

**Independent Project with Specialization in English  
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**The Complex Nature of Reading  
Comprehension for Upper Secondary  
Students with Autism in EFL Classrooms**

*Läsförståelsens komplexa karaktär för gymnasieelever med autism i  
EFL klassrum*

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# Abstract

In order to provide equal education to students with autism spectrum disorder (ASD) in Swedish upper secondary English as a foreign language (EFL) classrooms, support must be provided that adapts to their strengths and needs regarding reading comprehension. Multiple studies show that many upper secondary students with ASD in Sweden do not meet the knowledge requirements for passing grades in English, and require support in reading comprehension. Through a systematic research review based on ten studies regarding reading comprehension for L2 students as well as students with ASD, this paper aims to investigate what current research says regarding how L2 students with ASD process text and also explores scaffolding tools and teaching methods used for developing reading comprehension. Further the findings are discussed in regard to the Swedish educational context. The results from the reviewed studies found four factors that can affect the reading comprehension of L2 students with ASD; namely: 1) individualistic problem-solving strategies, 2) working memory and main idea comprehension, 3) forms of scaffolding and teaching methods as well as 4) language proficiency. The discussion sheds light on how the way in which these four factors interplay when teaching reading comprehension to L2 students with ASD is relevant for teachers as it identifies the strengths of students with ASD through a resource perspective. Adaptations that could be implemented based on the results, align with Swedish policy documents. Thus, future interventional studies that combine the four factors found in the results could be significant for teachers working with EFL students with ASD.

*Keyterms: reading comprehension, inference generation, autism spectrum disorder, English as a foreign language, working memory, scaffolding.*

# Individual Contributions

We hereby certify that all parts of this essay reflect the equal participation of both signatories below:

The parts we refer to are as follows:

- Planning of how to structure the work
- Establishing of research questions
- Article searches and decisions pertaining to the outline of the essay
- Narrowing down of the results through inclusion and exclusion criteria
- Presentation of findings, discussion, conclusion, abstract and method

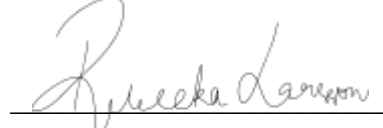
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# 1. Introduction

A question that many upper secondary teachers face in Sweden is how to be inclusive when teaching diverse students. The diversity among students makes it necessary to cater to different ways of thinking as well as offer support that suits individual needs in order to ensure the development of students in the different subjects they study. For teachers of English as a foreign language (EFL) in Swedish upper secondary schools it is important to teach reading comprehension through inclusive methods, as it is an area that can be more challenging for some students than it is for others. Unless met with individually adapted support, students with unique needs, such as those with autism spectrum disorder (ASD), risk not developing to their full potential in this area.

ASD is the umbrella term for a neurological condition that is unique to each individual on the spectrum but commonly includes a vast array of traits that do not align with typical norms, often in areas of communication and social interactions, which can result in struggles in reading comprehension (Muharikah et al., 2022; Murza et al., 2014; Tirado & Saldaña, 2016). According to Idring et al. (2015), circa 2.5% of upper secondary students (aged 15-19) in Sweden are on the autism spectrum, but the definition of autism spectrum disorder (ASD) is varied. As ASD is a neurological condition, some refer to it as an autism spectrum condition (ASC) (Cancino & Tomicic, 2023; School Inspectorate, 2012), as opposed to autism spectrum disorder (ASD). Further, within the autism spectrum, people require varying degrees of support and many students with lower support requirements who attend schools not specifically catered to students with special needs, often fall under the category of Aspergers (Autism & Asperger Association, 2013) or High-Functioning ASD (O'Connor & Klein, 2004). However, all degrees of autistic traits, fall under the umbrella term of autism spectrum disorder (ASD) and come with individual needs that teachers must meet. Contrarily, when referring to students who do not have developmental disorders such as ASD and thus develop neurologically according to typical norms, the umbrella term typically developing (TD) is used.

Teaching reading comprehension in upper secondary EFL classrooms in Sweden to students with ASD can be demanding in multiple ways due to the requirements of Swedish policy documents as well as the challenges students with ASD can face. As students progress through upper secondary school in Sweden, the requirements regarding reading comprehension in the EFL subject increase from being able to

understand text, to also being able to interpret complex texts (Skolverket, 2022a). This can be especially hard for students with ASD as the students who are on the autism spectrum in Swedish upper secondary classrooms can face certain struggles specifically in regard to reading comprehension. One struggle lies in their ability to identify the main idea of a text, as it can be hindered by a general focus on details when reading (Muharika et al., 2022; Murza et al., 2014). Additionally, the ability to infer implied meaning when reading, i.e. generate inferences, is a specific area that many students with ASD can struggle with as their atypical processing of information presented in texts can make it harder for them to connect what is read to prior knowledge than for students who are typically developing (Barth et al., 2022; Murza et al., 2014; O'Connor & Klein, 2004). For cognitive tasks such as connecting new information to prior knowledge, working memory, which is described by Adams et al. (2018) as “a limited amount of information that can be temporarily maintained in an accessible state” (p.340), is needed.

When speaking of students with ASD, norm criticism is necessary for equality in education. Norm criticism can be defined as a combination of theories and methods used to counter discrimination and exclusion of people who do not fit societal norms (Nationalencyklopedin, 2016), such as people with ASD. According to Dinishak (2016), a norm critical perspective allows one to move away from a deficit perspective which can hamper scientific progress by only viewing traits as weaknesses. Through a norm critical approach in regard to students with ASD, one is able to see strengths as well as areas that require support and find adaptations that allow these students to develop and flourish. The Swedish curriculum for upper secondary school states that schools must adapt and provide support based on students' individual needs and offer alternative ways for students who risk not reaching educational goals to do so through methods that are adapted for them (Skolverket, 2022c).

