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Remote intervention model for a student with Cerebral Palsy: Use of digital game with technological and assistive technology contributions

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ABSTRACT

With the COVID-19 pandemic period, it became necessary to create remote service models so as not to interrupt the educational development of students of the target population of special education. The objective was to develop a model of remote intervention for a student with cerebral palsy using a digital game, through the means of technological contributions and Assistive Technology Resources (ATR). This is qualitative research with a case study of a student with cerebral palsy who has difficulties in gross motor skills, use of his hands and communication, needing pedagogical interactions to match playful-educational activities in the midst of a pandemic period of COVID-19. For data collection, the following were used: (1) an information guide; (2) the identification and selection of ATR; and (3) the elaboration of the tic-tac-toe game in PowerPoint. After this stage, judges and researchers were present at the participant's residence to assess the family context, the selected equipment, and the ATR. The sessions were recorded via filming. Electronic notes were made through: (1) participant performance in basic notebook and game configuration skills; (2) the usability of ATR; and (3) interaction with the adversary (researcher). In the data analysis, the usability of the ATR was described together with the model used for the configuration and execution of the remote service. The family played a leading role in helping the participant in the initial training in remote mode for interaction with digital technology. It is noteworthy that the following ATR were used: (1) enlarged keyboard; (2) stationary mouse (Trackball type) to replace the mouse in order to increase the feedback time and improve the cursor direction.

Keywords: Special education; Remote teaching; Digital Games; Cerebral Palsy; Inclusion.

1. INTRODUCTION

Technological development has offered benefits to everyone in daily activities, providing the population with new tools that favor and streamline our communication, work, leisure, and personal and health care. In this way, when technology is used to aid functional problems faced by people with disabilities, streamlining, expanding, and promoting skills necessary for everyday life, it is called Assistive Technology (AT) (Bersch, 2017).

AT, according to Decree 10645/2021, which provides for the guidelines, objectives, and axes of the National Plan for AT, consists of an interdisciplinary area of knowledge. AT encompasses a wide range of products, equipment, devices, resources, methodologies, strategies, practices, and services designed to promote functionality and improve the activity and participation of individuals with disabilities or reduced mobility. The main objective of these technologies is to foster autonomy, independence, quality of life, and social inclusion of these people, as established by Decree 10645 of 2021. By facilitating access and full participation in various spheres of life, AT play a crucial role in promoting equality and dignity for al (Decree 10645, 2021).

The fact that a technology is useful for the autonomy of the person with a disability is not enough for it to be called AT. This technology is required to compensate or mitigate the consequences of barriers or deficiencies resulting from a disability or reduced mobility (Galvão Filho, 2009).

The AT innovations, so needed in our country, for example, in the area of special education, have their focus in the Assistive Technology Resources (ATR) for participants with Cerebral Palsy (CP). The use of ATR has become increasingly relevant inside and outside the educational environment so that people with different disabilities can live with quality, autonomy, and independence.

The United Nations Convention on the Rights of Persons with Disabilities defines persons with disabilities as "those who have physical, intellectual or sensory impairments which, in an interaction with various barriers, may impede their full and effective participation in society with other people" (Australian Human Rights Commission, 2006). CP or chronic non-progressive encephalopathy can be understood, within the term established in the literature and commonly used by health professionals and the population, as a set of disorders, that is, different conditions that occur in the child's brain development process, regarding the cause, type, and severity of the disabilities (Rosenbaum et al., 2007). The motor disorders of participants with CP are permanent and related to movement, posture, coordination, balance, and muscle tone, among other damages, that result in numerous complications of nerve and muscle function, as well as limitations related to functionality, which last for a lifetime (Fischinger, 1970). However, resources appropriate to the needs and specificities of students with CP are fundamental for their development and engagement in activities (Alves, 2006; Schirmer et al., 2007).

The manifestations of CP are related to movement and posture (alterations in muscle tone that affect gross and fine motor functions) and result in difficulties in walking, speaking, chewing, swallowing, and social interaction, among other characteristics (Rosenbaum et al., 2007). These obstacles lead to limitations in activities that, according to the International Classification of Functioning, Disability and Health (ICF), make it difficult for the person to perform the tasks and actions that they want to perform. Interventions with the participant with CP should aim at the development of the potential for action and interaction, considering that the motor alterations, resulting from the motor impairment, are factors that make it difficult for the subject to interact with the environment, with the object, and with their peers (World Health Organization, 2003).

With the exponential increase in the supply of technological resources, the term "Digital Information and Communication Technologies" (DICTs) is routinely present in the lives of people with the most diverse physical, cognitive, and social characteristics around the world, so that some normative documents, such as the National Common Curricular Base (BNCC), guide and make an impact at the national level on aspects related to the cyber and digital world. In this sense, the general competence number 5 of the BNCC stipulates that digital literacy encompasses the critical and ethical utilization of technology to facilitate communication, information access, knowledge production, problem-solving, and the exercise of agency in both personal and collective contexts (Ministério da Educação do Brasil, 2018).

