An overview of Assistive Technology Tools for Disabilities

Figure 1: Image giving examples through symbols of Assistive Technology

Author: Samara Cunningham

Student ID: H00429775

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Abstract

This report will focus on the advantages of assistive technology used in aiding people with disabilities, specifically assistive technology for learning and communication for children with autism. The reporter will touch on what autism spectrum disorder and assistive technology is and how assistive technology can be used to help/aid people with autism. Additionally, the author will give examples on high- and low-tech assistive technologies and, innovative assistive technologies and the pros and cons of assistive technology.

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1. Introduction

Autism is a development disorder that can affect people's communication, social skills and stress/anxiety levels. Assistive technology can be used to aid people with autism. This includes low- and high- tech assistive technology to help communication and learning. This report will focus on the different types of assistive technology and how they aid people with autism.

2. Autism

Autism Spectrum Disorder also known as ASD or autism is a development disability that can affect a person's communication, social skills, behaviour and can cause high levels of stress and anxiety. Autism is called a spectrum disorder because it can affect people differently and with varying levels of severity. (Murray, 2012) said "We know autism is a spectrum condition, and as such takes many forms, from the non-verbal to the highly talkative for example, or from those who revel in sensory stimuli to those who find such examples painful and distressing.". Furthermore, autism can affect people's abilities to get an education. According to (World Health Organization (WHO), 2023) around 1/100 people have autism. Children with autism can present with the same symptoms and more specific age-related ones including difficulty making relationships with other children, getting upset over tastes, smells and sounds and not engaging in as much pretend play.

3. Assistive Technology

Assistive technology (AT) is described by (Medicines and Healthcare products Regulatory Agency, 2023) as "products or systems that support and assist individuals with disabilities, restricted mobility or other impairments to perform functions that might otherwise be difficult or impossible.". High-tech AT is sophisticated, complex and normally computerized technology such as software/hardware and robotic equipment. However, AT does not have to be high tech. Equipment such as stimulation toys or weighted blankets are examples of low-tech AT which are simple, inexpensive tools used to help aid people (Archie, 2023). AT is not specifically for autism but is used for all types of disabilities. This includes, among others, learning disabilities, physical disabilities and vision or hearing impairment. The author will, however, focus on the use of AT for children with autism.

4. Communication

AT can be used to help children's communication on any level of the autism spectrum. Augmentative and Alternative Communication (ACC) is a method used to simplify language using visual communication such as symbols, pictures and models. ACC can be taught using AT. There are two ways that ACC can be taught/used. The first is augmented language. This is where language is simplified down to pictures. Children with autism can find it easier to communicate in a realistic way through visuals. This can be demonstrated in AT through low-tech options such as communication books. A communication book contains pictures and sometimes texts of everyday things to help a child with autism add to a conversation. For example, food and people. Moreover, high-tech AT can also aid communication. Electronic Voice Output Communication Aids (VOCA) use electronicly stored speech to help piece together longer sentences. (The Sequel Trust, 2018) highlights that electronic VOCA devices can be both touchscreens and buttons with pictures. It can be highly adaptable. This includes adding personalised pictures and rearranging them to suit the user. The second is Aided Language Stimulation. This is where pictures, symbols or models are shown when someone (such as a teacher, parent or carer) is talking. For example, saying car then pointing to a picture of a car. Aided Language Stimulation uses AT such as pictures and apps, rather than specific made hardware, to slowly help a child with autism learn different words, phrases, and sentences. This is similar but a step up from augmented language as it uses AT to learn language rather than using it as a tool to replace language. A specific example of AT for Aided Language Stimulation is simPODD (AssistiveWare B.V., 2019). This is a tablet app used to organise pictures and symbols to help build a routine and start using Aided Language Stimulation (Sheldon and Barthère, 2019). The difference between both techniques is that Augmented Language can be learnt by a child with autism independently and can be used to replace word or sentences. On the other hand, Aided Language Stimulation needs an adult partner to model the language and is used to learn language rather than replace it.

5. Learning

AT can be used in schools to help students with autism get a better education whilst also improving core skills such as imagination and social skills. Although the previously mentioned techniques can also be used in an education setting, there are also many specific AT made for learning. In education, both low- and high-tech AT is emphasized to enhance the learning experience. Figure 2 (Daud, 2018) highlights the two categories and some examples of AT that can help in education.

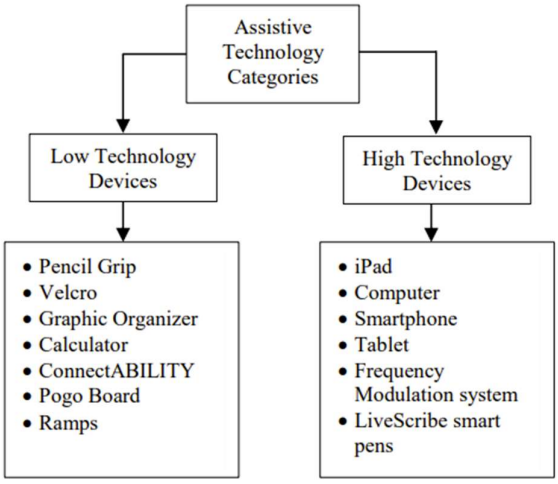

Figure 2: Assistive Technology Categories and Examples

Low-tech AT can be used in the classroom as a stimulation or motor aid that requires little training to use. Some examples, include pencil grippers, calculators and stimulation toys. Low-tech AT can be solutions for challenges in the classroom and can be adapted to fit individual needs. High-tech AT can require more training but offer a more engaging learning experience. Examples of this include iPads, smart boards and noise cancelling headphones. It should be noted that high-tech items usually are more expensive and therefore may not be as accessible in schools. High-tech AT such as using the same devices and apps can be used instead of paper or other alternatives as consistency and routine can help a student with autism. Virtual Learning Experience (VLE) is a term used to describe education integrated with apps and other AT to help students with autism learn in a more engaging way at their own pace.