The Swedish School Inspectorate (2012) found that, contrary to the guidelines stipulated in the Swedish curriculum for upper secondary school (Skolverket, 2022c), not all schools meet the needs of students with ASD due to limited knowledge about ASD and how to support these students. According to Anderson's (2020) study on Swedish students with ASD's absence in school and its connection to passing grades, results show that approximately 50% of students with ASD who attend Swedish schools do not receive passing grades in English, Swedish and Mathematics. Anderson's (2020) findings also show that caregivers report that the most prominent reasons behind these

students' limited attendance is due to faculty staff's limited knowledge regarding ASD as well as the lack of adaptation and support in both social and learning situations. Similar findings can be seen in the Autism and Aspergers Association's (2013) investigation, which also showed a lack of knowledge regarding ASD, as well as insufficient adaptations and support for students with ASD to be the main reasons behind their absence in school. This is pertinent as, in Sweden, schools are required by law to offer extra support for students who need it (SFS 2010:800, 3 chap. 5 §). One form of support, such as required by Swedish policy documents, is scaffolding. According to Gonulal and Loewen (2018), scaffolding is a term originated from Vygotsky used to describe ways to support students' individual needs to ensure the highest potential for development. They suggest that scaffolding is specifically beneficial for language learning as the focus on meeting and supporting students at their current level is crucial for language development. Scaffolding could thus be useful in helping students with ASD develop in both the English and Swedish subject, which they, according to Anderson (2020), struggle with.

The language learning that this paper investigates is English as a foreign language (EFL) in a Swedish context. However, the term EFL is complex as, although English does not have legal status in Sweden as a second language, it is used in daily life and media more than what is common in countries where English is a foreign language (Institutet för språk och folkminnen, 2021). Therefore, the term L2 students, as in second language learners, is used as an umbrella term in many studies and encompasses learners of English as a foreign language and English as a second language. However, since English is taught in Swedish upper secondary schools as a foreign language, the term EFL reflects English as it is taught in Sweden.

There are multiple factors that make teaching reading comprehension in EFL to upper secondary students with ASD in Sweden challenging. Although Swedish schools strive to be inclusive and provide equal education, the percentage of students with ASD who do not meet the requirements for passing grades gives light to the need for further knowledge in the area in order to adequately support them. As students with ASD can face unique challenges in regard to reading comprehension, it is necessary for teachers to develop unique ways to support students in this regard. Therefore, it is significant to not only investigate what current research says regarding students with ASD's reading comprehension, but also to connect the implications of the findings to a Swedish educational context.

## 2. Aim and Research Questions

The research reviewed in this paper sheds light on the complex nature of reading comprehension for students with ASD, while raising the perspective of EFL students in Swedish upper secondary schools. The implications of the results presented from ten studies are also discussed in relation to the upper secondary EFL education in Sweden in order to suggest ways to support students with ASD. As such, this paper aims to investigate what current research says regarding how L2 students with ASD process text for reading comprehension and explores scaffolding tools and teaching methods that have been used to support their development. In order to discuss the implications of the findings in relation to EFL students with ASD in Swedish upper secondary schools, our research questions are:

- What does current research say about how L2 students with ASD process text for reading comprehension in English?
- How can different forms of scaffolding and teaching methods affect the reading comprehension in English of L2 students with ASD according to current research?



## 3. Method

This systematic research review investigates what current research says about the reading comprehension of English as a second language (L2) learners as well as students with autism spectrum disorder (ASD). Further, it explores what current research says about scaffolding tools and teaching methods aimed to develop reading comprehension for students in this group. The databases: Education Research Complete (ERC) and Education Resources Information Center (ERIC), have been used as they include international research in pedagogy, subject didactics and educational science.

### 3.1 Inclusion and Exclusion Criteria

During the search process, exclusion and inclusion criteria regarding topic, age, participant-group size and publication range were applied in order to find relevant peer-reviewed studies. Appendix A details how the studies' year of publication range was adapted as necessary. Depending on the results yielded by each search, the publication range was widened if results were scarce or narrowed if plentiful, to find as recent studies as possible. However, all studies remained limited to the years 2000-2023. All ten studies are peer-reviewed and include at least two out of the three main topics; namely: 1) reading comprehension or inference generation strategies (IGS), 2) autism spectrum disorder (ASD), and 3) English as a foreign language (EFL) or English as a second language (ESL). The selected studies include participants who have English as their L1 or L2 and are as close to upper secondary age in Sweden (15-19) as possible, but no younger than ten. However, since research was sparse in certain areas, some studies include some, but not all, participants younger than ten (see Appendix A). Additionally, the inclusion criteria of larger participant-groups over smaller, was applied to reflect as much breadth within the heterogeneous autism spectrum as possible. Therefore, one of the main exclusion criteria when finding studies was that they involved less than three participants.

### 3.2 Search Process

To find the ten selected studies, different combinations of keyterms and synonyms from the three topics: inference generation, autism spectrum disorder and second language learning, were used. The search terms used to find each selected study are presented in

Appendix A. Nine out of ten studies were found through searches conducted in the databases ERC and ERIC. The tenth study, conducted by O'Connor and Klein (2004), was found through the references of Murza et al.'s (2014) study (see Appendix A). O'Connor and Klein's (2004) study was confirmed to be peer-reviewed by searching for its title in ERIC and ERC. Thus, ten peer-reviewed studies that meet the inclusion and exclusion criteria regarding topic, age range, participant-group size and publication range, are included in this systematic research review (see Table 1 for an overview of the results).

