INCLUSIVE EDUCATION AND THE USE OF ASSISTIVE TECHNOLOGIES FOR AUTISTIC STUDENTS

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ABSTRACT

The objective of this research was to analyze the impact of assistive technologies on the educational development of autistic students, focusing on the identification of the most effective resources and the barriers faced by educators and schools in the implementation of these technologies. The methodology adopted was a bibliographic review, with a survey of articles and academic materials in scientific databases, to analyze the theoretical and empirical contributions on the subject. The results indicated that assistive technologies have shown positive effects on the cognitive, social and emotional development of autistic students, especially regarding communication, social interaction and academic learning. However, the survey also pointed to challenges such as the lack of training of educators, inadequate school infrastructure, and the high costs of some devices. It is concluded that, despite the obstacles, assistive technologies have great potential to promote effective inclusive education, and it is essential to invest in teacher training and public policies that

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guarantee access to these resources, allowing the full inclusion of autistic students in the school environment.

Keywords: Inclusive Education. Technologies. Autism.

INTRODUCTION

Educational inclusion is a concept that is gaining more and more relevance in the world educational scenario. It is based on the idea that all students, regardless of their physical, psychological or intellectual conditions, should have the right to attend regular school, where they can interact with their peers and be accompanied by trained professionals. In this context, one of the most challenging groups and, at the same time, the most benefited by inclusive education are autistic students (Magalhães; Aciolli, 2020; Tavares; Saints; Freitas, 2016; Weizenmann; Pezzi; Zanon, 2020).

Autism, which is an autism spectrum disorder (ASD), is characterized by difficulties in communication, social interaction, and repetitive behaviors. These challenges require educational institutions to adopt differentiated pedagogical strategies and resources in order to ensure that autistic students have full access to knowledge. The adoption of assistive technologies has been a fundamental tool in promoting the educational inclusion of autistic students (Neto et al., 2018).

Assistive technologies are devices, equipment, or systems that help people overcome barriers related to their disabilities. For students with ASD, assistive technologies offer ways to improve communication, social interaction, and learning, creating a more accessible and supportive environment for the development of these students. Such technologies may include educational software, augmentative communication applications, reading and writing support devices, among other resources adapted to individual needs (Nunes; Alves, 2022).

With the advancement of technology and the increasing availability of adaptive tools, the use of assistive technologies in education has been widely discussed as an effective way to support the learning of students with autism. However, it is necessary to understand how these tools are being implemented in schools and what their real impacts are on student development (Santos; Leite, 2022).

In addition, it is essential to evaluate how these technologies can be effectively integrated into the school curriculum and the teaching-learning process. Despite the advances, there are still significant challenges in implementing assistive technologies in schools, especially regarding teacher training, accessibility, and the cost of some devices. Many educators and professionals in the field face difficulties in integrating assistive technologies into their pedagogical practices, which can limit the scope of their benefits. The lack of understanding about the specific needs of autistic students can lead to the inappropriate use of tools that, instead of facilitating, can hinder the learning process (Souza; Edges; Santos, 2014).

In this scenario, the objective of this research is to analyze the impact of assistive technologies on the educational development of autistic students, identifying which resources are most effective and how they can be used optimally in inclusive schools. The research also aims to discuss the barriers faced by teachers and school managers in the implementation of these technologies, proposing solutions that can contribute to a more inclusive and equitable education.

The importance of this research lies in the need to improve educational practices for autistic students through the conscious and effective use of assistive technologies. Considering the increase in the number of students with ASD in schools and the search for solutions that meet their specific needs, it is crucial to understand the role of these technologies in the inclusion process. This study will contribute to the reflection on the best practices and approaches in the use of technological resources in inclusive education.

In addition, the research can serve as a basis for future investigations, promoting the creation of more robust educational policies that ensure equitable access to education for all students, regardless of their conditions. By focusing on the integration of assistive technologies in the school context, the research will also contribute to the development of a more inclusive and accessible educational environment.

METHODOLOGY

The methodology adopted in this research is that of bibliographic review, with a survey of scientific articles and other academic materials available in databases. The literature review is a fundamental approach to compile and analyze existing information on a given topic, allowing a comprehensive understanding of the studies and practices already developed, as well as the gaps that still need to be explored. This type of research was chosen due to its ability to systematize the available knowledge on the theme of inclusive education and the use of assistive technologies for autistic students, identifying the theoretical and practical contributions that can be applied in the educational context.

To carry out the literature review, a survey was carried out in several scientific databases, such as Google Scholar, Scopus, PubMed, and other open access databases. The keywords used included "inclusive education", "autism", "assistive technologies" and "autism spectrum disorder". The research covered articles, theses, dissertations, books and other academic documents that address the impact and use of assistive technologies in the education of students with ASD.

The selection of materials considered the relevance, timeliness, and quality of the studies, prioritizing sources that brought scientific evidence and empirical data on the

subject. The analysis of the collected data followed a systematic process of categorization and interpretation. First, the selected texts were read and classified according to the most relevant topics for the study, such as the types of assistive technologies most used, the adapted pedagogical practices and the difficulties encountered by educators. From this organization, it was possible to identify patterns, tendencies and contradictions in the approaches presented by the different authors.

In addition, the research sought to identify gaps in the existing literature, such as areas that still lack in-depth investigation or more consistent practical applications. The review also focused on examining the impacts of assistive technologies on the learning and social development of autistic students, seeking to relate the results found with the recommended educational practices for school inclusion.

