Benefits of Assistive Technology for Children with Monoplegic Motor Disabilities

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Abstract

The benefits of Assistive technology involve assistance techniques where it presents resources to help people with disabilities, so our target audience are children with monoplegia motor disabilities, that is, the individual cannot move a limb, it was hand chosen as the focus of the problem to solve the handicapped condition. The objective is to point out techniques in assistive technology to improve the lives of children with monoplegic motor disabilities, through a procedure of a tool called Neomano Glove, demonstrating its benefits, and a comparison of another hand rehabilitation glove is also made, showing the superiority

and motivation of using the Neomano Glove capable of solving and facilitating children's lives. However, the methodology used was the bibliographic research accompanied by two types of research, quantitative and qualitative, so the neomano glove is very effective, as several users have already tested and approved its use, but the equipment can still be improved, as the accessory can evolve to help the hearing impaired communicate Libras..

Keywords: Monoplegia; Robotic Glove; Assistive Technology;

1. Introduction

The content of this work consists of providing a technology in an equipment that will be discussed in the course of the work focused on people who have some monoplegic disability. However, this deficiency occurs when a single limb, whether lower or upper, has paralysis. This paralysis occurs due to some factors such as injuries to the nervous system such as encephalitis, multiple sclerosis among others that can cause this effect on your limb.

Most people who suffer from being one of those who have some type of monoplegic disability tend to have difficulties performing an activity such as a simple game of buttons, chess or even checkers because, as can be seen, they do not have full control over them. their member's respect and that's a point that unpleasant for them. Based on the difficulties mentioned, a research was carried out to find some technology so that it can help in this new path in the lives of people who have this tribulation.

However, our objective is to point out techniques in assistive technology to improve the lives of children with motor disabilities. benefits of use, however, the methodology of bibliographic research was used through qualitative and quantitative research.

2. Theoretical Foundation

2.1 Research Methodology

The methodology used is the bibliographic research where a survey was carried out in numerous articles about the technologies used to help people who have some monoplegia disability.

The research used was qualitative, so information was collected creating ideas giving hypotheses, where topics of topics began to emerge to develop solutions for children with monoplegia motor disabilities. In this way, relevant results are obtained, until the choice of equipment as an answer to the problem.

However, quantitative research was included due to a large number of people who have some type of monoplegia disability according to a survey that was carried out based on biographical research. Our main focus is to try to reduce this index as much as possible

2.2 Assistive Technology solving the greatest difficulties of children with disabilities in their daily lives.

Assistive technology or AT is a provision of services and aids to support the disabled providing comfort and safety, however AT contributes to the effort of professionals to obtain special knowledge such as

therapists, doctors and even technological professionals creating and inventing techniques and equipment to reduce the degree of disability of the disabled.

According to Zuliani and Berghauser (2017):

Assistive technology creates tools, devices and instruments, for people with special needs, or better techniques, actions that involve knowing more about the problem, obtaining all this analysis, managing to obtain visions of improvements in the living conditions of the disabled. (Zuliani and Berghauser, 2017).

The assistive technology resources are linked to our daily lives, practically all our actions are the needs of the disabled at home, on the street, at work, and at school, etc., because when a technology is created, we realize that it was based on the things that we do, a wheelchair, for example, was invented in Egypt, it was used to transport people, a simple object and was not taken so seriously, and as time went by, it evolved into motorized and electric wheelchairs for the disabled, there was a follow-up of the evolution of this technology that affected humanity giving a new look to the object that turned into an assistive technology technique. Intimating that the purpose of AT is not just to solve, create actions or services and techniques, it is to evaluate, study and research the daily needs of the disabled.

Therefore, as our target audience is shaped by children with disabilities, researching and understanding their days at home and at school, does not only involve family funding but also their own parents' time management to take care of their child, dependence on the school where need a companion, understanding these problems is research worth checking out The assistive technology resources are linked to our daily lives, practically all our actions are the needs of the disabled at home, on the street, at work, and at school, etc., because when a technology is created, we realize that it was based on the things that we do, a wheelchair, for example, was invented in Egypt, it was used to transport people, a simple object and was not taken so seriously, and as time went by, it evolved into motorized and electric wheelchairs for the disabled, there was a follow-up of the evolution of this technology that affected humanity giving a new look to the object that turned into an assistive technology technique. Intimating that the purpose of AT is not just to solve, create actions or services and techniques, it is to evaluate, study and research the daily needs of the disabled.

