

# Intervention on reading comprehension: an approach designed for students with Asperger's Syndrome (AS)

*Intervenção em compreensão  
de leitura: uma abordagem  
desenvolvida para estudantes  
com Síndrome de Asperger (SA)*

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**Abstract:** This paper reports the results of a study which examined reading comprehension in adolescents and young adults with Asperger's Syndrome (AS). The study was conducted in the city of Fortaleza, Northwest region of Brazil, with 6 students from grade 6 and above. More specifically, the study focused on improving reading comprehension of teenagers and young adults with AS through an intervention program based on metacognitive reading strategies, having as a theoretical base the conciliatory approach of reading. We adopted the reading model proposed by Kintsch and Van Dijk (1983), which presents reading comprehension as a dynamic, online and strategic process. In addition, we relied on the theoretical framework of Solé (1998) to address basic reading strategies. The results presented in this paper are part of the mentioned research, they suggest that teaching activities that focus on explicit instruction are effective for reducing reading comprehension difficulties in students with AS. These activities encourage students to reflect on their knowledge, facilitating the comprehension process and self-monitoring.

**Keywords:** Autism Spectrum Disorders. Inferential comprehension. Reading strategies.

**Resumo:** Este artigo reporta um dos resultados de um estudo que examinou a compreensão leitora em adolescentes e jovens adultos com Síndrome de Asperger (SA). O estudo foi conduzido na cidade de Fortaleza, região nordeste do Brasil, com 6 estudantes que já concluíram o Ensino Fundamental I. Mais especificamente, o referido estudo teve seu foco na investigação e melhoria da compreensão leitora de adolescentes e jovens adultos com SA através de um programa de intervenção baseado em estratégias metacognitivas, tendo como base a abordagem conciliadora de leitura. Adotamos o modelo de leitura proposto por Kintsch e Van Dijk (1983), que apresenta a compreensão de leitura como um processo dinâmico, online e estratégico. Além disso, nos baseamos na ideia de Solé (1998) para abordar as estratégias básicas de leitura. Os resultados apresentados neste artigo são um recorte da pesquisa citada, apontam que atividades de ensino com instruções explícitas que sugeriram um caminho a ser seguido durante a leitura, servindo como uma espécie de guia de leitura e estimulando o aluno a refletir acerca de seus conhecimentos, de sua compreensão e que o levem ao automonitoramento constituem um meio seguro para minorar as dificuldades de compreensão leitora de pessoas com SA.

**Palavras-chave:** Transtorno do Espectro Autista. Compreensão inferencial. Estratégias de leitura.

## Introduction

Autism Spectrum Disorders (ASD) are common developmental syndromes among children around the world. Studies sponsored by the Brazilian government have pointed to an increasing number of students diagnosed with ASD in the country. While Elsabbagh *et al.* (2012) notes that there are no comprehensive studies on the prevalence of ASD in Latin America, it is estimated that there are about 30 cases of ASD per 10,000 children in Brazil (PAULA *et al.*, 2011).

Recent data have also showed an increasing number of children with ASD in regular classrooms in Brazil. This is due to the implementation of the inclusion paradigm, which is a mandate that all children with disabilities, including those with ASD, must have access to general education. Despite this increase, there is still little research on ASD children in Brazil.

Reading comprehension can be considered a powerful means of social inclusion for at least two reasons. First, reading comprehension is fundamental in formal education because it is essential for the development of knowledge in all scholar subjects. Second, reading comprehension plays an important role in society, as the modern society has a literate culture. Thus, we conducted an intervention on reading comprehension among students with Asperger Syndrome (a milder form of autism). Our findings have implications for reading instruction for students with ASD, and are informative for teachers who do not feel prepared to support those students.

The referred approach was developed as part of a PhD research<sup>1</sup>, based on our studies and experiences in Brazilian general and special classrooms. Our main goal in such research was to elaborate and test an intervention designed to help students with AS to improve their reading comprehension and to support teachers who work with the reading development of those students.

