

# How do children and adolescents with Specific Language Impairment comprehend verbal information?

## *Como crianças e adolescentes com Distúrbio Específico de Linguagem compreendem a linguagem oral?*

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### ABSTRACT

The aim of this study was to review relevant studies about language comprehension deficits observed in children and adolescents with Specific Language Impairment (SLI). Comprehensive databases were accessed in order to obtain relevant papers published in the last two decades. Literature shows that this clinical group may present important oral comprehension difficulties, which may be explained by either lack of linguistic knowledge or inefficient higher-order linguistic processing operations. As children with SLI develop, they improve comprehension abilities. However, deficits are still verified during adolescence. Therefore, early diagnosis of comprehension deficits is essential for effective intervention. Extensive literature reveals the effectiveness of many speech-language therapy techniques.

**Keywords:** Comprehension; Language development disorders; Language tests; Language therapy; Language development

### INTRODUCTION

Specific Language Impairment (SLI) is a primary language disorder, diagnosed clinically according to inclusion and exclusion criteria adopted internationally<sup>(1,2)</sup>. Complex and heterogeneous, the disorder is characterized by several linguistic and non-linguistic impairments<sup>(1,3)</sup>, among which verbal comprehension difficulties can be emphasized. These deficits may be explained by either lack of linguistic knowledge<sup>(4,5)</sup> or limited linguistic processing<sup>(6-12)</sup>.

Comprehension deficits are related to poorer prognosis<sup>(13,14)</sup>. Because of that, early diagnosis of these deficits – by using appropriate instruments – is of extreme importance. Systematic measures of language abilities are essential not only in the definition of diagnosis and prognosis, but also for adequate planning and conduction of the treatment<sup>(15)</sup>.

Nevertheless, that task is challenging, as comprehension is assessed indirectly, by observing behaviour<sup>(16)</sup>. Thus, standardized verbal comprehension tests may not reveal the actual impairments observed in everyday language use. These instruments may underestimate<sup>(17)</sup> or overestimate<sup>(18)</sup> the linguistic performance of individuals with language impairment and, consequently, affect the planning and the evaluation of the treatment.

Adaptive strategies to processing language may mask comprehension difficulties<sup>(6,19)</sup>. On the other hand, some comprehension tasks are complex and require more than good receptive language abilities. During childhood, the division between linguistic knowledge and language processing is not clear, because linguistic and cognitive systems are still being developed<sup>(16)</sup>.

Some authors have described linguistic processing as a complex phenomenon, in which – many times – bottom-up and top-down processes are simultaneously activated<sup>(20)</sup>. According to them, in the bottom-up processing, attention and perception systems deal with information before the individual is fully conscious of it, whereas in the top-down processing, previous knowledge influences the way information are attended to, perceived and retrieved. An important component also described is the Executive Central, which acts with the listener's motivation and goals, in order to manage cognitive resources involved in the task.

Therefore, language comprehension is a result of a complex interaction of linguistic knowledge sources, language-specific operations, and information processing abilities<sup>(21)</sup>.

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Multifaceted, this process depends not only on linguistic knowledge, but also on world knowledge and several cognitive processes<sup>(14)</sup>.

Understanding complex sentences involves perceptive processes, working memory, attention, access to lexical long-term memory, selection and integration of various language schemes<sup>(21)</sup>. At the discourse level, it is necessary to integrate verbal and nonverbal sources of information, such as propositional meaning, context, general knowledge, attentional focus, and the mental model built upon the integration of utterances<sup>(17)</sup>. Decoding literal meaning is not sufficient to comprehend language<sup>(22)</sup>. That is because a coherent representation of the discourse depends on comprehend, storage, and association of details<sup>(23)</sup>. Thus, based on general knowledge and context information<sup>(22)</sup>, one has to draw inferences, that is, to deduce implicit information<sup>(24)</sup>.

In spite of their complexity, the discourse comprehension abilities emerge early in normal development. According to literature, four-year-old children understand both literal and inferential information of narratives<sup>(25)</sup>. During pre-school years, they also develop another important ability: the monitoring of verbal comprehension<sup>(26)</sup>.

Subsequently – during childhood and adolescence – those abilities are improved quantitatively and qualitatively. As children with SLI develop, they become able to understand literal and inferential information of narratives<sup>(22)</sup>. During childhood and adolescence, drawing complex inferences based on world knowledge becomes easier<sup>(27)</sup>. Finally, they also achieve considerable progress towards the quality of the responses to inferential questions<sup>(28)</sup>.

Overall, children with receptive difficulties have a poorer prognosis. Based on that information, the aim of this literature review was to analyse relevant information about comprehension deficits verified in children and adolescents with Specific Language Impairment (SLI).