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According to Sardenberg and Maia (2019):

Assistive Technology can give us a new life, whether people with disabilities or not, for that to happen, we have to know how to take advantage of and understand devices such as computers, cell phones, programs, etc., that is, we have to make it happen. (Sardenberg and Maia, 2019).

The social inclusion of the disabled in society is a matter that should be thought about more deeply, finding solutions that help the disabled to reach a result of independence, but as we are talking about a child, the difficulty is greater, so it is important to obtain basic notions from technical aids with the services of professionals willing to help children to be social with other people, and of course the acceptance of the

use of the tool and technical help, and advice on technical aids, the ideas of social integration open the possibility for the disabled to be inserted in society through tools that help people with disabilities, becoming independent, fighting against prejudice, and not just adapting but learning, accepting and living with their lifestyle in the midst of society. And for a child they need to feel freedom, love and affection, not feel indifference and need like any other child, attention and inevitably go through frustrations and receive guidance to become an adult, and still be able to play to learn, with that the child even with special needs lives independently.

2.3 Implementation of the robotic glove in the daily life of children with monoplegic motor disabilities

According to the last 2010 census of the IBGE in Brazil, there are about 45.6 million people who have some type of disability, among which one, every 7.5 are children like this, totaling about 3.5 million children with disabilities. of any limitation. Due to this situation, the study was carried out with the aim of promoting accessibility and inclusion through technology that is currently increasingly becoming an ally of assistive technologies and due to the advancement of technology there are also opportunities to make people's daily lives more accessible. with physical disabilities, resources, methodologies, strategies, practices and services that aspire to day-to-day functionality are used for this purpose.

An alternative found to assist in the development of motor functions of the hand was the robotic glove, which with numerous repetitions of movements allows the user not only to perform movements, but also to develop these functions over time. To make the process faster, professional and surgical, it is necessary to seek and have the help of a specialized physiotherapy professional. Rehabilitation gloves known as robotic gloves that encompass a developed structure that has the ability to integrate hardware with software in a single project, configured exclusively for a particular limb, allows the user to reproduce traditional movements that are fundamental in anyone's daily life.

For a long time, the individual who has some limitation was segregated, increasing his restrictions and triggering new difficulties such as the problem of socializing and feeling inserted, however due to the advent of school inclusion where children are no longer taught. with disabilities in exclusive schools, now regular education must include children with disabilities in an appropriate environment, as the school with inclusive education develops an individual who is more sociable and willing to overcome their limitations. According to Piovesan, Bertoldo, Silva and Barin (2019):

roPviding innovative adaptations with the help of assistive technology helps the student to be inserted into the school environment and achieve more autonomy and freedom, thus resulting in a learning process with greater quality and effectiveness. (According to Piovesan, Bertoldo, Silva and Barin, 2019).

Currently, many technologies are created but not all are implemented because the implementation procedure is painful but very useful and necessary, for this it is extremely important that the environment where technology will be inserted, employees are aware of the technology used and that those involved can be trained to receive it, another crucial factor is the number of children selected for the implementation, because the larger the audience, the more precise the monitoring and control will be, in this way the gains of this technology will be revealed over time. Enabling a simple and new solution in the daily life of

children with monoplegia disabilities allows these children to perform new tasks that were not possible before, a simple glove will not be the only way out, however it is part of the advent that is very present in this century for this the use of robotic glove is considerable. The product used for the study has a comfortable material that easily adheres to the child's hand, with a simple and intuitive design that any user can enjoy without major complications. fact of being tested and validated in compliance with its requirements. Financing this technology will result in both a social and technological incentive, opening space for researchers from both the private and private areas to increasingly engage in the technological sector. Choosing a safe environment to introduce the glove can lead to mastery of the study and open space for product customization, making the process even more technical and surgical.

2.4 Benefits of using the robotic glove adaptation process in school and home education for children with physical disabilities.