From the current moment, it is noticed that there is a relationship between DICTs and Digital Games (DG), since some game models that were once able only to be performed in person (Dominoes, the nine men's Morris game and tic-tac-toe, for example) at this moment are now made possible in a digital environment, and the implementation of certain ATR for participants with CP, provide the inclusion of this group in the dynamics of the computerized world.

DG such as control and movement games (exergames) have become a dominant form of entertainment, being a predominant means of leisure in the 21st century (Aguado-Delgado et al., 2020). These games have extrapolated entertainment, and through new mechanics and "level design" they have been used as "serious games", with applications in education and rehabilitation. Educators and therapists are bringing new evidence about the cognitive potential of games (Kato, 2010). However, access to the game is essential in the contemporary world that seeks to promote quality of life and a more inclusive society, recognizing the universal right of access to education, culture, and leisure (Hauge et al., 2018).

The use of digital technologies has intensified since the beginning of non-face-to-face pedagogical activities due to social distancing to contain the COVID-19 pandemic. Considering the 2019 household survey, published in 2020 in Brazil, on Information and Communication Technologies, approximately 20 million Brazilians do not have access to the internet, which corresponds to 28% of the population (Centro Regional de Estudos para o Desenvolvimento da Sociedade da Informação, 2021). Despite this, opinion

No. 5 of the National Education Council considered the adoption of non-face-to-face pedagogical activities to be developed with students, while health restrictions for the presence of students in the school environment persist (Parecer CNE-CP nº 5/2020).

The recommendations were extended to all levels, stages, and educational modalities, maintaining specialized educational services and promoting the liaison of the specialized professional with the family to carry out non-face-to-face activities (Parecer CNE-CP n.º 5/2020). The report on emergency remote teaching strategies to maintain pedagogical activities, discussed in the research by Souza and Dainez (2020), explained the family's movement in the student's schooling process, in addition to the difficulties of teachers for remote interaction.

The non-face-to-face activities established in the opinion (Parecer CNE-CP n.º 5/2020) could or could not be mediated by DICTs, taking place through digital means, such as video classes, content organized on virtual teaching and learning platforms, social networks, electronic mail, blogs, conducting synchronous and asynchronous online classes, and using far-reaching social networks (WhatsApp, Facebook, Instagram).

Thus, the importance of education to create mediations based on facing the processes of exclusion of rights is highlighted, since the psychic development of children with disabilities depends on the quality of the personalized pedagogical mediation activity (Souza & Dainez, 2020).

Remote teaching was established with the authorization of the Ministry of Education (MEC), which can be distinguished from Distance Education (DE). In remote teaching, students follow classes synchronously during the time of their face-to-face classes with the aid of digital platforms. In DE teaching, the student carries out their study asynchronously, that is, in their own available time with the material that is made available. However, remote teaching is similar to DE, but with different concepts of teaching, modulating only with regard to the use of technology (Parecer CNE-CP n.º 5/2020).

Based on the aforementioned, the motivation of the present study was to develop a model of remote intervention for a student with CP, through means of the use of a digital game, technological contributions, and ATR.

2. METHODOLOGICAL PROCEDURES

The current study has a qualitative approach of the case study type. The case study has its own unique, particular interest and represents a potential in education. These studies highlight the characteristics of naturalistic cases, rich in descriptive data, with an open and flexible plan that focuses on reality in a complex and contextualized way, which prioritizes the qualitative approach of the research (Ventura, 2007).

After the approval of the Research Ethics Committee[1], for the selection of the participant, we received support from teachers of a special education institution in Oeste Paulista and teachers from the State Education Network, in order to carry out the identification of participants diagnosed with CP, who were classified as having levels 3 or 4, by the Manual Ability Classification System for Children With Cerebral Palsy (MACS) (Eliasson et al., 2006), as at these levels the individuals present specific needs for gross motor coordination and manipulative skills, in order to participate in interactions with playful and educational activities.

The MACS describes how children and adolescents (between four and 18 years old) habitually use their hands (both and not each one separately) to manipulate objects at home, at school, and in the community, such as during play, in leisure activities, and when eating and dressing. The MACS has five levels of classification, with level I being characterized by functional performance with minor limitations, while levels IV and V are characterized by severe functional limitations.

In addition to the MACS, the classification by the Gross Motor Function Classification System (GMFCS) was also taken into account (Silva et al., 2010). This classification system describes the impairment in gross motor function in children and adolescents (between two and 18 years old). This system is configured on a five-level scale, in which level I corresponds to less motor impairment and level V to greater impairment of motor functions. Children and adolescents are classified based on their age and the motor activities they can perform, both spontaneously and those that are part of their daily lives.