Table 1

*Overview of Selected Studies*

Title	Description of Study
Murza et al., (2014). A Randomized Controlled Trial of an Inference Generation Strategy Intervention for Adults With High-Functioning Autism Spectrum Disorder.	An interventional study that investigates how inference generation, metacognition, reading comprehension and social skills are affected by the ACT & Check strategy.
Nahatame, (2014). Strategic Processing and Predictive Inference Generation in L2 Reading.	An exploratory study that investigates the effect of instructional orientation on predictive inference generation while reading for second language learners.
Tirado & Saldaña, (2016). Readers with Autism Can Produce Inferences, but they Cannot Answer Inferential Questions.	An exploratory study that investigates the participants reading inference generation abilities under different conditions.
Grindle et al., (2020). Teaching Children with Autism Reading Comprehension Skills Using Online Reading Instruction: Preliminary Evaluation of Headsprout Reading Comprehension.	An interventional study that investigates if the computer program Headsprout Reading Comprehension can be used when teaching reading comprehension strategies to students with autism spectrum disorder.
Drill & Bellini, (2022). Combining Readers Theater, Story Mapping and Video Self-Modeling Interventions to Improve Narrative Reading Comprehension in Children with Autism Spectrum Disorder.	An interventional study that investigates the effectiveness of an intervention package consisting of three separate evidence based interventions aimed to benefit narrative reading comprehension for children with autism spectrum disorder.
Hall et al., (2020). The Effects of Inference Instruction on the Reading Comprehension of English Learners with Reading Comprehension Difficulties.	An interventional study that investigates the effect of inference teaching interventions on the inference generation abilities and general reading comprehension of English learners who struggle with reading comprehension.
Cancino & Tomicic, (2023). English as a Foreign Language (EFL) Reading Metacognition Awareness in Chilean learners with Autism Spectrum Condition: An Exploratory Study.	An exploratory study that investigates the metacognitive awareness of students with autism spectrum disorder who study English as a foreign language and which strategies they use while reading.
Turner et al., (2017). Developing an intervention to improve reading comprehension for children and young people with autism spectrum disorders.	An interventional study that investigates the effectiveness of a reciprocal teaching intervention on reading comprehension for students with autism spectrum disorder.
Alison et al., (2017). Technology-Based Shared Story Reading for Students with Autism Who Are English-Language Learners.	An interventional study that investigates the effectiveness of a shared-reading intervention on literacy skills for students with autism spectrum disorder.
O'Connor & Klein, (2004). Exploration of Strategies for Facilitating the Reading Comprehension of High-Functioning Students with Autism Spectrum Disorders.	An exploratory study that explores three strategies (pre-reading questions, anaphoric cueing and cloze tasks) in order to support reading comprehension for students with high functioning autism spectrum disorder.

*Note.* This table presents the selected studies included in this research review

## 4. Results

This systematic research review investigates what current research says about the text processing of English language learners with Autism Spectrum Disorder (ASD) and how different forms of scaffolding and teaching methods, aimed to develop their reading comprehension, can be used with these students. By summarising results from the selected studies, four major themes can be seen. Namely: 1) students with ASD's common preference for individualistic problem-solving strategies, 2) their working memory and main idea comprehension, 3) different forms of scaffolding and teaching methods to support these students and, 4) language proficiency's effect on reading comprehension. The combined results show an overlap of challenges for L2 learners with ASD regarding reading comprehension.

### 4.1 Individualistic Problem-Solving Strategies

Current research identifies difficulties students with ASD can face in regard to the interactive nature of asking and answering questions due to a common preference for individualistic problem-solving strategies. A study by Tirado and Saldaña (2016) with 66 participants who were either typically developing (TD), had poor reading comprehension skills, or were on the autism spectrum, tested the participants' ability to generate inferences under different conditions. Through looking at how students with ASD interacted with texts written to elicit certain inferences, they found that students with ASD were able to generate inferences when reading short passages, yet had a limited ability to answer inferential questions. This, Tirado and Saldaña (2016) suggest, could be due to the social requirements of understanding the questions themselves, as it requires interaction. Further, according to an exploratory study by Cancino and Tomicic (2023) on the metacognitive strategy use of 27 EFL students with autism spectrum condition (ASC) while reading, the results show that participants struggle to "access the mental states of other individuals" (p.16). This led to participants relying on individualistic problem-solving strategies rather than engaging in pretend play or other social activities. Cancino and Tomicic's (2023) findings regarding the common preference of individualistic problem solving strategies align with Tirado and Saldaña's (2016) suggestion that the social interaction required for answering questions may have hindered participants' ability to answer inferential questions. In conclusion, the common preference for individualistic problem-solving strategies can affect how one

perceives students with ASD's abilities, since asking questions may not cater to an individualistic problem-solving style.

## 4.2 Working Memory and Main Idea Comprehension

An area that requires scaffolding in order to develop reading comprehension in regard to inference generation for students with ASD, is working memory. In Tirado and Saldaña's (2016) study investigating the inference generation abilities of students with ASD compared to those who are TD, the results showed that students with ASD had an equal working memory capacity to students who are TD, yet struggled to generate inferences in longer passages where readers who are TD succeeded. In line with Tirado and Saldaña's (2016) findings, Cancino and Tomicic's (2023) study on the metacognitive awareness and reading strategies of EFL students with ASC, showed that the participants tended to focus on details rather than main ideas. According to Cancino and Tomicic (2023), focusing on details occupies their working memory when reading longer passages, and makes recalling information which is necessary for inference generation a struggle. As such, Cancino and Tomicic's (2023) findings support Tirado and Saldaña's (2016) claim, a reason for students with ASD's struggle to produce inferences and consequently global text comprehension, can in part be due to the working memory load of a detail-oriented approach when reading longer passages.