Assertive technology cannot actually cure overnight; however, it can help in a way that, in the long run, the user becomes haptic to do any activity without the need for the aid of some tool or equipment. Its use (SASSAKI, 2003) "has enabled the valorization, integration and inclusion of these people, promoting their human rights". The monoplegia disability must be treated differently for each user, as both have their needs and difficulties to be monitored and developed during the period, in order to always adapt and improve the glove that allows better control over the limb, bringing news. and upgrades for both personal and professional development, in addition to social inclusion, making them feel more comfortable within Brazilian society. Nowadays, it is noticeable that people with a monoplegic disability suffer from some kind of prejudice about their disability, so the person with monoplegia is supported by the Accessibility Law, Law No. and basic criteria for promoting accessibility for people with disabilities or reduced mobility, and other provisions.

Some benefits of assertive technology:

- It allows for more independence: the individual becomes more independent so that they no longer need help to carry out their activities, they tend to be more willing to do something alone, it is clear that each person at momentarily different times adapts more easily to this positive point which is independence.
- It offers more autonomy: based on her potential and her mentality of knowing that she is capable of accomplishing something, she challenges herself to always look for something new and pursue challenges that can be challenging, occupying other spaces and increasing her repertoire.
- Respects the context, environment and individuality of each user: Respect is the basis of everything in society, although these people with a certain disability tend to be looked at in a different way, with other looks as if they were judgments, however this is wrong, no one must judge, on the contrary, one must help those who need it and without asking for anything in return.
- Promotes social inclusion: When using assertive technology that is locked in the glove, it is proposed that the person feels more comfortable to use in public, promoting more self-confidence, being able to perform more activities because they feel their self-esteem is higher.
- It empowers people: so that the individual becomes more capable of making their own decisions, with the mastery of what will bring them the most benefits.

However, what has been said are benefits that bring more capacity as much as self-confidence,

empowerment, inclusion, independence are some of these points that make citizens more capable of doing something they want for their own benefit and challenge themselves more and more to do it. some activity that could not before, but now with the glove and its movement slowly resuming it can help more and more.

3. Methodology

The Neomano glove was created by Neofect with the aim of benefiting the monoplegic motor disabled to perform daily activities, components are demonstrated that help in the usability of the equipment presenting some benefits for those who use it.

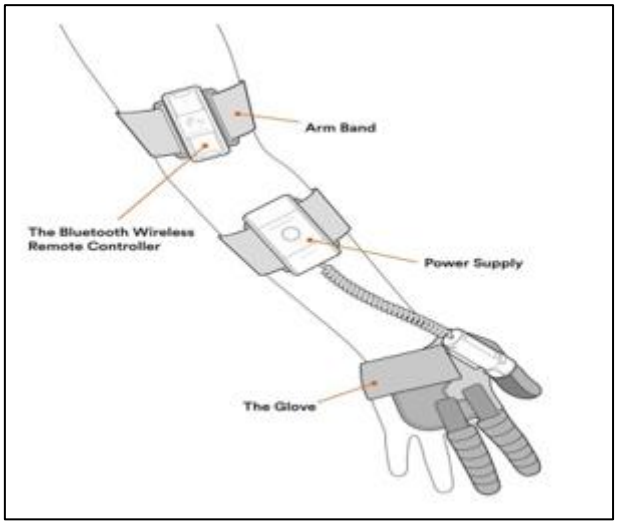

Figura 01: Technical specification of the Neomano Glove.
Source: Indiegogo, 2020.

Therefore, the equipment has privileges in its elements, favoring the deficient ease of handling, comfort and independence, these components are divided and are around the arm reaching the hand.

Figure 02: Glove.
Source: Indiegogo, 2020.

- Aluminum Splint: The glove covers three fingers, the thumb, index, and middle finger, and an aluminum splint is added to the thumb to precisely facilitate finger movements.

- Assistive Handle on Index Finger: On the index finger, there is an assist handle that is located on the back of the index finger in order to prevent finger hardening and control the force pressure of the equipment.
- Clamps: The sleeve contains two clamps, one to position the remote control via bluetooth and the other to position the power supply, making the equipment comfortable to use.
- Remote control and motor activation: The remote control is used wirelessly and via bluetooth, it is responsible for activating the glove, it is powered by three AAA batteries connected to the power supply that connects to the glove, however the control has two buttons the Grip in order to activate the function of winding the three fingers forming a C, and the Release button in order to deactivate the function leaving it immobile.

Figure 03: Remote Control.
Source: Indiegogo, 2020.