## LITERATURE REVIEW

### Comprehension deficits in SLI: reasonable explanations

There are several explanations for the comprehension deficits observed in SLI. One of them is the lack of linguistic knowledge, especially of morphology and syntax. According to literature, Greek<sup>(4)</sup> and Hebraic speakers<sup>(5)</sup> with SLI have poorer performance than the control groups matched by the level of linguistic abilities. Both clinical groups experience greater difficulty with semantically reversible relative clauses. There is a particular difficulty with complex structures that involve syntactic movement, such as object relatives rather than the subject ones<sup>(5)</sup>.

Another point to consider is the limited linguistic processing. Differently from control groups, pre-school and school children with SLI cannot process sentences automatically, what requires considerable effort<sup>(7)</sup>. These deficits not only make it difficult to process linguistic information in real-time, but also affect the long-term representation of language<sup>(6)</sup>.

Due to these processing difficulties, children with SLI may

comprehend information less accurately and/or slower than the control ones. Some studies found that pre-school children with SLI have difficulty with -wh questions, especially when syntactic complexity and length are combined<sup>(29)</sup>. Other studies showed that school-age children and adolescents perform tasks of grammatical judgement<sup>(30)</sup> and on-line comprehension of questions reasonably accurate, but slower than the control groups<sup>(31)</sup>.

According to literature, the slower language processing may be explained by inefficient higher-order linguistic operations rather than failures in the inferior acoustic-phonetic processing<sup>(32)</sup>. Children with SLI process isolated monosyllables without any difficulty; conversely, they have significant difficulty in processing words in sentences<sup>(32)</sup>. Moreover, they perform better when the verbal stimuli are presented slower; this resource enables them to complete linguistic operations and cognitive processes necessary to comprehend complex sentences<sup>(8)</sup>.

Some studies suggest that these comprehension difficulties are explained by limited working memory<sup>(8-10)</sup>, difficulty with the management of processing resources<sup>(9)</sup>, such as sustained and selective attention<sup>(7,11)</sup> and inhibition of irrelevant information<sup>(7-12)</sup>. These studies demonstrated the influence of working memory capacity on the comprehension of simple sentences, as well as the importance of attention to understand complex sentences<sup>(10)</sup>. In addition, sustained attention plays a crucial role in real-time comprehension<sup>(7)</sup>.

### Performance in comprehension tasks and prognosis

Literature demonstrates that comprehension deficits are evident at discourse level. Because children with language disorders allot processing capacity and time to the comprehension of the surface form at the expense of broader processing of context<sup>(33)</sup>. Thus several studies reveal delayed development of literal and inferential comprehension of discourse. Some of them showed that school-age children with SLI performed similarly to control groups two or three years younger in a task of literal and inferential comprehension of discourse<sup>(22)</sup>. Other studies reported a slighter delay in terms of inferential comprehension, but compatible with the general linguistic development<sup>(24)</sup>.

Nevertheless, there is controversy over whether or not there are specific inference deficits. Some authors found that schoolchildren with SLI have difficulty with both literal and inferential information of discourse<sup>(22,34)</sup>. Conversely, others suggested that pre-school children<sup>(35)</sup> and adolescents with SLI<sup>(36)</sup> have difficulties specifically with inferential information. This incongruity of results seems to be explained by differences in the age range of the samples studied.

Overall, comprehension deficits at the discourse level persist even when clues are presented. For example, closed questions – that could be answered verbally or with gestures<sup>(24)</sup> – and visual resources<sup>(22,24,33)</sup>. The first ones reduce the demands of discourse elaboration<sup>(24)</sup>, whereas the last ones – such as pictures<sup>(33)</sup>, logical sequences<sup>(22)</sup> or illustrated books<sup>(24)</sup> – facilitate the processing of information.

Qualitatively, children with SLI perform poorer than

the control groups. Firstly because even though they draw inferences often, the deductions are – most of times – irrelevant to the context of the narrative<sup>(34)</sup>. Secondly, these children commit more frequently some typologies, such as failure of literal comprehension, scope of question misunderstood<sup>(33-34)</sup>, odd responses<sup>(34)</sup> and errors due to lack of expressive ability – in terms of syntax and phonology<sup>(33)</sup>.

Furthermore, compensatory strategies are not sufficiently effective. The purely semantic ones – frequently used by children with expressive-receptive disorders – are ineffective regardless of the processing demands whereas those based on syntactic clues – commonly used by children with expressive disorders – are vulnerable to high processing demands<sup>(6)</sup>.