### **A general view on reading**

Reading research has been conducted all over the world and involved several themes and methodologies, from the neurological studies to intervention projects designed to promote and develop reading skills. Reading has been currently understood as an ability which involves linguistic as well as cognitive processes that require the mobilization of great knowledge in a communicative set. Reading is “a highly complex interactive activity of meaning production”. (KOCH; ELIAS, 2015, p. 11).<sup>2</sup>

This idea corroborates the “Simple View of Reading”, a theoretical approach introduced by Philip Gough and his colleagues. According to this view, reading is a compound of two main components: 1) decoding and 2) linguistic comprehension (ROBERTS; SCOTT, 2006). In addition to decoding and cognitive processing (which involves the understanding of the text read and the strategies used for it), it is also extremely important to consider the different contexts surrounding the text and its reading, it means all the social, cultural and historical factors that result in interpretations beyond comprehension.

In short, reading is perceived by many experts as a dialogue, a communicative act, through which one can build meanings. From this perspective, reading is considered “an individual and social competence, a process of production (and construction) of meaning that involves four elements: the reader, the author, the text and the context.” (COSSON, 2017, p.36 - emphasis added).<sup>3</sup>

Reading comprehension “occurs as the reader builds a mental representation of a text message” (PERFETTI *et al.*, 2005, p. 228), this way,

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<sup>2</sup> Original note: “uma atividade interativa altamente complexa de produção de sentidos”. (KOCH; ELIAS, 2015, p. 11 - author’s translation).

<sup>3</sup> Original note: “uma competência individual e social, um processo de produção (e construção) de sentidos que envolve quatro elementos: o leitor, o autor, o texto e o contexto” (COSSON, 2017, p. 36 - author’s translation).

the reader's prior knowledge and the inferences that the reader makes during the reading process are essential for an effective understanding. In conjunction with that, to have a successful comprehension, it is necessary that "the demands of the text, the challenges of the task, and the skills and proclivities of the reader are all well aligned" (SNOW, 2010, p. 413).

Reading plays a fundamental role in formal education, because it is essential for the development of knowledge in all the scholar subjects (SNOW, 2010). Accordingly, students who have problems in reading are likely to experience difficulties in acquiring and comprehending topics in other areas of knowledge.

Moving beyond the school context, many other contexts of our everyday life benefit from reading. Our society is organized based on a literate culture, and so forth even those people who have never gone to school understand the value of the written code in our daily lives. Reading is a reason for valuing man in a society, knowing how to read is socially perceived in a positive way, while the absence of reading is always seen in a negative way.

Through reading, it is possible to overcome many social barriers, to update our cultural impressions, to fill out a part of our training gaps with accessible information, and to experience a safe form of leisure. Therefore, reading facilitates the reachment of a good place in the academies and in the austere labor market, while, at the same time, it is a powerful means of social inclusion.

### **A general view on AS**

The AS is a form of Autism Spectrum Disorder (ASD) identified in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders, DSM-IV (AMERICAN PSYCHIATRIC ASSOCIATION, 2002).

However, in the most recent version of the manual, DSM-V (AMERICAN PSYCHIATRIC ASSOCIATION, 2013), the AS was incorporated into a new "umbrella" term that encompasses several disorders in a single group, which is called ASD. As a new definition, the AS has come to be considered a milder form of autism. Thus, patients diagnosed as being affected by the AS according to the DSM-IV are only labeled in degree of impairment according to DSM-V.<sup>4</sup>, as the note attests:

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<sup>4</sup> Although the nomenclature AS is not expressed in the most recent manual that assists physicians in the diagnosis of issues related to neurodevelopmental disorders, in Brazil, the manual used for the diagnosis is still the DSM-IV (AMERICAN PSYCHIATRIC ASSOCIATION, 2002), resulting, therefore, in Brazilian diagnoses that

Prior to the publication of the DSM-5, children might have been given one of four different diagnoses: autistic disorder, childhood disintegrative disorder, pervasive developmental disorder not otherwise specified, or Asperger's syndrome (American Psychiatric Association, 2000). Although each of these diagnoses was unique, they all identified children with developmental disorders that fell along a continuum ranging from lower to higher functioning. When the DSM was revised, children with any of these disorders were grouped together under ASD. (SENOKOSSOFF, 2016, p. 224)

The ASD syndromes are among the most common developmental disorders amid children nowadays. Exploring the epidemiology of ASD, a study conducted by Fombonne (2009), under a global perspective, found an index of 1 case per each 140 investigated children.