Students with ASD's detail-oriented reading makes summarising, though potentially challenging, beneficial for identifying the main ideas in texts. According to O'Connor and Klein's (2004) study in which 20 participants with high-functioning ASD's reading comprehension was tested under different circumstances, students with ASD were found to struggle significantly with identifying main ideas in text. This aligns with findings from Turner et al's (2017) study with 29 participants on the autism spectrum, that analysed the effectiveness of a Reciprocal Teaching-Intervention where students collaborated to understand the meaning of texts. Before receiving the intervention, students with ASD were found to focus more on lexical decoding than on understanding the main idea of texts. However, Turner et al's (2017) intervention was successful in developing the participants' ability to understand main ideas in text through teaching them to summarise sections, which according to the participants, lessened the memory demands of texts. Thus, scaffolding working memory by summarising, can benefit students with ASD's main idea comprehension. According to Cancino and Tomicic's (2023) findings though, students with ASC can struggle to summarise texts due to their

detail-oriented reading. Thus, although summarising can benefit the ability to identify main ideas by scaffolding the working memory of students with ASD, their struggles with working memory load can make summarising challenging.

### 4.3 Forms of Scaffolding and Teaching Methods

Teacher modelling can be beneficial for developing the inference generation skills necessary for students with ASD's reading comprehension. In Murza et al.'s (2014) study they investigate how 25 adults with high-functioning ASD's reading comprehension is affected by an ACT & Check Strategy intervention where teachers model how to generate inferences by thinking out loud. The results show that this method of explicitly teaching participants about inferences significantly improved their reading comprehension (Murza et al., 2014). Similarly, Grindle's (2020) study, where a digital platform designed to teach students reading comprehension was tested on six participants with ASD, found that the digital tool required additional scaffolding by the interventionist modelling their reading process through thinking aloud for participants to generate inferences. Similarly, Hall et al.'s (2020) study, investigating the effects of explicit inference teaching on reading comprehension for 78 participants who were L2 learners who struggled with reading comprehension, showed that having the teacher model generating inferences by finding clues within the text, was beneficial to participants' abilities to answer inferential questions. As such, modelling can be a useful scaffolding tool for both struggling L2 readers and students with ASD in developing their reading comprehension.

Additionally, graphic organisers can support students with ASD's ability to activate prior knowledge, which is necessary for their reading comprehension. In O'Connor and Klein's (2004) study, which among other things investigates how pre-reading questions aimed to activate prior knowledge can support reading comprehension for students with high-functioning ASD, they found that activating prior knowledge through pre-reading questions mainly benefitted participants with a higher comprehension ability to begin with. For students with lower comprehension levels, pre-reading questions can be detrimental as they can activate irrelevant prior knowledge which may hamper their comprehension (O'Connor & Klein, 2004). In order to scaffold this, O'Connor and Klein (2004) suggest using graphic organisers to ensure that the prior knowledge activated is relevant to the text.

One way to scaffold the use of graphic organisers to activate prior knowledge, is teacher modelling. Drill and Bellini's (2022) interventional study, where three students with ASD individually received an intervention, aimed to develop participants' reading comprehension by reading a book using different scaffolding strategies such as graphic organisers. The graphic organiser ensured that participants activated relevant information in order to grasp coming passages of the book, which developed their reading comprehension significantly (Drill & Bellini, 2022). Additionally, the interventionist in Drill and Bellini's (2022) study taught participants how to use graphic organisers through modelling, which is in line with Grindle et al. (2020), Hall et al. (2020) and Murza et al.'s (2014) studies where modelling was used successfully as a teaching method. Further, Hall et al.'s (2020) study, on the effects of explicitly teaching inference generation for L2 learners who were struggling readers, showed that graphic organisers supported their knowledge based inference generation by helping to connect the content in the text to prior knowledge. Thus, multiple studies show that graphic organisers can be useful scaffolding tools for activating prior knowledge for students with ASD as well as L2 learners.

Other visual aids such as graphs, images and highlights were also found to be beneficial to the reading comprehension of students with ASD as well as EFL students as it can lower the abstract thinking demands while reading as well as encourage the use of reread strategies. Cancino and Tomicic (2023) who studied the metacognition awareness of EFL learners with ASC, as well as Tirado and Saldaña (2016) who studied the inference generation of students with ASD under different conditions, found that students on the autism spectrum were able to visualise independently as they read. Multiple studies show that visual aids are beneficial for students with ASD's reading comprehension as it lowers their abstract thinking process, thus helping them visualise further (Alison et al., 2017; Cancino & Tomicic, 2023; Hall et al., 2020). Cancino and Tomicic (2023) found that their participants benefited from visual scaffolding that lowered the abstract thinking process requirements such as thermometer graphs and images even though they struggled with visualisation when distractions occurred or the text was uninteresting to them. In a similar vein, Hall et al. (2020) found that highlighting sections in texts that require inferencing, prompted second language learners to engage in the abstract thinking process of stopping and reflecting, which improved their reading comprehension. Likewise, Alison et al.'s (2017) study, with three English language learners with ASD which investigated the effects of a digital

tool that highlights sections of text as students need, showed that highlighting text prompted students to reread sections, which was beneficial to their reading comprehension. The process of rereading is, according to Cancino and Tomicic (2023), an individualistic problem-solving strategy that EFL students with ASC prefer using, yet Drill and Bellini (2022) found that they do not always use this strategy autonomously. Thus, highlighting sections as Alison et al. (2017) did, can prompt students with ASD to use a rereading strategy. As such, visual aids are beneficial in many ways for facilitating reading comprehension development.