Finally, the classification of the Communication Function Classification System (CFCS) (Hidecker et al., 2011) was also considered, which describes the functional and current performance of communication by the effectiveness of the various forms used by individuals with CP, whether: speech, sounds, look, facial expressions, gestures, notes, hand signals, communicative boards, vocalizer, or others. This system also has five classification levels, in which level I corresponds to effective communication with little or no delay in understanding, formulating a message, or resolving a misunderstanding, and level V characterizes communication that is rarely effective, even with familiar people.

The inclusion criteria adopted were: (1) being a participant with CP, level 3 or 4 GMFCS, MACS, and CFCS; (2) having a computer, cell phone, and internet network available at their residence; and (3) having a tutor (family members, teacher, and the like) to accompany and support the participant during the initial set-up of the service.

From these questions raised, a participant was found who fit the criteria established in Table 1.

1. The study was linked to the research: "Assistive Technology for the improvement of executive functions with a focus on analog and DG as innovation in customization, validation of prototypes and training for interventions in Special Education", being submitted to the Research Ethics Committee of the University Paulista State (Unesp), Faculty of Sciences and Technology – Presidente Prudente/SP campus, according to Resolution No. 510/2016 of the National Health Council (CNS) and obtaining CAAE: 58589322.7.0000.5402.

Table 1:
Characterization of the participant

Age group and gender	Classification of motor functions	Characterization described according to information obtained from the person responsible
16 years, male	GMFCS – IV MACS – III CFCS – III	The participant communicates verbally without any difficulty in conveying what he wants. He uses a wheelchair and gets around independently when possible (depending on the location). He can manipulate small objects, but with difficulty (turns on the TV set and video game alone). He's interested in superhero movies, YouTube videos, Harry Potter, and swimming. He understands the tasks that are proposed to him and shows interest and enthusiasm for the activities. He has contact with DG through cell phone, computer, and Xbox. He does not have an adapted mouse or keyboard but handles the platforms alone. Observation: He presents difficulties interacting with the games he only watches, according to the mother.

Note: Own elaboration.

For data collection, an Information Guide was prepared and applied with the participant and his guardian to understand the following items: (1) use or not of a wheelchair; (2) way of manipulating objects; (3) everyday interests; (4) difficulty understanding what is being said; (5) emotional behavior; (6) contact with DG; (7) how he interacts with DGs; and (8) DG platforms available at home.

After the elaboration of the information script, the person responsible for the participant was contacted[2]. Subsequently, meetings were held via Google Meet between researchers, collaborators, and the study supervisor. The meetings aimed to outline the steps to be followed in the research. It was decided, at first, that it would be necessary to obtain information about the participant in order to: (1) elaborate the DG according to the specificities of the research participant; and (2) plan adaptations (teaching strategies and pedagogical resources) necessary for the execution of DG.

Subsequently, the ATR identification and selection process was carried out, and, finally, the elaboration in the digital mode in PowerPoint of tic-tac-toe and the intervention plan in remote mode with the tic-tac-toe.

Following this step, the judges, together with the researchers, were present at the participant's residence to assess the family context, the selected AT equipment and resources, and issue their opinions and suggestions. The judges were: a teacher from the Specialized Educational Service and a research teacher in AT.

2. The purpose of the study was explained in order to collect the signatures of the Free and Clarified Term of Commitment, authorization for photo and filming and an assent term. In addition, it was verified with the participant himself if there was an interest in carrying out activities with DG, inherent to the research, to which he replied positively.

The care sessions were started and recorded via film. Field notes were made through: (1) participant performance in basic notebook and game configuration skills; (2) the usability of the selected ATR; and (3) interaction with the adversary (researcher).

In the data analysis, the usability of the ATR was described, as well as the model used for the configuration and execution of the remote service from the filming and field notes made by the team, respecting all necessary health care, given the COVID-19 pandemic situation . The game[3] was also an element analyzed in a descriptive way regarding its functionality, for the training of the participant's gross motor function and hand use.

3. RESULTS AND DISCUSSION

In this section, the procedures adopted for the interaction in the remote mode will be described, for the usability and evaluation of ATR for a student with CP in the form of a digital game.

3.1. IDENTIFICATION, SELECTION, TRAINING AND USABILITY VALIDATION OF ATR

From the information script, the MACS, GMFCS, and CFCS classifications, and the observation of the participant's ability to use the notebook, different ATR were raised for the accessibility of the student with a PC to the equipment. Among those tested, as shown in Frame 1, it was necessary to use the following resources: 1 – The Stationary Mouse (Trackball type) – and 4 – Enlarged keyboard with overlay (this one without the need for the beehive, only the enlarged keyboard) – to provide functional user accessibility to the notebook.