Figure 04: Power Supply.
Source: Indiegogo, 2022.

The hand in its original state, the buttons drive the motor, hanging on the thumb is responsible for controlling the finger winding function, the motor is connected to the control.

Non-Slip Silicone: Non-slip silicone is inserted into the palm and fingers in order to firmly hold objects.

The magnets attached to the engine: If the sleeve is not in use, the engine can be carefully removed from the magnets that hold the engine to the sleeve, leaving the accessory inactive.

The equipment is useful for various activities in which it is more functional because it contains an easy-to-use control, replaceable glove, partial and total grip with a customizable grip, supports up to 20N grip force, glove is useful for tasks that require dexterity. One of them is playing a game of golf, opening pots, holding objects, writing and drawing.

Figure 05: Neomano Glove Design.
Source: Indiegogo, 2020.

It is not limited to just these tasks; the device contains numerous simple and common features that will help the user to perform their tasks. Therefore, the neomano glove can be compared or improved by the Robot Hand Rehabilitation Glove.

Figure 06: Hand rehabilitation robot glove.
Source: Amazon, 2021.

- Function: The accessory is to recover the functionality of the hand, so it is a glove for therapy fighting hemiplegia with cerebral palsy, it covers the fingers and palm.
- Glove made of polymer material: it is resistant to chemicals and its surface provides comfort.
- Power supply: It has lifespan.
- It has two modes: passive, the equipment is inactive and mirror mode allowing the trained hand to have the same movement as the other healthy hand.
- Features two gloves: One for control and one for rehabilitation.

- Host or robot cooperation: To manage and calculate hand force and motion.

The equipment can bring adapted improvement solutions for the neomano glove, it can bring new functions for children with monoplegia motor disabilities

4. Results

In general, assistive technology (AT) contributes to the effort of professionals to obtain special knowledge in the area of health, technology or to help in the creation or invention of techniques and equipment and it can also be used to create tools, devices and also instruments to reduce the degree of difficulty for people with disabilities or professionals, depending on the area in which they work.

Tool: To find techniques to solve the problem of monoplegia disabled children, it is necessary to find assistance, the objective is to point out a specific tactic, an equipment capable of helping children to live independently, this tool is a robotic glove called neomano Glove.

Change in the lives of monoplegic motor-disabled children: The basis here is to identify the benefits that disabled people can gain from the accessory in use. However, the essential thing is the school and home life of children who go through obstacles because of their disability, with the chosen accessory it is possible to interact with other people and children of the same age and objects, developing functions that were previously impossible, which may affect their private life, interacting with his family, at school he will be able to draw and write, helping him with his studies, the neomano glove fulfills the duty of inserting the disabled in society without dependence on others, giving more confidence

Equipment adaptation process: Therefore, in order to use the equipment, the disabled person goes through a process of monitoring a specialist in several areas, usually a therapist, physiotherapist or technology professional to teach how to use the equipment, however it serves to help the disabled by accompanying with evaluations, training to use the accessory, verifying the comfort and tranquility when using the tool, evaluating the advantages, interests and benefits of the neomano glove being executed, accepting and learning to live with its condition.

Figure 07: Equipment of the Hand Rehabilitation Glove.
Source: Banggood, 2022.

Figure 08: More practical Neomano Glove
Source: Neofect, 2022.

Comparison Neomano Glove & Hand Rehabilitation Glove: In the neomano glove, its equipment is more practical, orderly and close to the user, it is more viable in domestic environments and even in education, as its accessories are fixed to the clamps even when still being used. makes it very fluid, being able to move freely with all the equipment on the arm, in addition to helping to carry out daily activities, increasing confidence and safety, leaving the hand less stiff, thanks to its design the handling is adapted to different situations, the components of the sleeve can be removed easily and is already implemented in the market. The rehabilitation glove in the context of movement is very limited, because as the glove needs to be connected to the robot to work, its movement is reduced, in terms of the power supply, it has a useful life, but it still loses to neomano because of the power supply. power to be carried on the arm, on the rehabilitation robot is not compared to the remote control via bluetooth, with its simplicity of presenting two buttons, holding the object and releasing the object, so the rehabilitation glove can help a lot to recover the functionality of the hand paralysis.