Digital tools can benefit students with ASD's ability to take different perspectives, since it caters to a common preference for more individualistic problem-solving strategies. One of the scaffolding strategies used in Drill and Bellini's (2022) study on reading comprehension development for students with ASD, was the digital tool Video-Self-Modelling (VSM) which can be used individually. The results of their study showed that, through participants recording themselves using VSM, they developed their ability to take different perspectives while reading (Drill & Bellini, 2022). This result is significant as Cancino and Tomicic's (2023) study, on the metacognition awareness of EFL students with ASC, found that taking different perspectives was challenging for the participants. Thus, by using teaching methods that cater to the common preference for individualistic problem-solving strategies, students with ASD can develop their ability to take different perspectives.

However, digital tools often require scaffolding from teachers in order to be beneficial to students with ASD. Grindle et al.'s (2020) study, which investigates if students with ASD could benefit from the use of a computer-based program that teaches inference generation, showed that in order for it to be successful, the teacher had to scaffold the digital tool by modelling how to answer questions presented through the program. Another example of a digital tool being successful but requiring additional scaffolding, is shown in Alison et al.'s (2017) study where L2 students with ASD used a digital tool which highlighted relevant sections of text and gave reading prompts as needed. In Alison et al.'s (2017) study, scaffolding was required from the interventionist, as participants did not understand the inferential questions being asked through the digital tool. As such, the interventionists explicitly taught the students what the words in the questions meant, and consequently the participants developed their ability to answer. In conclusion, studies show that digital tools can be effective in developing reading comprehension for students with ASD if scaffolded properly.



## 4.4 Language Proficiency's Effect on Reading Comprehension

Active engagement with texts, as a result of attempting to generate inferences, can benefit the reading comprehension of students with varying language proficiency levels. Nahatame's (2014) study, where the reading speed and responses of 37 L2 learners were analysed, showed that participants with higher language proficiency levels were able to produce inferences to a higher degree than participants with lower language proficiency levels. However, students with lower language proficiency levels responded to the prompt to generate inferences by altering their text processing, through reading slower and engaging more actively with the text. Thus, the prompt to generate inferences benefited all participants' reading comprehension, even though participants with lower language proficiency levels were unable to produce inferences to the same degree as those with higher language proficiency levels. Similarly, results from Hall et al's (2020) study on inference instruction for English language learners, showed that participants did not significantly improve their ability to generate inferences after the intervention, but rather improved their general reading comprehension. The act of attempting to generate inferences in both cases, led to a more active engagement with the text, which benefited the participants' reading comprehension even when they failed to successfully generate inferences. These findings point to the importance of active engagement with texts when reading for EFL students.

## 5. Discussion

The aim of this systematic literature review is to investigate how L2 students with ASD process text and explore scaffolding methods that have been used to support their reading comprehension in order to discuss the implications of the findings for upper secondary EFL students with ASD in Sweden. According to Idring et al. (2015), about 2.5% of Swedish upper secondary students are on the autism spectrum. Yet, approximately 50% of students with ASD in Sweden do not meet passing grades in Swedish, Mathematics and English (Anderson, 2020), which makes supporting their needs and identifying their strengths vital for providing an equal education. The results shed light on the importance of a holistic view on students in this group that encompasses four factors that affect reading comprehension for EFL students with ASD; namely: 1) working memory and main idea comprehension, 2) forms of scaffolding and teaching methods, 3) individualistic problem-solving strategies and 4) language proficiency. Further, when analysing the forms of tests used in these studies, the accuracy of the tests is called into question, as there is a typically developing norm that permeates the research which requires a norm critical lens to discuss. Therefore, the four factors uncovered, as well as a norm critical examination of the results will be discussed in regard to a Swedish school context.

The first factor that, according to the results, affects reading comprehension for EFL students with ASD regards working memory and main idea comprehension. The findings from this literature review show that students with ASD struggle to identify the main idea of texts since they tend to focus on details whilst reading which occupies their working memory (Cancino & Tomicic, 2023; O'Connor & Klein, 2004). Further, Tirado and Saldaña (2016) found that producing emotional inferences and global text comprehension when reading longer passages was especially challenging for students with ASD which could be due to the working memory load it requires. This is relevant for Swedish upper secondary EFL students with ASD since the commentary material for the English and other foreign languages syllabi requires students to be able to read and interpret novel-length passages of text (Skolverket, 2022a). Additionally, the Swedish syllabus for upper secondary English also states that students are required to interpret the main idea in texts (Skolverket, 2022b) which they can find challenging but if scaffolded correctly, can be developed (Cancino & Tomicic, 2023; O'Connor & Klein, 2004; Turner et al., 2017). Turner et al.'s (2017) Reciprocal Teaching

intervention where students collaboratively identify the meaning of texts through discussion is an example of successful scaffolding in this area.

The second factor that, according to the results, can affect reading comprehension for EFL students with ASD, is forms of scaffolding and teaching methods used. The English syllabus in Sweden states that the English education should include teaching students strategies, such as visualising, associating, and predicting content, in order for them to notice details and acquire the ability to infer meaning in different types of texts (Skolverket, 2022b), and the results from the research show multiple ways to scaffold students in this area. Studies show that students with ASD have the ability to visualise whilst reading (Cancino & Tomicic, 2023; Tirado & Saldaña, 2016), however, Cancino and Tomicic's (2023) study note that distractions and uninteresting texts can interfere with these students ability to visualise. They therefore suggest using visual scaffolding, such as images and graphs, to support students with ASD's ability to visualise. Other forms of scaffolding such as pre-reading questions with support of graphic organisers were also beneficial for their ability to associate and predict content (Drill & Bellini, 2022; O'Connor & Klein, 2004). Further, graphic organisers not only benefit the working memory of students with ASD, but also benefit the reading comprehension of English language learners' since graphic organisers and highlighting sections improve their ability to generate inferences (Hall et al., 2020; Alison et al., 2017).