Frame 1:
Assistive Technology Resources identified and tested for use in tic-tac-toe

1. Stationary mouse (Trackball type) 	The Stationary Mouse (Trackball type) is one of the essential resources for individuals evaluated with more advanced degrees of MACS (levels 4 and 5). The central blue sphere is called a trackball and allows the execution of cursor movements on the screen. The stationary mouse also has two left and right click buttons located next to the trackball to avoid unnecessary mouse clicks, requiring less fine motor control on the part of the user.

3. Adaptation to the COVID-19 pandemic situation. Considering that there was a face-to-face session at the participant's home, with their guardians, there was a need to establish the face-to-face interaction protocol due to the pandemic situation caused by the COVID-19 coronavirus, a highly transmissible virus, which emerged at the end of 2019 and beginning of 2020 and its permanence until the present day, still not having the possibility of immunization of the entire population and the need to continue with the research, it was necessary to follow the protocol of "standard operating procedure for intervention activities" of the granting University of the research, which defines prevention actions and precautions to minimize the possibility of transmission or contagion of the COVID-19 virus, both for the researcher and for the student, adopting the practices and fundamental principles of prevention of COVID-19.

2. Pre-molded tubular orthosis 	Pre-molded tubular orthosis: used for typing on the keyboard or for pointing to something on the notebook screen, being flexible and molding itself to the user's hand and finger, thus facilitating fine motor skills.
3. Inclined Plane 	Inclined Plane: It can be constructed of different materials. This is a support tool that aims to align the viewing angle and the contact angle of the user's hands with the computer keyboard.
4. Enlarged keyboard with overlay 	Enlarged keyboard with overlay: adapted with colored and enlarged numbers, letters, and symbols. They are widely used by people who have vision difficulties, a characteristic that many participants with CP present. In turn, the overlay is made of acrylic and is used coupled to a computer keyboard, with the purpose of helping users who have little motor coordination/reduced mobility in the upper limbs. The overlay prevents more than one key from being pressed at the same time or a key from being pressed improperly.
5. Pressure actuator 	Pressure actuator: the feature is connected to the mouse (those which have trigger input) or directly to the device/ computer, thus replacing the common mouse click; a small pressure on any part of the top cover (blue color cover) will provide the trigger/click.

Note: Own elaboration.

Some tests were carried out among the researchers regarding the notebook settings, the use of the stationary mouse, and the forms of remote assistance, as described in this section, for manipulation with the game and filming of the participant using the AT resources. Subsequently, the resources and their functionalities were presented to the participant in person. On that occasion, at the participant's home, the notebook was configured and verified, and instructions on the basic questions of the equipment and the initial settings for using the game and its gameplay were provided, using the stationary mouse and the software for communication between participant

and researcher and the student's postural arrangements in the chair in front of the notebook, which made it possible to evaluate potential aspects regarding the effectiveness between the equipment and the context of DG, as shown in Figure 1.

With the COVID-19 pandemic, new challenges emerged for teachers and students. Torres and Borges (2021) highlighted the challenges of special education teachers in the context of the COVID-19 pandemic. They noticed that 83.6% of the professors increased their dedication of working hours to the preparation of remote classes and that there was a drastic decrease of 31.51% in student participation.

Nevertheless, Barreto and Rocha (2020) come to understand technology as a space for struggles, transformations, but also inequalities in Physical Education classes and the COVID-19 pandemic to the detriment that the lack of access to technology equipment and internet networks makes it difficult for the student to learn, so that families are required to make available a computer or mobile devices with mobile data availability to access the platform, link, video class, and/or school guidelines. In the study in question, these difficulties were overcome through the contribution of the university with its equipment and the family with the structure of the environment, mentoring support, and the availability of equipment.

Figure 1:
Images of the participant using the features of the enlarged keyboard with contrast, stationary trackball mouse, and pre-molded tubular orthosis, during face-to-face training

Note: Personal archive.

It was reported to the participant which ATR can be connected, in terms of his specifications, to conventional resources. Specifically, it is the enlarged keyboard with contrast and acrylic overlay support, according to item 4 of Frame 1; and a stationary mouse (Trackball type), according to item 1 of Frame 1. The functions of the stationary mouse are subdivided into five buttons, with pressure activation, of different colors and sounds in contact

with the buttons. Both features rely on the availability of USB ports, which required reorganization for the concomitant connection of the mouse and keyboard.

As an associated resource, the pre-molded tubular orthosis or triple bendable facilitator with tip was presented, according to item 2 of Frame 1, considering the relevance of evaluating the precision of the participant's movements.

The process of presenting the resources and initiating their use was accompanied by a special education teacher, a specialist in Specialized Educational Assistance, familiar with the resources in question and with experience in the process of introducing ATR in the routine of Target Population Students of Special Education.

During the preparation of the area where the resources would be arranged for use, it was noted that the space of the activity tray, coupled to the participant's wheelchair, did not support the resources at the same time and did not favor the extension movement of the upper limbs, which caused inadequate posture and retraction of the shoulders to handle the resources. Thus, within the possibilities of furniture existing in the participant's residence, a rectangular table was found to have all the space needed to organize the resources and enable the proper positioning of the upper limbs and the visual field for the DG played on their notebook.

