
Language Comprehension in Autism

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Recently, the practical and theoretical significance of deficits in language comprehension to the syndrome(s) of autism has become recognized. Autism is a pervasive developmental disorder occurring with or without mental retardation and by extreme social deficits, delayed development and bizarre use of language and unusual sensory responses, with onset before 30 months of age [1]. Difficulties in expressive language constitute one of the most noticeable characteristics of autism and are the earliest and greatest source of concern for many parents. Nevertheless, only in the last ten years has language comprehension been studied directly [2]. As a result, autism is now typically characterized as including a general delay in the acquisition of almost all language skills, though not speech skills such as articulation. However, since other disorders (e.g., mental retardation, receptive language delay) also involve general language delay, factors that differentiate autism from related disorders have particular theoretical importance. Deficits in language comprehension and use may be necessary, and if not specific, at least more specific, to autism than are problems in other areas of language development [3].

Studies of comprehension in persons with autism

Comprehension as measured on standardized tests

Relatively few studies have directly addressed the comprehension of language in children and adults with autism. In one of the most comprehensive description of the language of autistic children [2], high functioning autistic boys were compared to boys with receptive language disorders who were roughly of the same chronological age, matched on nonverbal IQ and whose language was similar in sentence length and grammatical complexity. The boys with autism had lower scores on vocabulary tests, sentence comprehension, and WISC subtests of comprehension, similarity and vocabulary than the language-delayed children. The autistic children were non significantly higher than the language delayed children on digit span. The autistic children also received higher decoding scores in reading but performed significantly less well in reading comprehension.

In a follow-up study of the same group of children several years later, Cantwell et al [3] found the two groups to be equal in the number of grammatical morphemes and complex sentence structures they produced in spontaneous conversation. However, there were even greater differences between the groups in comprehension, as measured on the Reynell scales than there had been earlier. The autistic children did comparatively better on expressive language scales than comprehension scales, while this trend was reversed for the language delayed children.

Sentence comprehension

In a recent study that focused on sentence comprehension, Lord [4] assessed the ability of autistic

children (mean chronological age=11 years, mean nonverbal mental age=4.8 years) as compared to sociable, retarded children (same chronological and mental ages) and normally developing 2-, 3-, and 4-year olds. to follow simple instructions that involved moving familiar objects around a doll house. Overall, the autistic and sociable, mentally retarded groups of children performed less well than normally developing 2-year-olds (who were less successful than 3- to 4-year-olds). The same pattern of difficulty across sentence types, as defined by semantic relations, occurred for all groups. However, the mentally retarded children had greater difficulty with more complex sentences, even when alternatives limited the possible responses, than did either the autistic or normally developing groups. Otherwise, the autistic children consistently performed less well than did any other group.

In another test of sentence comprehension, autistic children performed significantly less well overall than did normally developing children matched on nonverbal mental age or Peabody picture Vocabulary Test scores [5]. Some of the autistic children used a word order strategy, indicating acquisition of standard rules of English syntax. However, unlike the normally developing 3- and 4-year-olds, none of the autistic children used a knowledge-based strategy to determine relationships between the elements in the sentences. Overall, for experimental measures of sentence comprehension as for standardized test results, the emerging picture suggested that autistic children show more severe delays than comparison groups, but seem to show normal patterns of acquisition of linguistic strategies. Use of socially determined nonlinguistic strategies is even more severely delayed than linguistic strategies perhaps because of the autistic children's lack of social knowledge.

Relationships between language comprehension and other behaviours

In considering whether autism entails language-specific deficits or not, recent discussions of the nature of language comprehension in normally developing children and adults are of interest. In the last 10 years, a definite shift has occurred away from considering comprehension, at least of spoken language, to be primarily a process of acquiring linguistic structures. Comprehension has come to be viewed as a multi-faceted activity that is intimately tied to the contexts in which it occurs. The minimal unit of analysis for comprehension is taken to be the sentence plus the situation, not simply the words or linguistic structures in the sentence [6]. At the sentence level, the situation (e.g., physical context, knowledge of probable events, paralinguistic cues) is recognized as both complementing the linguistic information and thus making the listener's task less complex than it might seem, and as placing additional demands on the listener to integrate discrepant pieces of information and to make inferences on the basis of past experience or future expectations [7]. With stories or paragraphs, the listener's perception of social goals, knowledge of the world and ability to provide his or her own context when what is given is not sufficient, become even more important to "understanding the event" [6] than at the single sentence level. Comprehension is viewed as an active, interpersonal process where the listener's job is not so much to determine what the individual linguistic forms "mean", but what the listener needs to know in order to understand the speaker's intention. Thus, language comprehension is not seen as a discrete, self-contained process in itself, but the end result of both cognitive and social skills.