The third factor that the results suggest can affect reading comprehension for EFL students with ASD, is a common preference for individualistic problem-solving strategies. The Swedish curriculum for upper secondary schools states that education should serve to develop students' skills in working independently, as well as developing their ability to work with others (Skolverket, 2022c) which is relevant for students with ASD as a common preference for a more individualistic problem-solving strategy lends itself to independent work more so than working with others (Cancino & Tomicic, 2023; Nahatame, 2014). According to the results from Nahatame's (2014) study on inference generation for students with ASD, students with ASD were able to successfully generate inferences as the task required, yet were unable to answer inferential questions. Consequently, Nahatame (2014) suggests that the inability to answer questions lies in the interactive nature of a question. This aligns with the results of Cancino and Tomicic (2023), which point to students with ASD being averse to asking questions when in need of help, as they prefer individualistic problem-solving strategies that require less interaction. These results together point to a general aversion

toward problem-solving through interaction with others which makes fulfilling the requirement to work collaboratively potentially challenging for students with ASD. However, participants from Turner et al.'s (2017) study reported a preference for reading in groups as opposed to reading with the entire class. Although the participants do not state whether they would prefer working in groups rather than individually, this is of note as it is a contrasting finding which shows students with ASD having a positive attitude towards collaborative learning.

The general preference to work independently, could still in part be why explicit teaching and teacher modelling as well as digital tools were successful teaching methods in developing students' reading ability (Grindle et al., 2020; Murza et al., 2014). Explicit teaching and teacher modelling are methods that are individualistic in nature since, rather than requiring the students to ask questions and gain knowledge through dialogue, the teacher shows explicitly how to use strategies. Similarly, the use of digital tools was successful for developing reading comprehension skills of students with ASD as it caters to the common preference for more individualistic problem-solving strategies that require less social interaction (Cancino and Tomicic, 2023).

The fourth factor found in the results shed light on reading comprehension's dependent relation to language proficiency. Results show that one's ability to engage in inferencing and interpretive tasks is hinged upon one's language proficiency (Hall et al., 2020; Nahatame, 2014), which is of note as many students with ASD often do not meet the language proficiency goals required for a passing grade in Swedish schools (Anderson, 2020). The commentary material for English and other foreign languages syllabi reflects an understanding of the requirement of a certain language proficiency level in order to interpret text rather than just understand it in a foreign language (Skolverket, 2022a). However, this is reflected in the knowledge requirements in foreign languages such as Chinese, but not specifically for English in upper secondary schools (Skolverket, 2022a). This is most likely due to the inclusion of English as a compulsory subject in both primary and secondary schools in Sweden beforehand, ensuring an expected language proficiency level when students reach upper secondary schools. However, in the case of students with ASD, they often do not meet the requirements for their age group (Anderson, 2020). Therefore, it is important for teachers to note that, as Hall et al. (2020) and Nahatame's (2014) results show, L2 students with ASD's language proficiency levels may be hindering them from

generating inferences and interpreting texts rather than the cause being an innate inability to interpret or infer.

Finally, when examining the results regarding students with ASD's reading comprehension, a norm critical approach is necessary since, according to Dinishak (2016) the behaviour of people with ASD easily can be misunderstood by those who are typically developing (TD). When investigating to what extent students with ASD can infer meaning through what is not explicitly stated, it is important to note that the way in which meaning is inferred through characters' actions in narratives, or tonal shifts, may not align with how students with ASD themselves express what is inferred through their own actions and tonal shifts. According to the Autism and Aspergers Association (2013), there is a need to translate both the behaviour of people who are TD to students with ASD for them to understand the norms of people who are TD, as well as to translate the behaviour of students with ASD to people who are TD for them to understand norms of people with ASD. Tests, such as Murza et al. (2014), Nahatame (2014) and Tirado and Saldaña (2016) used in their studies, where students with ASD are asked to infer characters' emotions or predict coming events based off a passage that describes characters who are TD portraying emotions according to their norms, are then potentially testing the student with ASD's ability to translate TD behaviour, rather than the ability to infer per se.

Not only does a norm critical lens call the accuracy of tests used in studies such as these into question, but also they open the discussion regarding viewing L2 students with ASD from a resource perspective. Not only is this key in finding scaffolding methods that benefit them, but it also identifies the strengths of this group of students which could allow teachers to align more strongly with the Swedish curriculum's aim to develop each students' confidence in their own abilities (Skolverket, 2022c).

The results implications in Swedish upper secondary classrooms strengthen the Swedish School Inspectorate's (2012) prompting for further education for teachers and faculty staff regarding ASD in order to develop more appropriate forms of support and adaptations. Teachers in Sweden are instructed to use evidence based teaching, but through looking at research in this field with a norm critical lens, it is clear that the way in which evidence is gathered must be adapted if it is to accurately reflect students with ASD's abilities. The overlap of struggles of EFL students with ASD in regard to reading comprehension requires forms of research that attempts to counteract a typically

developing bias in its execution. However, the research presented in this paper, points to the fact that the struggles identified, can be met and scaffolded if supported correctly.