The evaluative tests started with the enlarged keyboard with overlay, and the participant was presented with its functionality. It was soon concluded that the overlay was unnecessary on this occasion because the participant has satisfactory motor control without the need for support and is able to effect the pressure movement on the direction keys (left, right, up, and down) without the support of the overlay. The enlarged keyboard ensured him better performance, movement effectiveness, agility, and precision.

The stationary mouse made it possible to optimize the physical space for moving the cursor without the need to reduce speed and activate the filter against tremor. In view of the user's motor skills, the cursor moved by the sphere, at conventional speed and displacements, successfully fulfilled its function, ensuring effectiveness in terms of usability. In addition, the repertoire of DG to be taught was expanded, as shown in Figure 1 of Frame 1.

In the context of methodological accessibility, the strategies used in teaching the participant to use the resources available in the stationary mouse were: demonstration, activation of the necessary key with the oral indication of the key's color by the researcher, and encouragement for the participant to carry out the same move.

In the case of a set of movements and activations of functions, in addition to the demonstration, the researcher narrated the steps to the participant, for example: “take the cursor, click, lock, drag, and release the click”. With the application in the context of the digital game, the participant demonstrated understanding of the sequence and alternation of the functions necessary at that moment.

At the end of the face-to-face training with the ATR, the functionality of the enlarged keyboard and the stationary mouse was observed, in view of the participant's motor skills, with no need for secondary resources.

As for the judges' opinion of the participant's residential context and their interaction with the digital environment and synchronously with the researchers, when playing the game, changes in posture, insertions of resources 1 and 4, according to Frame 1, and family collaboration for assistance and, later, the possibility of participant autonomy in the remote environment. The judges, after accepting their suggestions in full, validated this context and dynamics of interaction.

American Occupational Therapy Association (2008) considers that, in the face of a delay in neuropsychomotor development, the family should focus on the best and most appropriate management of these subjects, that is, an individualized management, from the perception of the participant's physical, sensory, cognitive, emotional, and social aspects so that they collaborate in the potentialization of the participant's abilities and capacities.

3.2. ELABORATION IN THE DIGITAL MODE IN POWERPOINT OF TIC-TAC-TOE

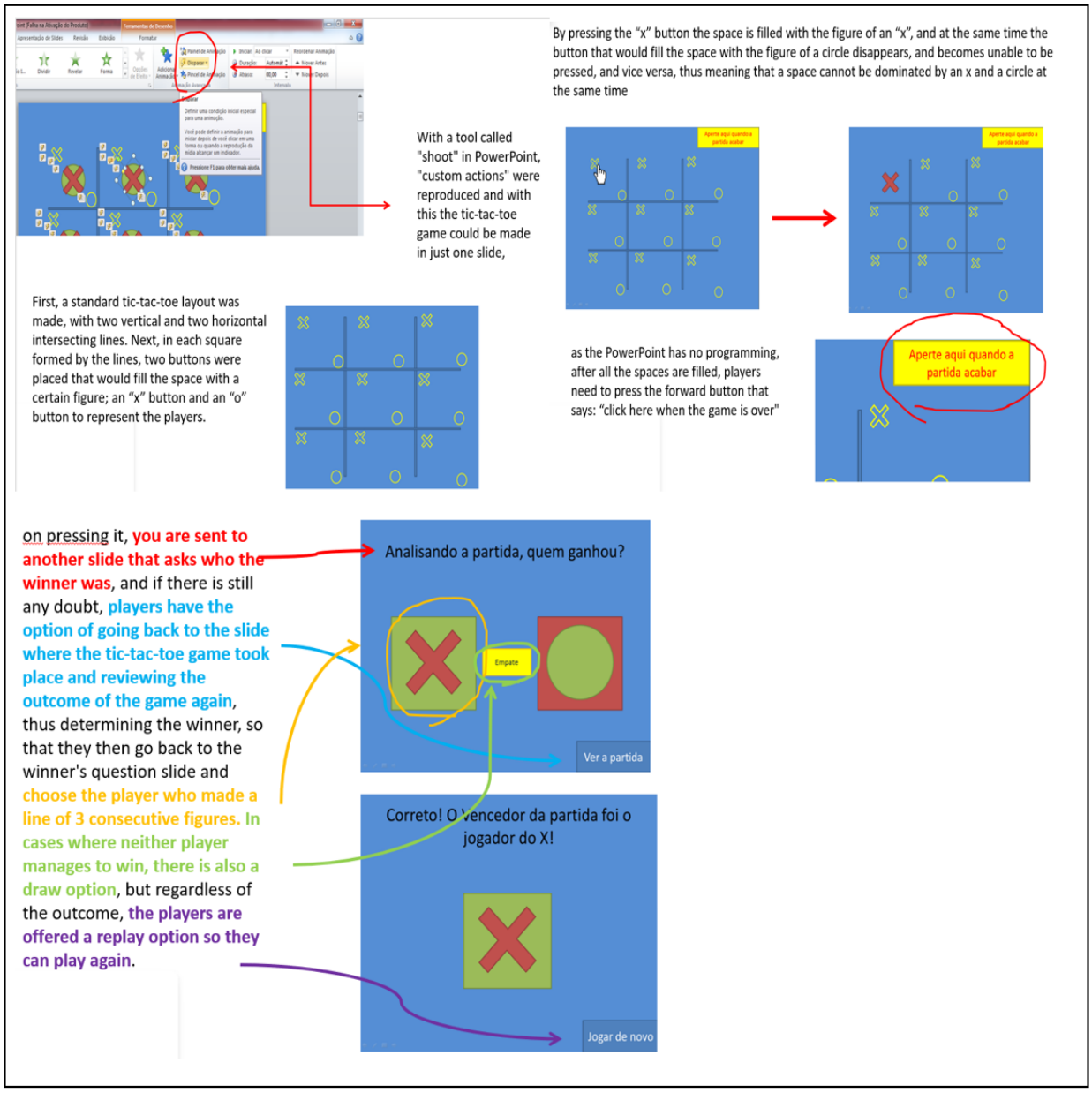
A wide range of digital versions of originally analog games was surveyed, more specifically tic-tac-toe, as it is a traditional game that is familiar to the participant. Therefore, the game was developed in the AT laboratory of a State University, using the PowerPoint tool, as shown in Frame 2.