At Centers for Disease Control and Prevention (CDC) research, a study conducted by Autism and Developmental Disabilities Monitoring (ADDM) Network showed that the prevalence of ASD increased over the last decade: 1 case per 150 children in 2007, 1 case per 110 children in 2009, 1 case per 88 children in 2012, and 1 case per 68 children in 2014, (CHRISTENSEN *et al.*, 2016). The most recent index from 2016 showed 1 case per 59 children (BAIO *et al.*, 2018).

In Brazil, as in other developing countries, there is little information about ASD rates. Elsabbagh *et al.* (2012) noted that there were no comprehensive studies on the prevalence of ASD in Latin America. However, according to Paula *et al.* (2011), the rate was about 30 cases per 10,000 children. Data on epidemiology of AS specifically are even scarcer.

Although there are data which show the high number of children with ASD, there are still few studies about this topic, specially with regard to the reading comprehension ability of people (of all ages) with AS.

According to Moore (2007), people with AS present damage in five specific areas of development: 1) language development; 2) social interaction; 3) sensory integration; 4) motor functioning and 5) cognitive processing.

With regard to language development, there were six characteristics that we took into consideration to conduct our study: 1) the possibility of delay in initial speech and, in some cases, achieving fluency only between three and four years of age; 2) difficulties in making language effective in everyday situations; 3) language used

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point to AS, and not to milder ASD. Thus, in our study, we preferred to use the term AS, based on DSM-IV (AMERICAN PSYCHIATRIC ASSOCIATION, 2002).

automatically but not spontaneously; 4) difficulties in understanding figures of language, such as metaphors; 5) difficulties in interpreting literal or implicit meanings and 6) a greater difficulty with reading and writing than with mathematical calculations (CARVALHO, 2013).

Concerning the intelligence levels, people with AS have normal or even higher levels of intelligence individuals without such syndrome. On the other side, those with AS usually present significant difficulties in what encompasses social intelligence, so that they seem to be “social illiterates” (FITÓ, 2012).

In addition, although people with AS do not usually present significant delays in the acquisition of oral language, they seem to be slower than what is expected while acquiring the written code (SANTOS; PEIXOTO, 2009; CARVALHO, 2013). With regard to reading, those people tend to decode easily, whereas their reading comprehension tends to be deficient (FITÓ, 2012; GOMES, 2011; CARVALHO, 2013; SOUSA, 2015).

### **Reading and AS**

In addition to the social and emotional difficulties that people with AS can experience, many also struggle with reading comprehension (SENOKOSSOFF, 2016). Researches show that more than 65% of children with ASD have difficulties with reading comprehension skills (NATION *et al.*, 2006). On the other hand, because the AS is not a degenerative disorder, it does not cause a cognitive impairment. Thus, people with AS can learn and improve their knowledge, including reading comprehension, throughout their lives.

At school, in general, children with AS do not present great difficulties to learn the contents, especially if the subjects are included in their particular area of interest. Presenting an enormous capacity to memorize a lot of content, including meticulous details, is a characteristic of people with AS. However, they need a differentiated teaching plan that builds on their skills and never underscores their limitations. In reading itself, those students need a class plan with specific reading strategies that a teacher might use to support them.

Taking into consideration the typical difficulties in reading comprehension that every child faces during the process of reading development and the characteristic complications that children with AS have, people with this neurobehavioral condition should receive special attention in classroom in order to fully realize their potential, so that they can be successful in their academic and school life.

## Reading comprehension and the teachers' role

Based on the premise that the more experienced have fewer difficulties in reading comprehension, Kleiman (2008) suggests that reading strategies must be taught and applied by the teacher in a classroom to guide students to focus on the meaning in a text and also to facilitate students' development in reading comprehension. At the same time, motivating students in the practice of such ability is part of teachers' role.

Therefore, the teacher is considered the main mediator of reading. He or she is expected to encourage students to contextualize the text, to reflect on their motivation for reading, to guide students to link the text with prior knowledge, and to instruct reading strategies that students can consciously and systematically use to understand/interpret the text.