5. Conclusion

The purpose of this work was to carry out bibliographical research to expose the benefits that exist in the use of an adequate and consistent robotic glove to help a child with monoplegia in the hand in its recovery and in the execution of basic movements.

In view of this, it appears that after several debates and research, the general objective of this work was met, as the work effectively managed to identify ways that can help these children, so that they feel more capable and confident in performing everyday tasks that were not possible before.

However, the research of this work started from the hypotheses of which tool to use and how it would change the lives of children with monoplegic motor disabilities in the hand, because with the help of this tool it provides these children with a way to socialize and to be able to do simple tasks of the your day to day.

Thus, during the work it was verified that the resource used to help these children, effectively worked, because since the device has countless users who tested and testified their positive experiences in relation to the product addressed, so we were able to give confidence to the next users and give them the ability to

do simple tasks that the child had difficulty before.

Concerning future work, this article also offers a possible improvement for the proposed glove. An improvement that could transform the NeoMano glove into a device that continued with the functions already present and with an additional option of communication through Libras, thus enabling communication with the hearing impaired, this technology would promote more inclusion, practicality and ease.

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7. References

Bersch R. Introdução a Tecnologia Assistiva. Porto Alegre: CEDI, 2017.

Brasil. Descreto Nº10.098 de 19 de dezembro de 2000 <https://www.gov.br/governodigital/pt-br/legislacao/legislacao-acessibilidade>acesso em 20 março de 2022.

Brasil. 28 de setembro de 2021<https://mercur.com.br/6-beneficios-da-tecnologia-assistiva/>acesso em 20 março de 2022.

Colégio Jatobá, 2020. O que as crianças precisam para ter um crescimento saudável. Disponível em <https://colegiojatoba.com.br/sem-categoria/crescimento-saudavel-para-as-criancas> acesso 21 de março de 2022.

Cristina R. Corrêa F. A utilização de Tecnologia Assistiva na vida cotidiana de crianças com deficiência. São Paulo: Ciência & Saúde Coletiva, 2013.

Filho G. Pesquisa Nacional de Tecnologia Assistiva. São Paulo: Instituto de Tecnologia Social, 2012.

IBGE - Instituto Brasileiro de Geografia e Estatística, 2010. Conheça o Brasil - População pessoas com deficiência. Disponível em <https://educa.ibge.gov.br/jovens/conheca-o-brasil/populacao/20551-pessoas-com-deficiencia.html> acesso 6 de abril de 2022.

Indiegogo, 2021. Neofect NeoMano: Recuperar o aperto de mão - Parte 2. Disponível em < encurtador.com.br/aevFZ> acesso 1 de maio 2022.

Luvas do robô da reabilitação da função da mão do equipamento da reabilitação da mão do hospital do CE para pacientes do curso com hemiplegia. Disponível em <https://pt.aliexpress.com/item/1005003400160374.html> acesso 3 de maio de 2022.

Luvas de Robô De Reabilitação, função Pneumática da mão Robô de Reabilitação, espelho, luva, curso, hemiplegia, equipamento de exercício de treinamento de aperto de mão. Disponível em <https://www.amazon.com.br/Reabilita%C3%A7%C3%A3o-Pneum%C3%A1tica-Hemiplegia-Equipamento-Treinamento/dp/B09NW12L3M?th=1> acesso 1 de maio de 2022.

Neofect, 2022. Neomano a luva robótica, macia e usável. Disponível em <https://www.neofect.com/us/neomano> acesso 3 de maio de 2022.

Paniz C. O que uma criança precisa. Escola de Educação Infantil Particular. Rio Grande do Sul: Cataventura, 2022.

Piovesan, Josiane Bertoldo, Suzel Lima da Silva e Claudia Smaniotto Barin. "NECESSIDADES FORMATIVAS PARA USO PEDAGÓGICO DAS TECNOLOGIAS ASSISTIVAS". Redin-Revista Educacional Interdisciplinar 8.1 (2019).

Sardenberg. T, Maia H. Tecnologia da Informação e Comunicação e Tecnologia Assistiva: Aproximações e Distanciamentos. São Paulo: RIAEE – Revista Ibero-Americana de Estudos em Educação, 2021.

SASSAKI, R. K. Inclusão: Construindo uma sociedade para todos. 5.ed. Rio de Janeiro: WVA, 2003.