## 6. Conclusion

Through analysing ten studies on reading comprehension for EFL students as well as students with ASD, four factors that can affect reading comprehension for these students emerged. The four factors: working memory, scaffolding, problem-solving strategies and language proficiency, were shown to interplay in a way that makes clear the importance of a holistic view on the needs of EFL students with ASD. Further, the discussion of these factors in a Swedish upper secondary school context, identifies the necessity of a norm critical perspective on research within this field. Firstly, students with ASD's detail-oriented approach to reading can strain their working memory which can make grasping texts' main ideas challenging. This is relevant to EFL students in Sweden as identifying main ideas in text is a requirement of the English syllabus in Swedish upper secondary schools (Skolverket, 2022b). Secondly, different scaffolding tools and teaching methods, such as digital tools, visual aids, modelling and explicit teaching, can support the use and development of reading comprehension strategies required for interpreting texts, which aligns with the English syllabus in Swedish upper secondary schools (Skolverket, 2022b). Thirdly, a common preference for individualistic problem-solving strategies among students with ASD can make social interactions challenging, which is important for teachers in Sweden to understand, as the potential aversion to working collaboratively can make the Swedish curriculum's requirement of working with others hard to fulfil (Skolverket, 2022c). Finally, the findings show that language proficiency levels are seminal for the ability to interpret text. This finding is reflected in the Swedish commentary material for English and other foreign languages syllabi (Skolverket, 2022a), yet is relevant for teachers to consider, as the assumed proficiency level based on age in Swedish schools might not accurately reflect the abilities of students with ASD (Anderson, 2020). A norm critical perspective on the findings, reveals implications for adaptations of future research to more accurately assess students with ASD's reading comprehension by taking into account the typically developing norms that can affect research findings.

The limitations of this research review consists of factors such as an inconsistent use of quotation marks, asterixis, key terms synonyms and year of publications limits, which affected the results when searching for studies. Also, not all searches were conducted in both the ERIC and ERC database, which led to inconsistent results from certain searches. Additionally, a singular search used a feature which excluded studies

that were aimed at postsecondary education students from the results. Further, the studies included inconsistent participant groups both in size and age range which made the results reflect both individual cases and generalisations from larger groups.

For future research, devising more norm critical ways of testing reading comprehension for EFL students with ASD could yield different results. Therefore, a study that investigates the effectiveness of an intervention aimed to develop EFL students with ASD's reading comprehension that combines the four factors presented in this review and is tested through a more norm critical method, could be significant for teachers as well as the participants.



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## Appendix A

**Table 2.**  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
08/11/ 2023	ERIC	Search terms: <b>inference reading strategies AND ASD</b>  Publication date range: 2013-2023	2	Murza, K. A., Nye, C., Schwartz, J. B., Ehren, B. J., & Hahn-Vaughn, D. L. (2014). A randomized controlled trial of an inference generation strategy intervention for adults with high-functioning autism spectrum disorder. <i>American Journal of Speech-Language Pathology</i> , 23(3), 461–473. <a href="https://doi.org.proxy.mau.se/10.1044/2014_AISLP-13-0012">https://doi.org.proxy.mau.se/10.1044/2014_AISLP-13-0012</a>	25 adults with HF-ASD	An interventional study that investigates how inference generation, metacognition, reading comprehension and social skills are affected by the ACT & Check strategy.
8/11/ 2023	ERIC	Search terms: <b>inference reading strategies AND second language learning OR neurodiversity</b>  Publication date range: 2013-2023	60	Nahatame, S. (2014). Strategic processing and predictive inference generation in L2 reading. <i>Reading in a Foreign Language</i> , 26(2), 54–77.	37 second language learners, aged 18–28 in Japan.	An exploratory study that investigates the effect of instructional orientation on predictive inference generation while reading for second language learners.

Table 2. (continued)  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
14/11/2023	ERIC	Search terms: <b>neurodiversity OR neurodiverse OR autism OR autistic OR adhd OR dyslexia AND inferencing</b>	12	Tirado, M., & Saldaña, D. (2016). Readers with autism can produce inferences, but they cannot answer inferential questions. <i>Journal of Autism &amp; Developmental Disorders</i> , 46(3), 1025–1037. <a href="https://doi.org/proxyxmanu.se/10.1007/s10803-015-2648-6">https://doi.org/proxyxmanu.se/10.1007/s10803-015-2648-6</a>	66 Spanish participants aged 11-20 who either have autism spectrum disorder, poor reading comprehension or are typically developing.	An exploratory study that investigates the participants reading inference generation abilities under different conditions.
20/11/2023	ERIC & ERIC	Search terms: <b>"inference generation*" AND "esl" OR "english as a second language" OR "ell" OR "english language learners"</b>	3	Hall, C., Vaughn, S., Barnes, M. A., Stewart, A. A., Austin, C. R., & Roberts, G. (2020). The effects of inference instruction on the reading comprehension of English learners with reading comprehension difficulties. <i>Remedial and Special Education</i> , 41(5), 259–270. <a href="https://doi.org/proxyxmanu.se/10.1177/0741932518824983">https://doi.org/proxyxmanu.se/10.1177/0741932518824983</a>	78 sixth- to seventh grade English learners with reading comprehension difficulties in Texas.	An interventional study that investigates the effect of inference teaching interventions on the inference generation abilities and general reading comprehension of English learners who struggle with reading comprehension.
		Publication date range: 2013-2023				