Computer accessibility features, designed to make the computer accessible to people with neurological disorders, such as CP, are considered AT (Archambault et al., 2008) and should enable interaction with DG. These resources are not always adaptive, allowing pressure calibration, change of position and colors, fitting to the body, etc.

DG and the controllers (or controls) for interacting with these games can help the performance of students with multiple disabilities by allowing them to be used as tools to engage these subjects in the training of functional skills (Costa & Carvalho, 2005). The purpose is to integrate different intelligences and stimulate cognitive, perceptual, and motor activities, since this playful interaction can help in their development and increase their behavioral repertoire (Araújo et al., 2015).

Frame 2.

Images of the sequencing of the tic-tac-toe elaboration screens in the PowerPoint tool

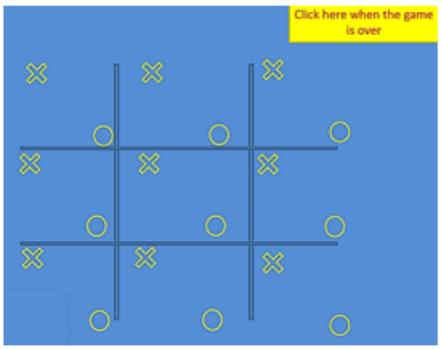
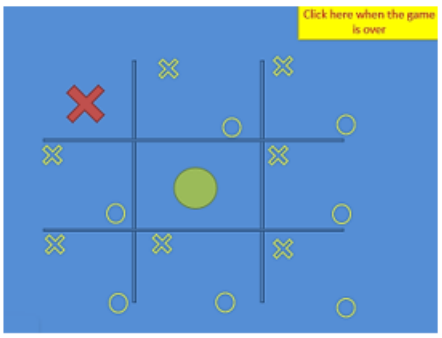
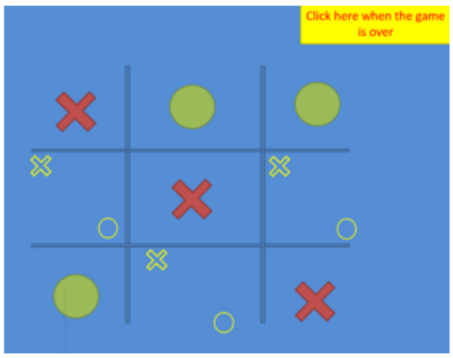


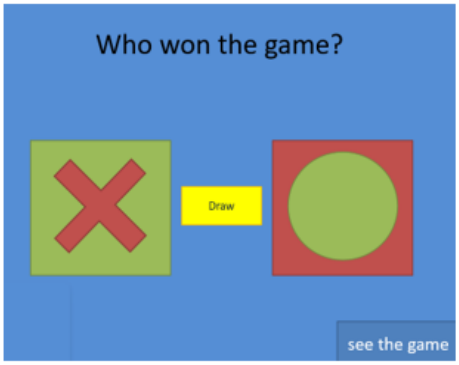
Note: Own elaboration.

Some meetings were held between the researchers to create the tic-tac-toe game in this environment, as shown in Frame 3.

