI and TLD, had more difficulty accurately identifying auditory affect cues than did their older counterparts. Creusere et al. also found a significant correlation between age and the ability to accurately identify auditory emotion

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