Table 2. (continued)  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
20/11/2023	ERIC	Search terms: <b>neurodiverse OR autism OR ASD OR "autism spectrum disorder" OR neurodiversity AND inference OR "inference making" OR inferring OR inference generation OR reading comprehension</b>  Publication date range: 2000-2023	182	Grindle, C., Kurzeja, O., Tyler, E., Saville, M., Hughes, J. C., Hastings, R. P., & Brown, F. J. (2020). Teaching children with autism reading comprehension skills using online reading instruction: Preliminary evaluation of headsprout reading comprehension. <i>Journal of International Special Needs Education, 23</i> (1), 1–12.	Six participants with autism spectrum disorder, aged 7-13.	An interventional study that investigates if the computer program Headsprout Reading Comprehension can be used when teaching reading comprehension strategies to students with autism spectrum disorder.
				Drill, R. B., & Bellini, S. (2022). Combining readers theater, story mapping and video self-modeling interventions to improve narrative reading comprehension in children with autism spectrum disorder. <i>Journal of Autism and Developmental Disorders, 52</i> (1), 1–15. <a href="https://doi.org.proxyv.mau.se/10.1007/s10803-021-04908-x">https://doi.org.proxyv.mau.se/10.1007/s10803-021-04908-x</a>	Three participants with autism spectrum disorder, aged 12-14.	An interventional study that investigates the effectiveness of an intervention package consisting of three separate evidence based interventions aimed to benefit narrative reading comprehension for children with autism spectrum disorder.

Table 2. (continued)  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
20/11/2023	ERIC & ERIC	Note: <i>A feature that excludes results not aimed toward "postsecondary education" was used.</i>  Search terms: "asd" OR "autism spectrum disorder" OR "autism" AND "efl" OR "english as a foreign language"	21	Cancino, M., & Tomicic, N. (2023). English as a foreign language (EFL) reading metacognition awareness in Chilean learners with autism spectrum condition: An exploratory study. <i>TESL-EJ</i> , 26(4), 1–28. <a href="https://doi-org.proxvymau.se/10.55593/ej.26104a12">https://doi-org.proxvymau.se/10.55593/ej.26104a12</a>	27 Chilean students with level 1 autism aged 9-14.	An exploratory study that investigates the metacognitive awareness of students with autism spectrum disorder who study English as a foreign language and which strategies they use while reading.
Publication date range: 2013-2023						
05/12/2023	ERIC & ERIC	Note: <i>A Similar Results' feature was used on Cancino and Tomicic's (2023) study.</i>  Search terms: 'Similar Results' AND Autis* OR ASD OR "Autism spectrum disorder" OR asperger OR "autism level 1" OR "autism spectrum condition" OR neurodivers* OR neurodiversity OR HF-ASD OR "high functioning autism" AND "inference generation strateg*" OR Infe* OR inference OR "reading comprehension" OR "reading"	9	Turner, H., Remington, A., & Hill, V. (2017). Developing an intervention to improve reading comprehension for children and young people with autism spectrum disorders. <i>Educational &amp; Child Psychology</i> , 34(2), 13–26. <a href="https://doi-org.proxvymau.se/10.53841/bpsecp.2017.34.2.13">https://doi-org.proxvymau.se/10.53841/bpsecp.2017.34.2.13</a>	29 participants (15 receiving intervention and 14 in a control group) with autism spectrum disorder and a mean age of 13,5 in England.	An interventional study that investigates the effectiveness of a reciprocal teaching intervention on reading comprehension for students with autism spectrum disorder.
Publication date range: 2000-2023						

Table 2. (continued)  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
05/12 /2023	ERIC & ERIC	Search terms: <b>Autis* OR ASD OR "Autism spectrum disorder"</b> OR <b>asperger</b> OR <b>"autism level 1"</b> OR <b>"autism spectrum condition"</b> OR <b>neurodivers* OR neurodiversity</b> OR <b>HF-ASD</b> OR <b>"high functioning autism"</b> AND <b>"inference generation strateg*"</b> OR <b>Infer* OR inference</b> OR <b>"reading comprehension"</b> OR <b>"reading"</b> AND <b>"English language learn*"</b> OR <b>ELL</b> OR <b>"English as a foreign language"</b> OR <b>EFL</b> OR <b>"English as a second language"</b> OR <b>ESL</b> OR <b>"Second language learn*"</b> OR <b>"second language learning"</b>	13	Alison, C., Root, J R., Browder, D. M., & Wood, L. (2017). Technology-based shared story reading for students with autism who are English-language learners. <i>Journal of Special Education Technology</i> , 32(2), 91–101. <a href="https://doi.org.proxyv.mau.se/10.1177/0162643417690606">https://doi.org.proxyv.mau.se/10.1177/0162643417690606</a>	Three participants aged 8-10 who study English as a Second language.	An interventional study that investigates the effectiveness of a shared-reading intervention on literacy skills for students with autism spectrum disorder.

Publication date range:  
 2000-2023



Table 2. (continued)  
*Search Methods and Results*

Date	Database	Search Terms & Publication Date Range	Results	Articles Chosen	Participants	Study
05/12 /2023		Note: <i>This study was not found through searching with search terms. It was instead found through the reference list of Murza et al.'s (2014) study and then searched for in ERC &amp; ERIC.</i>	1	O'Connor, I. M., & Klein, P. D. (2004). Exploration of strategies for facilitating the reading comprehension of high-functioning students with autism spectrum disorders. <i>Journal of Autism &amp; Developmental Disorders</i> , 34(2), 115–127. <a href="https://doi.org.proxy.mau.se/10.1023/B:JADD.0000022603.44077.6b">https://doi.org.proxy.mau.se/10.1023/B:JADD.0000022603.44077.6b</a>	20 participants aged 15 with high functioning autism spectrum disorder	An exploratory study that explores three strategies (pre-reading questions, anaphoric cueing and cloze tasks) in order to support reading comprehension for students with high functioning autism spectrum disorder.

*Note.* This table presents the date of each search and the search terms used when finding each selected study, as well as a description of the studies and their participants.