Frame 3:

Images of the digital tic-tac-toe screens in PowerPoint

Screen 1 	- Tic-tac-toe Home screen.
Screen 2 	- After clicking on "Play"...
Screen 3 	- When clicking on the pieces (X or O), the respective symbol appears and takes shape by itself in the clicked location, and so the game continues...
Screen 4 	- When one of the players completes a row, the game is over, and when clicking on the yellow icon, located in the upper right corner, there is a question...

Screen 5 	- After clicking on the symbol that won, there is an animation that congratulates the winner.
Screen 6 	- End game screen.

Note: Own elaboration.

3.3. INTERVENTIONS IN REMOTE MODE WITH THE DIGITAL TIC-TAC-TOE

To carry out the consultations that totaled 12 sessions in remote mode, the TeamViewer tool was used (https://www.teamviewer.com/pt-br/), a freely available piece of software that allows remote control of a computer, using only a login and password. It was also necessary that the Microsoft Power-Point program was installed on the participant's notebook, as this is the means by which the participant can interact with the tic-tac-toe. In this way, the functionality could be tested, considering the ATR, as detailed in Figure 1, which allowed the participant's accessibility in their remote interaction.

After accessing the game using TeamViewer, researchers and participant made a video call via WhatsApp. This strategy was used since, through a meeting via Google Meet, the participant would not be able to see the researcher and play at the same time.

To film the service, the Az Screen Recorder application was used (https://az-screen-recorder.br.uptodown.com/android), installed on the researcher's cell phone, which asked the participant to place the cell phone

in the field of view of the usability of the ATR and, thus, be able to record the service.

Another important factor to be highlighted is that, in order to access the participant's computer, it was necessary for the participant, or his guardian, to indicate the TeamViewer ID and password to the researcher. Because he was not fully literate, the participant did not read these letters and numbers correctly, and the help of his guardian was always necessary for this step.

Specifically for children with disabilities, Rodrigo Mendes Institute (2020) indicates that to support inclusive distance learning, the following are necessary: family support, understanding of their reality during this period, and the offer of activities that stimulate fine motor coordination.

The study by Lima et al. (2022) investigated the perception of teachers about Physical Education classes for students with multiple and intellectual disabilities and found that teachers recorded videos and then forwarded them via WhatsApp to the classroom group. The group consisted of families and other teachers. WhatsApp was the most commonly used tool for remote teaching, which is in line with the model applied in this study, in which WhatsApp was used to visualize the action that the participant performed.

To carry out the consultations, in accordance with a conversation with the participant himself, for a better use and, consequently, a longer duration of the intervention, five rounds of tic-tac-toe were played.

After a few weeks of treatment, it was noticed that the interventions were monotonous. As an innovation, the researcher and his team retrieved data from the information script that indicated the participant's story preferences. However, it was proposed to the participant that a fictional story be created in which, to solve problems, it would be necessary to play games of tic-tac-toe. The themes chosen for storytelling were: Norse mythology and superheroes, themes that highlighted the playful dimension in order to encourage the participant to participate and play the game with greater pleasure and dedication. This action proved to be relevant, since that there was an increase in the intervention time, and greater efficiency during the service.

4. CONCLUSIONS

The current study proposed to establish a methodology for remote interaction with adaptations for technological accessibility that occurred in a single face-to-face meeting, using a digital game with a CP participant at level III of MACS and CFCS, and level IV of GMFCS, that is, a participant with considerable difficulties in gross motor skills, hand use, and communication for his educational and social inclusion, who requires pedagogical interactions to match these playful-educational activities in the midst of a pandemic period of COVID-19.

Beyond this period, the proposal is to establish possibilities for extra--classroom or clinical appointments in order to overcome the time, temperature, and location needed to administer motor games or even stimuli for cognitive functions.

In a collaboration proposal, the family was predominant in helping the participant in the initial training in remote mode, for interaction with digital technology. This collective effort generated feedback on the performance of the participant, through which each week it was possible to notice an evolution in gross motor and hand coordination movements, in spatial orientation, and in communication interactions and with the digital environment.

In this study, ATR were used through an enlarged keyboard, so that in quick response games, the participant did not miss the desired key or even press two keys at the same time, and the stationary mouse (Trackball type) to replace the mouse pad with the objective of increasing feedback time and improving cursor direction. This mouse has been tested for other games to be implemented using these features. This study is unique in the implementation of strategies, resources, software, and training in AT, which envisioned a methodological model of intervention with participants with neurological dysfunctions and other physical and/or sensory impairments.

From the data analysis, the judges concluded that the ATR described are effective, together with the planning of strategies for teaching DG to the participant with CP, being a facilitating and effective means for the social and educational inclusion of this population and a way to encompass this participant's knowledge of the digital world.

The proposed ATR will make it possible for professionals in the therapeutic and educational area to expand their services, since on the same online platform, it is possible for several participants to interact and dialogue without the need for the participant to travel to the school or any rehabilitation site in order to receive attendance.