Differently from control groups, when the processing demands are high, children with SLI do not rely on earlier strategies systemically; instead, they perform considerably worse, due to the vulnerability of the representation of the strategies<sup>(19)</sup>. During adolescence, subjects with SLI – especially those belonging to the grammatical subtype – still perform worse than control groups. They comprehend wh- questions by relying on lexical/thematic or discourse representation, instead of syntactic information<sup>(31)</sup>.

On the other hand, throughout linguistic development children with SLI improve comprehension abilities. Studies reveal that children and adolescents with SLI improve comprehension quantitative and qualitatively. As time passes, these children obtain higher scores in tasks of discourse comprehension<sup>(22)</sup> and improve the quality of the responses<sup>(28)</sup>.

However, even though there is progress in comprehension, the deficits are not overcome. Recent studies<sup>(36)</sup> revealed that adolescents with SLI – compared to control groups – fail regarding the accuracy of inferential comprehension. They also demonstrated that the group with SLI performs poorly in terms of quality of response, as they omit more information.

### Intervention process

Seeing the poor prognosis of comprehension deficits, early intervention is of extreme importance. Studies and consultative papers describe techniques developed for the improvement of comprehension abilities. The metasyntactic therapy, for example, facilitates comprehension and production of passive voice by using the visual codes as tool<sup>(37)</sup>. The use of software programs may also facilitate real-time comprehension<sup>(38)</sup>. This is done indirectly, by improving abilities involved in language comprehension, such as auditory processing and working memory, or directly, by modifying speech acoustically.

Scientific literature also reports the effectiveness of therapy focused on difficulties with comprehension of discourse. This intervention may be direct, with imagery training<sup>(12)</sup> and scripted book-sharing discussions<sup>(39-40)</sup>. Indirect intervention is also possible, by using games appropriate for the development of lexical-semantic abilities, which are necessary for the comprehension of the texts read<sup>(40)</sup>. The benefits of these techniques are reported by literature<sup>(23,39-40)</sup>, especially when literal comprehension is considered<sup>(23)</sup>.

## DISCUSSION

Extensive literature reports that children with Specific Language Impairment (SLI) have considerable difficulty with comprehension of sentences and discourse. Compared to control groups, children with SLI make more errors in comprehension tasks<sup>(4-5,22,29,33-35)</sup> or complete them slower<sup>(30-31)</sup>. This characteristic is observed even later in the development, such as school age and adolescence.

Comprehension deficits may be explained, in part, by the lack of linguistic knowledge, especially morphology and syntax<sup>(4-5)</sup>, which are seriously impaired in children with SLI<sup>(1,3)</sup>. However, considering the complexity of language comprehension<sup>(14,17,20-21)</sup>, difficulties in higher-order linguistic processing must be considered as well<sup>(32)</sup>. For instance, deficits in working memory<sup>(9-10)</sup> and sustained selective attention<sup>(7,11)</sup>, as well as difficulties with the inhibition of irrelevant information<sup>(7,12)</sup>.

As comprehension abilities are assessed indirectly<sup>(16)</sup>, standardised tests may not reveal the real performance of children with language disorders. In everyday language use, comprehension deficits may be masked by compensatory strategies, because of the familiarity of information<sup>(6)</sup>. However, when the processing demands are high, these children perform poorer<sup>(19)</sup>. Those with grammatical SLI still use ineffective strategies – such as lexical/thematic or discourse information – during adolescence<sup>(31)</sup>.

Because of that, comprehending discourse is a challenging task for children with SLI. As they have difficulty in building mental models, they allot time to the interpretation of the surface information and waste cognitive resources at the expense of broader processing of context<sup>(33)</sup>. Fragile, literal and inferential information not integrated into the model tend to be forgotten<sup>(17)</sup>.

Regardless the testing procedure, children with SLI perform poorly in discourse comprehension tasks. Overall, they are comparable to younger children with normal development<sup>(22,24,33)</sup>. These deficits occur even when the demands of elaboration of discourse and/ or linguistic processing are reduced, by providing clues<sup>(22,24,33)</sup>.

Differently from autistic spectrum disorders, there is a lack of consensus over whether or not children with SLI have specific inferencing deficits. Some studies examining comprehension abilities in school-age children with SLI demonstrated that they have difficulty with both literal and inferential information of the discourse<sup>(22,34)</sup>. On the other hand, other studies reveal that difficulties with inferences are observed in younger samples<sup>(35)</sup>, whose everyday experiences may be restrict, making it difficult to infer information<sup>(17)</sup>. The literature also reports inferential difficulties in adolescents with SLI<sup>(36)</sup>, who may mask comprehension difficulties by using compensatory strategies<sup>(6,19)</sup>.

Difficulties only with inferential information are not typically described even in children with semantic-pragmatic disorder. Instead, studies report considerable difficulties with both literal and inferential information of narratives<sup>(22)</sup>. This finding is surprising, given the pragmatic profile of these children<sup>(3)</sup>.