It is important for any reader to search for meaning and monitor consciously their comprehension of the text during reading (BRUNER *et al.*, 1976). For students with AS, it is not different. At first, reading strategies shift from cognitive to metacognitive (requiring a certain mental effort from the reader). Next, as the reader becomes more experienced, reading strategies tend to become automatic.

When working with children with AS in the classroom, teachers need to provide explicit instruction in cognitive strategies that lead to significant improvements in reading comprehension. Students, especially those with AS, can and should be taught to make sense of what they are reading (SENOKOSSOFF, 2016).

### The study

After all this reflection about the reading of people with AS and the mediating role of the teacher, as well as the observation of the current scenario of special education in Brazil, we conducted a study in which we developed an intervention on reading comprehension – explicit strategy instruction – in order to improve the reading comprehension of students with AS by means of explicit teaching of reading strategies.

Our main goal was to examine the effectiveness of an intervention designed to help students with AS to better comprehend what they read as well as to support teachers who work with students with AS.

In order to reach our goals, we adopted the conciliatory vision of reading from a theoretical perspective based on the sociointeractionism, mainly the reading model proposed by Kintsch and Van Dijk (1983)<sup>5</sup>, as well as the framework of reading strategies proposed by Solé (1998).

## The method

Participants were six grade six students (5 boys and 1 girl, mean age 132 months old) who had been diagnosed with AS. The students came from public and private schools in urban and suburban areas of Fortaleza, Brazil. All the participants spent a term at an institution specialized in intervention and treatment of people with ASD, where we conducted the research. The data were collected in a quiet room in the institution.

The students were first observed in their school environment and then were administered a decoding test. The test assessed the oral reading of isolated words and pseudowords in Portuguese, based on the list suggested by Salles *et al.* (2013), with a total of 60 stimuli. The words and pseudowords were presented in a black mono-spaced font (Arial; 32 point) on a 21-in. screen, on the center of a white background by the Power Point program in a predefined order.

The task was to read aloud the singly shown word or pseudoword on the screen. The students were instructed to press “enter” after they had read the word in order to read the subsequent one. Six practice trials were used to familiarize the participants with the procedure.

Based on the performance of the decoding test, we formed 2 groups of 3 students, according to their schedules and available times. Both groups participated in the pre-test and post-test, in which we assessed the levels of inferential comprehension reached by the participants while reading.

The tests used in the present research were based on validated international tests: *Gates-MacGinitie Reading Test* (GMRT), by MacGinitie *et al.* (2002) and the *Qualitative Reading Inventory* (QRI), by Leslie and Caldwell (2001). In addition, the layout proposed by Sousa (2015) was adapted. The pre-test and post-test were developed specifically to be used in our research and tested in a pilot study.

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<sup>5</sup> Kintsch and Van Dijk (1983) postulate the existence of a microstructural level (the surface of the text) and a macro-structural level (the implicit and subliminal information in a text). So, according to this model, the macrostructural level involves inferential understanding and the microstructural level encompasses literal understanding.



Thus, each test was composed of 3 short texts with different genres (book review, scientific informative and poem), selected from didactic books used in Grade 6. For each text, there were 6 multiple-choice questions, which assessed the comprehension of textual and contextual information. The participants were asked to complete the test within 30 minutes. The performance on the reading comprehension test was analyzed according to criteria described in Table 1.

Table 1 - Inferential reading comprehension test analysis criteria

Code	Level of Reading comprehension	Parameters – quantity of correct answer	Minimum of correct answer by text
N1	Frustration	0 - 3	0
N2	Low comprehension	4 - 7	2
N3	Moderate comprehension	8 - 11	3
N4	Successful comprehension	12 - 15	4
N5	Complete comprehension	16 - 18	5

Source: Prepared by the authors.

During the intervention period, the control group participated in “literary circles”, an approach that involved interpretation of images of picture books. We sat together to “read” a different picture book and discuss about its contents for 30 minutes every Friday for four weeks. There was no formal instruction. We went through each page of the books and discussed the main idea of each story.