RESULTS AND DATA ANALYSIS

ASSISTIVE TECHNOLOGIES IN THE COGNITIVE DEVELOPMENT OF AUTISTIC STUDENTS

The use of assistive technologies has shown positive results in supporting the cognitive development of autistic students, especially in areas such as language and communication. Several studies highlight the effectiveness of augmentative and alternative communication (AAC) applications, such as software that allows expression through icons or voice, for students who face difficulties in speech and verbal communication. These apps, such as Proloquo2Go and TouchChat, have been increasingly used in inclusive schools, providing students with a way to express themselves and interact with their peers and teachers more effectively (Moher et al., 2015).

In addition, the use of educational software has also proven to be advantageous in stimulating the learning of academic concepts. Interactive math, reading and writing programs, which adjust the level of difficulty according to the student's progress, have helped to improve the school performance of students with ASD. These tools can be customized to meet the specific needs of each student, respecting their learning pace and cognitive difficulties (Carlotto; Danelichem; Billerbeck, 2021; File; Domingues Junior; Gomes, 2023).

Interaction with these technologies can also improve the attention and memory of autistic students, creating a more engaging and dynamic learning experience. In addition, the use of assistive technologies allows autistic students to practice and develop cognitive skills in a less challenging environment than the traditional one, favoring greater self-confidence and self-esteem (Magalhães; Aciolli, 2020).

ASSISTIVE TECHNOLOGIES IN SOCIAL AND EMOTIONAL DEVELOPMENT

Another relevant impact of assistive technologies for autistic students is on social and emotional development. Students with ASD often face difficulties in social interactions, being more prone to isolation situations. Assistive technologies offer resources that encourage socialization, such as interactive games and digital platforms that promote the exchange of experiences between students. These resources help to develop interaction skills, understanding emotions, and respect for the other's space, which are fundamental for social development (Lima; Domingues Junior; Gomes, 2023; File; Domingues Junior; Silva, 2024; Magellan; Aciolli, 2020).

Technologies such as the Social Robot, which allows interaction with devices in a playful and controlled way, have been successfully applied in educational programs, with the aim of teaching social skills in a structured way. This type of technology is especially useful for students who have difficulty understanding or reacting appropriately to facial expressions, gestures, or voice intonations, characteristics often present in autism (Souza; Edges; Santos, 2014).

Interaction with assistive technologies can also reduce stress and anxiety for autistic students, providing a more predictable and controlled environment. The use of devices that structure communication and behavior contributes to the feeling of security, which is fundamental for the emotional development of students (Nunes; Alves, 2022).

CHALLENGES AND OPPORTUNITIES IN THE IMPLEMENTATION OF ASSISTIVE TECHNOLOGIES

Despite the benefits mentioned, the implementation of assistive technologies in the school context faces several challenges. The first obstacle is the adequate training of educators, who need to be trained to use these tools effectively. Many teachers still do not feel prepared to deal with the specific demands of autistic students, which can compromise the use of technologies properly. Therefore, the continuous training of education professionals is essential to ensure that technological resources are integrated into the pedagogical process in a meaningful way ((Matias; Probst, 2018).

In addition, the infrastructure of schools can also be a limiting factor. In many institutions, especially public ones, the lack of financial resources and the absence of adequate equipment make it difficult to adopt assistive technologies. The cost of some devices and software, coupled with the scarcity of specialized technical support, can be a significant obstacle to the full inclusion of autistic students (Cardozo; Santos, 2020; Lima et al., 2024; Lima et al., 2024; File; Silva; Domingues Júnior, 2024).

However, continuous technological advancement offers new opportunities for overcoming these challenges. The development of more accessible and low-cost applications and platforms, as well as the possibility of using mobile devices such as tablets and smartphones, has allowed more schools to implement assistive technologies. The popularization of technology has also facilitated access to support materials and online training for teachers, creating new forms of training and exchange of experiences (Camargo et al., 2020).

FINAL CONSIDERATIONS

Research on the use of assistive technologies in the inclusive education of autistic students reveals a promising picture, but it also highlights significant challenges that need to be overcome. Assistive technologies offer vast potential to improve the cognitive, social, and emotional development of students with ASD, promoting more effective learning and greater inclusion in the school environment. However, the implementation of these technologies requires joint efforts by teachers, school managers and public policies. It is essential to invest in the training of educators, so that they can use the tools in an appropriate and personalized way for each student.

In addition, school infrastructure must be adapted to provide the necessary resources for digital and technological inclusion. Access to assistive technologies should be a priority, especially in public schools, which face greater financial difficulties. The creation of public policies that encourage the adoption of these technologies, with the support of technology companies, can represent a viable solution for overcoming financial barriers. Finally, the research reinforces the importance of an inclusive educational environment, which respects the individualities of autistic students and promotes equal opportunities for all.

The use of assistive technologies, when applied in a planned and strategic way, has the potential to transform the education of students with ASD, ensuring that they can develop their skills to the fullest and participate fully in school life. This study also points to the need for more research that can deepen the understanding of the impact of assistive technologies on the learning of autistic students, allowing the improvement of educational practices.

The constant evolution of technological tools and pedagogical methodologies offers a vast field for innovation in the teaching-learning process. In an increasingly digital world, assistive technologies emerge as fundamental allies in building a more inclusive and

accessible education for all, contributing to a fairer and more egalitarian future for autistic students.

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