For interaction with DG, interaction movements based on selection (pressing buttons) and navigation along the presented graphical interface are essential. However, the notebook, coupled with the enlarged keyboard, and interaction via the Big Ball mouse were elements that turned the digital game into an AT due to the decrease in the range of movements and effort undertaken, or even in the fatigue.

Alternative access resources were necessary to allow the student to interact with the digital game, but the task of designing interactive screens in remote mode was a challenge because there was no reference to support this interaction methodology. DG for students with CP should consider components in game mechanics and specific motivational patterns, such as the insertion of storytelling in the current study.

New studies are required considering the necessity to modulate the usability of DG, their mechanics, the choice of specific ATR, and the demands of teaching strategies according to the specific casuistry in terms of the neurological, sensory, and cognitive conditions of the participants.

AUTHORSHIP OF THE ARTICLE

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CONFLICT OF INTEREST

It is declared that there is no conflict of interest and authorship of the article.

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Modelo de intervenção remota a um estudante com Paralisia Cerebral: Uso de jogo digital com aportes tecnológicos e de tecnologia assistiva

RESUMO

Com o período de pandemia da COVID-19, tornou-se necessária a criação de modelos de atendimento remoto para não interromper o desenvolvimento educacional dos alunos do público-alvo da educação especial. Objetivou-se desenvolver um modelo de intervenção remota para um aluno com paralisia cerebral, utilizando um jogo digital, por meio de contribuições tecnológicas e Recursos de Tecnologia Assistiva (RTA). Trata-se de uma pesquisa qualitativa com estudo de caso de um aluno com paralisia cerebral que apresenta dificuldades na motricidade grossa, no uso das mãos e na comunicação, necessitando de interações pedagógicas que correspondam às atividades lúdico-educativas em meio a um período de pandemia de COVID-19. Para a coleta de dados, recorreu-se: (1) a um guia informativo; (2) à identificação e seleção dos RTA; e (3) à elaboração do jogo da velha em PowerPoint. Após essa etapa, juízes e pesquisadores estiveram presentes na residência do participante para avaliar o contexto familiar, os equipamentos selecionados e os RTA. As sessões foram gravadas por meio de filmagem. As anotações eletrônicas foram realizadas por meio de: (1) desempenho do participante nas habilidades básicas de configuração do notebook e do jogo; (2) a usabilidade dos RTA; e (3) interação com o adversário (pesquisador). Na análise dos dados, foram descritas a usabilidade dos RTA juntamente com o modelo utilizado para configuração e execução do serviço remoto. A família teve protagonismo no auxílio ao participante na formação inicial na modalidade remota para interação com a tecnologia digital. Ressalta-se que foram utilizados os seguintes RTA: (1) teclado ampliado; (2) mouse estacionário (tipo Trackball).

Palavras-chave: Educação especial; Ensino remoto; Jogos Digitais; Paralisia Cerebral; Inclusão.

Modelo de intervención remota para un estudiante con Parálisis Cerebral: Uso de juego digital con aportes tecnológicos y de tecnología asistiva

RESUMEN

Con el período de pandemia de COVID-19, se hizo necesario crear modelos de atención remota para no interrumpir el desarrollo educativo de los estudiantes de la población objetivo de educación especial. El objetivo fue desarrollar un modelo de intervención remota para un estudiante con parálisis cerebral mediante un juego digital, a través de aportes tecnológicos y Recursos de Tecnología Asistiva (RTA). Se trata de una investigación cualitativa con el estudio de caso de un estudiante con parálisis cerebral que presenta dificultades en la motricidad gruesa y el uso de las manos y la comunicación, necesitando interacciones pedagógicas que combinen con actividades lúdico-educativas en medio de un período pandémico de COVID-19. Para la recolección de datos, se recurrió a: (1) un guía informativo; (2) la identificación y selección de RTA; y (3) la elaboración del juego de tres en raya en PowerPoint. Finalizada esta etapa, jueces e investigadores se hicieron presentes en la residencia del participante para valorar el contexto familiar, el equipamiento seleccionado y el RTA así como para dar sus opiniones y sugerencias. Las sesiones fueron grabadas mediante filmación. Las notas electrónicas se realizaron a través de: (1) desempeño de los participantes en habilidades básicas de configuración de cuadernos y juegos; (2) la usabilidad de RTA; y (3) interacción con el adversario (investigador). En el análisis de los datos, se describió la usabilidad de los RTA junto con el modelo utilizado para la configuración y ejecución del servicio remoto. La familia tuvo un papel protagónico al ayudar al participante en la capacitación inicial en modalidad remota para la interacción con la tecnología digital. Cabe destacar que se utilizaron los siguientes RTA: (1) teclado ampliado; (2) mouse estacionario (tipo Trackball).

Palabras clave: Educación especial; Enseñanza remota; Juegos Digitales; Parálisis Cerebral; Inclusión.