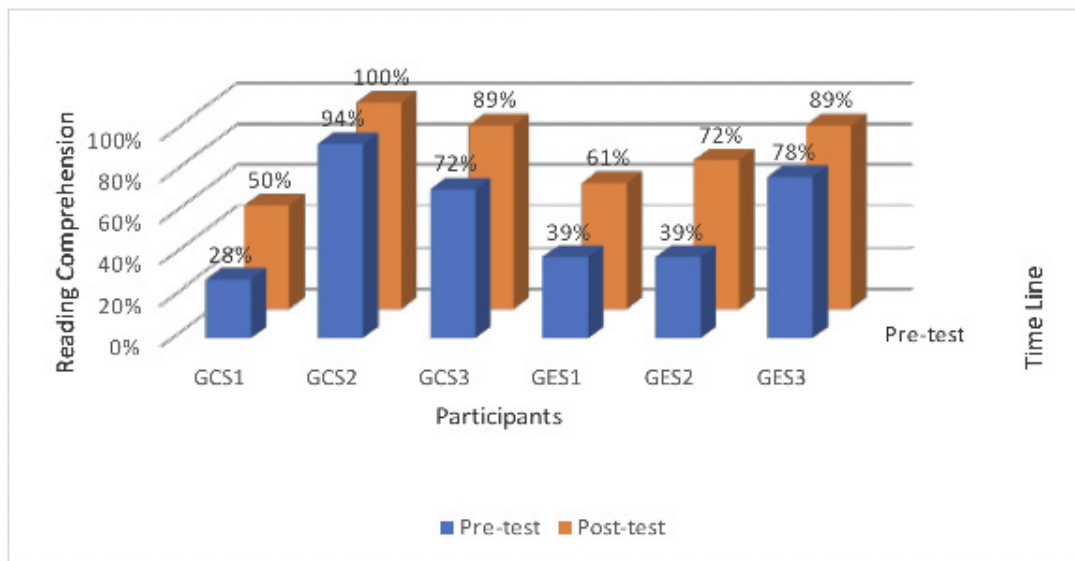
The experimental group participated in the “teaching proposal”, a reading strategy intervention. There were two 30-minute sessions per week for four weeks, with a total of eight sessions. During the intervention, we applied an approach that involved seven procedures. The procedures focused on the four reading strategies suggested by Solé (1998) as being the basic reading strategies (prediction, inference, scanning and verification). The procedures were: 1) activate or build prior knowledge; 2) read slowly to understand – paragraph by paragraph, summarize each paragraph, extract each paragraph’s main idea before moving to the next paragraph and predict the content of the next paragraphs; 3) verify predicted information; 4) identify “important words” (key word and unknown words); 5) observe the anaphoric, cataphoric and referential links and, in the text, try to figure out what elements they referred to; 6) infer logical or implicit information from the text; 7) summarize the text.

After the data were collected at pre-test and post-test, the information from the participants were compared and analyzed.

## The results

As displayed in the following figure, all the participants improved their reading comprehension after the intervention.

Chart 1 – Participants' Reading Comprehension Development



Source: Prepared by the authors.<sup>6</sup>

In fact, both approaches adopted by our study (teaching proposal and literary circles) were beneficial for developing reading comprehension skills. It seems that the use of strategies were effective regardless of whether an activity required the use of written texts.

We observed, however, that the students of the experimental group, who participated in the reading strategy intervention, had better outcomes than the participants in the control group, who experienced the activities of the literary circles. The mean rate of improvement in the control group was 15% while the same rate for the experimental group was 22%. Perhaps it can be justified by the fact that the experimental group participated in a larger number of sessions than the control group.

Table 2 presents the development of the reading comprehension of the participants of our research in terms of their levels of reading comprehension in the pre-test and post-test.

<sup>6</sup> In the graph, GCS refers to students in controlled group while GES refers to students in experimental group.

Table 2 - Development of reading comprehension level considering pre-test and post-test

		Pre-test	Post-test	Development of reading level
		Level of reading comprehension	Level of reading comprehension	
Participants	GC1	Frustration	Low comprehension	1 level up
	GC2	Complete comprehension	Complete comprehension	stable
	GC3	Successful comprehension	Complete comprehension	1 level up
	GE1	Low comprehension	Successful comprehension	2 levels up
	GE2	Frustration	Moderate comprehension	2 levels up
	GE3	Successful comprehension	Successful comprehension	stable

Source: Prepared by the authors.