Theories of cognitive dysfunction in autism

The potential implications of viewing comprehension as the endpoint of the multiple processes are particularly significant for persons with autism who have difficulties in both cognitive and social areas. Three different theories have been postulated to account, at least in part, for the comprehension difficulties of autistic persons. These theories are Boucher's [8] hypothesis of retrieval difficulties from long-term memory, Rutter's [9] proposal of cognitive deficits in processing social meaning and Hermelin and O'Conner's [10] theory of rule extraction and use of meaning. These theories all address areas of cognition that extend: beyond language comprehension. They operate on different levels and are not necessarily mutually exclusive. Below, each of these perspectives is reviewed briefly.

Deficits in retrieval and long-term memory

Boucher [8], [11] hypothesized that persons with autism have selective and global deficits in long-term memory, particularly as manifested in retrieval. Boucher's claim was made in part on the basis of similarities in noncognitive behaviours, like motor stereotypies and reduced exploration, between persons with autism and persons with hippocampal lesions resulting in amnesia [11]. As evidence for specific deficits in retrieval, Boucher reported that autistic children who generally performed less well in free recall tests, were more variable in cued recall and performed better on paired associate tasks than children matched to them on nonverbal mental age. Autistic children showed greater recency but less consistent primary effects than mental age matches. Thus, difficulties in responding to language during comprehension tasks were seen as a function of deficits in retrieving either the contexts in which the information was learned or intended verbal or motoric responses [8].

Deficits in processing social meanings

Another theory with implications for comprehension deficits is Rutter's proposal of the centrality to autism of underlying deficits in the processing of social meaning. Social meanings include both the ability to make sense out of basic information that is specifically social (e.g., facial expressions, intonation) and responding to more complex situations involving interpersonal relationship (e.g., recognizing or anticipating cooperation between friends). This theory fits nicely with an increasing trend in psycholinguistics and the field of cognitive development to view the initial indications of "comprehension" in infants and toddlers as primarily social responses, gradually developing into nonlinguistic and then linguistic strategies.

For example, Chapman [7] proposed a sequence of nonlinguistic response strategies that progressed from language serving to draw the child's attention to the speaker and what the speaker was looking at, offering or doing. Next, language was seen as serving as a lexical "guide" to context determined responses, in which a word marked an object or event as its referent, but the child's response was wholly determined by the immediate social or physical environment. Next, words began to indicate specific actions that were expected from the child or served as guides evoking previous behaviours performed on the same objects. Finally, language indicated the elements in a relationship (such as noun verb-noun) but with past experience or the immediate context continuing to determine the nature of

that relationship (action-object, possessor-object). Chapman's description of non-linguistic response patterns and strategies, especially those for children under 2 years of age, constitutes an almost perfect list of the behaviours most obviously deficient in young, autistic children. For the 8- to 12-month-old child, Chapman described two of the major "comprehension" responses as "Look at what mother looks at" and "Imitate ongoing action". For the 12- to 18-month-old child, she proposed "Give evidence of notice" and "Use objects in the conventional way for that situation" as two context-determined responses. For autistic children who have severe deficits in processing social meanings, such behaviours that help normally-developing infants participate in early "conversations", may not occur for years, if ever.

A deficit in processing social meanings could be seen to have both "bottom-up" and "top-down" implications for language comprehension in autistic children. For example, not attending to people's faces for the same length time as most children [10] or attending to unusual parts of the face could reduce comprehension, since both children and adults have been shown to respond more accurately to language when they are looking at the speaker [7]. Thus, the socially deficient autistic child would fail to process some social information at even a very basic level.

In terms of higher-order processing, recent models of comprehension [12] have emphasized the protagonist-based organization of problem-solving strategies used by most children when trying to understand stories or other forms of connected discourse. Normally developing children appear to code and report events as they pertain to the people in the events and to the goals of these people [12]. Comprehension is seen as the building of a possible world containing goals and various events, where expectations can be confirmed and disconfirmed and discrepancies resolved in terms of a child's knowledge human behaviour.