6. Innovative Technology

Innovative technology means new methods, ideas and projects made. Technology is constantly advancing, and AT is included in this. New AT includes many things such as new devices, apps, tools and more. For autism, one example is 'text-to-speech' software. Text-to-speech software works well in VLE and can also help with ACC. This is because it helps children with autism in learning language and improving their own speech. Many autistic children also find it difficult to read text. Text-to-speech technology becomes helpful in everyday use and in the classroom allowing them to get better education and improve other essential life skills. Additionally, it gives a new gateway into Aided Language Stimulation as it becomes easier to consistently learn language without constant support from a model. Furthermore, research is constantly underway. (Boston's Children Hospital, 'no date') gives the example of Dr Ralf Schlosser who repurposes everyday technology such as tablets, phones, smartwatches and smart speakers as his main point of research into improving ACC. Another example of innovative AT technology is AI used to help diagnose autism. (Rudy, 2023) explains that AI can recognise patterns of "autistic traits" as well as differentiate between unrelated disorders or personality differences. This eliminates the human error of diagnosis as well as the delays in diagnosis due to long waiting lists for doctors. However, AI has yet to reach the stage where it can replace humans in diagnosing and treating autism.

7. Pros and Cons

AT carries many pros when helping children with autism. Fig 3 (Batereno, 2022) shows that their review found many benefits to AT in education such as motivation, participation, and social skills. Fig 3 also highlights that AT makes a big impact on inclusion.

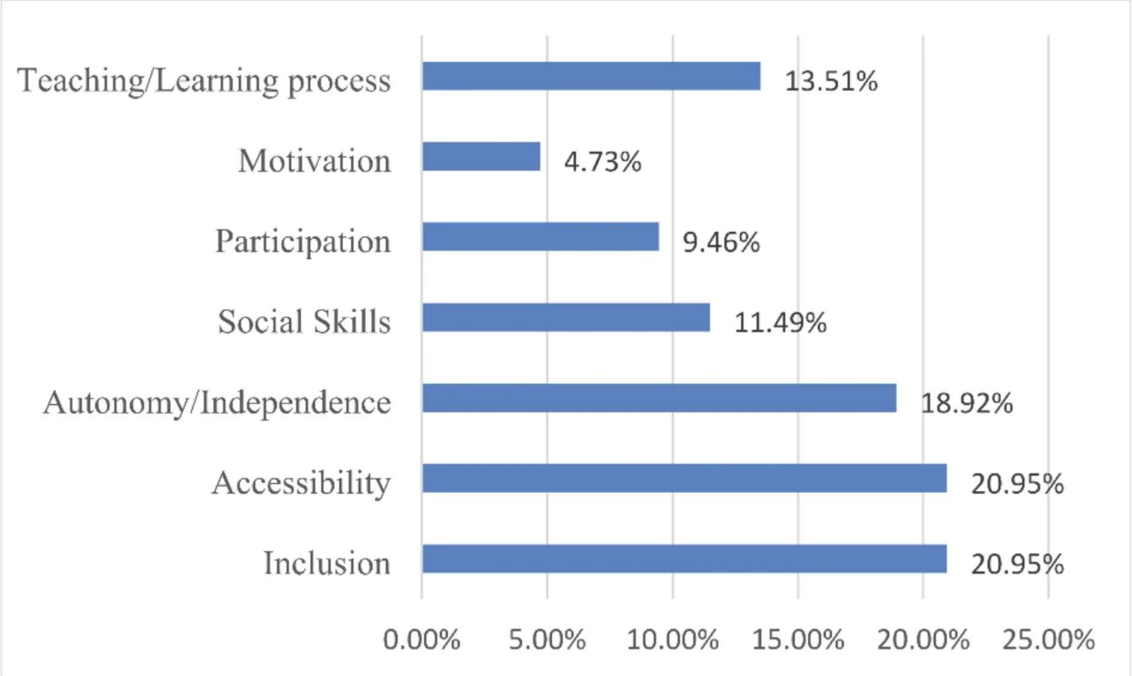

Figure 3: Benefits of Assistive Technology in Education

Balancing out the scale so that children with autism have don't have as many disadvantages is important. This includes inside the classroom, allowing them to get a better education and outside the classroom, to build relationships and life skills. AT allows children to participate in normal day-to-day activities such as having conversations and staying engaged. It also allows children to work at their own pace and gain a bit independence. However, there are also cons to AT. One con to AT is cost. Whilst low-tech AT is relatively cheap, high-tech AT can be expensive and not accessible for everyone. Children may not get the specific attention they need as well as potentially depending on AT rather than learning from it. (Webber, 2005) says "while computers hold promise for positive outcomes in learning and development, they also have a negative impact on the health and social development of learners who spend a large amount of time in front of a screen". In general, a balance between using high-tech and low-tech AT as well as in-person contact, and attention is a good way to utilise the pros of AT and eliminate the cons. A specific example would be (Raut, 2023) who points out the pros of VLE such as pacing, less social stress and "fewer sensory assaults" as well as the cons of VLE such

as accessibility and understandings whilst also emphasizing a balanced use is the most effective in supporting a child with autism in the classroom.

8. Conclusion

In conclusion, AT can be used in many ways to help children with autism for communication, learning and more. Both low-tech and high-tech AT can be used to improve the different techniques in which children with autism are taught language and other skills in and out of school, such as AAC. On top of that, there are many new AT that are an advancement on aiding children with autism and more that are constantly being researched.

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