The results suggest that readers with AS need adaptations to enhance their reading comprehension skills. These activities enable them to reflect on their understanding and monitor their comprehension during reading. Thus, the four basic reading strategies (SOLÉ, 1998) used in a combined and systematic way seem to facilitate reading comprehension of students with AS. Therefore, teachers should carry out instructional activities on reading strategies among these students.

The teaching proposal applied at our research, which involved 7 tasks and the four basic reading strategies (SOLÉ, 1998) was effective in improving students' reading comprehension. With regard to the literary circles, the results from this approach also demonstrated an improvement in reading comprehension, although the effect was smaller compared to the outcomes from the reading strategy intervention. In any case, activities involving sequenced reading, explicit instructions, comprehension strategies, socialization and routine lead to better performance on reading comprehension for students with AS.

The results of our study confirm those of previous studies (FLORES; GANZ, 2007; HUNDERT; VAN DELF, 2009; STRINGFIELD *et al.*, 2011) that focused on tasks with explicit and routine instruction of cognitive strategies. Taken together, these studies suggest that explicit and systematic instruction in reading strategies can help readers with ASD improve reading comprehension performance. Specifically, these activities help students with ASD organize their ideas and thoughts independently during reading. Tasks such as "oral brainstorming" and "observation of referential links", for example, help readers remember important details related to the topic of the text and organize the

information read. In the same vein, practices as “summary of the text” and “summary of each paragraph” are means of helping readers to retain what is read, in order to form a coherent line of understanding.

The present study also confirms the notion that although people with ASD have difficulties in processing the textual macrostructure, they are able to make considerable progress in reading comprehension in a short period of time with explicit instruction. Such instruction enables them to overcome their characteristic deficits, make necessary connections within the text and in relation to other texts, organize ideas, self-monitor, and interact with the text.

Finally, our study demonstrates that a more experienced reader can act as a mediator to improve the reading skills of a less experienced reader through scaffolding approach (BRUNER, 1976; CANTALICE, 2004).

In short, our research identified that teaching activities with explicit instructions that suggest a path to be followed during reading, serving as a kind of reading guide and stimulating the student to reflect on their knowledge, understanding and self-monitoring are a safe way to reduce the difficulties of reading comprehension of people with AS, especially if the activities involve the four basic reading strategies.

## Conclusion

To conclude, our study suggests that reading comprehension interventions are helpful for students with AS. People with AS typically demonstrate an excellent ability in phonological processing (decoding), while their reading comprehension seems damaged (SURIAN, 2010; FITÓ, 2012; GOMES, 2011; CARVALHO, 2013; SOUSA, 2015). In order to reduce this impairment, several metacognitive processes can be modified by means of instructing comprehension strategies, given that readers are capable of monitoring their own comprehension during reading (FLETCHER, 2007). In the meantime, teachers must provide students with activities that guide them to monitor their own learning and comprehension. This is achieved through both explicit instruction and modelling.

Our results also demonstrate that reading comprehension interventions can be provided to small groups of students simultaneously. However, for those students with more severe impairments, a one-on-one intervention may provide better overcomes.

Although the benefits of adaptive education for students with special conditions have been reported around the world, the topic remains controversial in Brazil. Public schools often lack capacity in addressing the needs of students with ASD. Relatedly, teachers typically do not receive sufficient training in special education, and consequently do not know how to meet the needs of students with ASD or other disabilities. Thus, our results inform literacy teachers of instructional strategies effective for students with AS. Broadly speaking, this research is also relevant for teachers of other areas of knowledge, as reading is the basis for learning.

The approach that we showed in this research is a suggestion for those teachers who are supposed to help students with AS to improve their reading comprehension but do not know how to do it. The approach can be used as a guide and implemented along with other reading materials. It can also be used with neurotypical students, once the reading comprehension is the most difficult part of the reading for these students as well (CANTALICE, 2004; FERREIRA; DIAS, 2004; FLETCHER, 2007; BARBOSA *et al.*, 2011).

Given the dearth of research in this area, it is important to gather information through empirical studies. Thus, our study can serve as a first step into a promising line of inquiry. Future studies should include a larger sample size and students with different types of disabilities. They should also design longer and more effective interventions.

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