Deficits in encoding meaning and extracting rules

Hermelin and O'Conner [10] have proposed a third approach to the cognitive deficits in autism, that they postulated as superceding any specific social dysfunction. The authors defined meaning as the classification and interpretation of information. Autism was seen as a cognitive disorder in encoding meaning, particularly those meanings discerned from multi-modal, multi-dimensional sources of input (which is how social interaction might be categorized).

Problems in encoding meaning could be seen as occurring at two points in a processing sequence. First, autistic children were seen as failing to extract temporally-ordered patterns from rule-bound input. Second, autistic children were seen as failing to use rules, with which it was assumed they were already familiar, to encode auditory information. A corollary of this hypothesis is the failure to code information in the most efficient modality (e.g., to encode verbal information temporally). Evidence in support of the former proposal is provided by studies in which autistic children's performance on verbal recall tasks was facilitated to a lesser extent by potential categorization of words or the presentation of words in meaningful sentences than was the performance of control groups.

The third different views of cognitive deficit can each be used to account for developmental trends in comprehension. For example, it appeared that, even in the context of a concrete, nonsocial task requiring only the movement of familiar objects, children with autism had more difficulty than could be accounted for by their cognitive delays [4]. The implication of this study was that some explanation

is required for the "incapacity" that occurred even in nonsocial contexts where memory requirements were minimal and where the children's comprehension of the meaning of individual words had been pretested. There was also some suggestion that this incapacity was developmental, since at the somewhat shaky basis of cross-sectional data, autistic children appeared to follow normal developmental trends. It is in explaining this type of phenomena that Hermelin and O'Conner's theories of deficient encoding and rule extraction could prove particularly useful [10], [13]. Basic processes such as sustained attention and the speed of processing may also help explain these results. While these deficits may be greater in persons with autism than in persons with other cognitive or language-related disorders, it seems somewhat unlikely, (given the findings of Tager-Flusberg [5] concerning the use of word order and Cantwell et al [3] concerning the use of other syntactic rules) that the deficits are quantitatively different in the autistic syndrome(s) than in other language-related disorders. However, the necessary comparisons among groups have not yet been made.

On the other hand, deficits in processing social meanings may be most evident in very early language comprehension tasks, where primary attentional and response strategies may be social in nature, and in contexts where knowledge of social relationships is required. To the degree that social relations can be treated as any other relationships between objects in the world, children with autism look less handicapped. However, difficulties with primarily social understanding remain. Basic deficits in attention and responsiveness to social behaviours, as well as higher order problems in the identification of social goals and knowledge about predictable social relationships both seem necessary to explain these difficulties. It is possible that problems in higher order processes are a product of both basic social deficits and the encoding deficits proposed earlier, which might be seen as including higher order use of social frameworks and meanings. The level at which deficits are specific to autism is not known. However, it is in this area of processing social meanings that the concept of incapacity, rather than delay or disorder, seems most appropriate, since behaviours reflecting this deficit remain distinguishing characteristics throughout life.

Finally, difficulties in retrieval seem most relevant to explain why persons with autism failed to use rules or knowledge that they were assumed to have [5], [10]. As such, specific retrieval problems might be expected to be manifested most obviously in older and/or higher functioning children with autism. If, with development, the tasks of comprehension gradually become more and more that of providing one's own framework or context, social or otherwise, deficits in retrieval may account for some of the disordered "usage" reported by Boucher [8], Hermelin and O'Conner [10] and others. Nevertheless, when initial knowledge is controlled, it is not clear how specific these deficits may be to autism.

Deficits in comprehension are true incapacities, in the sense that research has repeatedly discovered that autistic children really do not understand language as well as others, in the same way that infants do, not understand language to the same extent as older children [4]. On the other hand, while comprehension delays are seen as incapacities (rather than as "performance deficits" that might vary from moment to moment"), these delays are seen as very much a part of the broader cognitive deficits described above. One could argue that autism is not a language disorder at all, but a syndrome characterized by particularly poor processing of rapidly presented multi-modal, multi-level information that frequently presupposes basic social responses and the use of higher order frameworks related to social goals and intentions. However, since language comprehension almost always involves all of the above characteristics, little is gained by overlooking the particular relevance of these deficits to language.

The comprehension difficulties experienced by autistic children are thus not seen as specific deficits but rather as the product of several interacting cognitive deficits. Which of these deficits are specific to autism, which are exaggerated in autism but also typical of the disorders, and which primarily reflect delays in normal developmental processes is not resolved, although observations of the course of development provide some suggestion of the particular importance of deficits in processing social meanings. Symbolization is not an individual act, but a social one [14]. The same might be said for comprehension.

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