Children with SLI infer as often as the control ones, even though difficulties are not relevant for the context of the narratives<sup>(34)</sup>. The high occurrence of this error may be explained by some factors: limited general knowledge<sup>(17)</sup>, difficulty in processing language<sup>(9-10)</sup> or suppressing irrelevant information<sup>(7-12)</sup>.

Furthermore, qualitative performance of children and adolescents with SLI is poor. This clinical group commits some errors more often than control groups. For instance, the typologies failure of literal comprehension, scope of question misunderstood, odd responses and errors due to lack of expressive ability – specifically, in terms of syntax or phonology<sup>(33-34)</sup>.

As children and adolescents with SLI develop, they make quantitative and qualitative progress in terms of comprehension abilities<sup>(22,28)</sup>. Even though, comprehension deficits persist: adolescents with SLI have difficulties with inferential information and tend to omit details of the discourse<sup>(36)</sup>.

Given the poor prognosis of expressive-receptive language disorders<sup>(13,14)</sup>, early diagnosis of comprehension deficits is essential, so that effective intervention is possible. There are important tools for this task, such as questionnaires and tests for the assessment of comprehension of real-time language.

The growing body of literature demonstrates the effectiveness of language intervention. Techniques such as metasyntactic therapy<sup>(37)</sup> favour the acquisition of syntax, whereas software programs facilitate real-time comprehension directly or indirectly<sup>(38)</sup>. Finally, intervention focused on discourse comprehension is also possible, by using scripted book-sharing discussions<sup>(39-40)</sup>, imagery training of sentences and narratives<sup>(23)</sup>, as well as ludic activities that facilitate the acquisition of semantic and lexical abilities<sup>(40)</sup>.

This literature review was comprised of international papers, due to the lack of national text about the thematic. Overall, we concluded – by considering the studies reported – that subjects with SLI have difficulties with language comprehension even during adolescence. Although effective intervention improves comprehension abilities, subjects with SLI are still below the standard scores.

Children and adolescents with SLI have particular difficulties in comprehending real-time language without semantic and/or contextual clues. In other words, this clinical

group depends on additional clues to understand language. These resources are necessary due to either inefficient syntactic processing – especially when messages are long – or limited working memory – when the sentences are simple. These deficits usually result in difficulties with both literal and inferential or deductive information.

According to the previously presented and discussed, language intervention is effective and essential in these cases. Although this intervention does not provide complete recovery, it facilitates language development and results in important progress. Considering that, speech-language pathologists should not neglect these aspects in the assessment and rehabilitation of children and adolescents with SLI.

## FINAL COMMENTS

This literature review shows that children and adolescents with Specific Language Impairment (SLI) have considerable difficulties in comprehending sentences and discourse. This characteristic occurs not only in pre-school years, but during the whole development process. Some studies explain these difficulties as a consequence of lack of linguistic knowledge, especially of syntax, whereas others consider the contribution of the influence of higher-order linguistic processing.

Receptive problems may be subtle in everyday language use, due to compensatory strategies. On the other hand, these strategies are vulnerable to higher processing demands. Because of this, understanding real-time language is challenging for this clinical group.

No clear consensus exists over whether or not children and adolescents with SLI have specific inference deficits. These subjects infer as often as control groups. However, qualitative differences are observed. The clinical group commits more errors due to failure of literal comprehension or misunderstanding of the scope of the question. They also give odd responses or make errors due to expressive difficulty more frequently.

As children with SLI develop, they improve comprehension quantitative and qualitatively. Conversely, the deficit is still verified during adolescence. Because of this, early diagnosis and adequate intervention are of extreme importance.

## RESUMO

O objetivo deste trabalho foi analisar estudos relevantes sobre as alterações de compreensão em crianças e adolescentes com Distúrbio Específico de Linguagem (DEL). Para tanto, realizou-se levantamento bibliográfico em bases de dados científicas. A literatura revela que essa população pode apresentar dificuldade importante de compreensão oral, atribuída ou à falta de conhecimento linguístico ou a falhas de processamento. Conforme se desenvolvem, as crianças com DEL apresentam evolução das habilidades de compreensão. No entanto, dificuldades persistem mesmo em faixas etárias mais avançadas, como a adolescência. Dessa forma, é importante diagnosticar precocemente tais alterações e intervir devidamente. Pesquisas científicas comprovam a efetividade da terapia fonoaudiológica por meio de técnicas variadas.

**Descritores:** Compreensão; Transtornos do desenvolvimento da linguagem; Testes de linguagem; Terapia da linguagem; Desenvolvimento da linguagem

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