ASSISTIVE TECHOLOGIES FOR THE COMMUNICATION AND PARTICIPACION OF CHILDREN WITH CONGENITAL ZIKA VIRUS SYNDROME

TECNOLOGIAS ASSISTIVAS PARA A COMUNICAÇÃO E A PARTICIPAÇÃO DE CRIANÇAS COM A SÍNDROME CONGÊNITA DO ZIKA VÍRUS

TECNOLOGÍAS DE ASISTENCIA PARA LA COMUNCACIÓN Y LA PARTICIPACIÓN DE NINÕS COM SÍNDORME CONGÉNITA DEL VIRUS DEL ZIKA

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ABSTRACT: This paper presents results on the use of assistive technology for the communication and participation of non-speaking children with multiple disabilities due to the Congenital Zika Virus Syndrome. The investigation addressed the conceptions of education professionals who worked with these children in 2019 and 2020. Data were collected during a Continuing Education Program through records on an online platform and training portfolios. To support the analysis, the references of the bioecological and systemic theory of human development by Uri Bronfenbrenner were used. The results showed, among other aspects, that the use of assistive technology resources favors the promotion of communication and, consequently, participation, and also the schooling of these children, provided that the necessary support and assistance are offered, whether at home or at school.

KEYWORDS: Assistive technologies. Multiple disability. Communication. Participation. Congenital Zika Virus Syndrome. Early childhood education.

***RESUMO**: Este artigo apresenta resultados sobre o uso de tecnologia assistiva para a comunicação e a participação de crianças com deficiência múltipla não oralizadas em decorrência da Síndrome Congênita do Zika Vírus (SCZV). A pesquisa abordou as concepções de profissionais da educação que atuaram com essas crianças nos anos de 2019 e 2020. Os dados foram coletados durante um Programa de Formação Continuada por meio de registros em plataforma online e portfólios formativos. Para fundar as análises, os*

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referenciais da teoria bioecológica e sistêmica do desenvolvimento humano de Uri Bronfenbrenner foram empregados. Os resultados evidenciaram, entre outros aspectos, que usar recursos de tecnologia assistiva favorece a promoção da comunicação e, consequentemente, da participação, e, também, a escolarização dessas crianças, desde que se ofereça o apoio necessário, seja em casa ou na escola.

PALAVRAS-CHAVE: *Tecnologias assistivas. Deficiência múltipla. Comunicação. Participação. Síndrome Congênita do Zika Vírus. Educação infantil.*

RESUMEN*: Este artículo presenta resultados sobre el uso de tecnología de asistencia para la comunicación y participación de niños no oralizados con discapacidades múltiples debido al síndrome congénito del virus del Zika (SCZV). La investigación abordó las concepciones las concepciones de los profesionales de la educación que trabajaron con estos niños en los años 2019 y 2020. Los datos fueron recolectados durante un Programa de Educación Continua a través de registros en una plataforma en línea y portafolios de capacitación. Para sustentar el análisis se utilizó como referencia la teoría bioecológica y sistémica del desarrollo humano de Uri Bronfenbrenner. Los resultados mostraron, entre otros aspectos, que el uso de recursos de tecnología de asistencia favorece la promoción de la comunicación y, consecuentemente, la participación, y también la escolarización de estos niños, siempre que se ofrezca el apoyo necesario, ya sea en casa o en la escuela.*

PALABRAS CLAVE*: Tecnologías de assistência. Discapacidad múltiple. Comunicación. Participación. Síndrome Congénito del Virus del Zika. Educación infantil.*

Introduction and theoretical aspects

Since 2012, the Observatory of Special Education and Educational Inclusion (ObEE) has carried out a set of research on the schooling and development of children with multiple disabilities. In the following years, with the Zika virus epidemic, these investigations were accentuated, considering that Rio de Janeiro was the second most affected state by the virus, with a high incidence in the Baixada Fluminense, priority locus of our investigations.

The multiple deficiency caused by the Congenital Zika Virus Syndrome (CZVS) affected hundreds of babies whose mothers were infected by the Zika Virus during pregnancy, causing, among other developmental peculiarities, microcephaly (DINIZ, 2016; LÖWY, 2019; PLETSCH; MENDES, 2020). Microcephaly is the most serious complication in children, but Zika Virus infection is also associated with a number of other conditions, including hypertonia, seizures, ophthalmic abnormalities, cardiac arthrogryposis and other conditions and developmental delay (FREITAS *et al.,* 2020). In other words, microcephaly caused by CZVS leads to a combination of disabilities (in general, intellectual, visual and/or motor disabilities) compatible with multiple disabilities, which can affect development in

different ways, with different consequences for their quality of life and in relations with the environment (PLETSCH; ARAUJO; SOUZA, 2020; ROCHA, 2014; 2018; ROCHA; PLETSCH, 2015; 2018). Brazil was the most severely affected country among those territories that reported Zika Virus outbreaks. In 2018, there were 2,952 confirmed cases of CZVS in the country, constituting 79% of cases for the region according to the Pan American Health Organization (PAHO) (PAHO/WHO, 2015). Recent studies have identified neurological disorders, such as neurodevelopmental delay, especially in the domain of language, in children exposed to the Zika Virus (ZV) who were asymptomatic at birth (LOPES *et al.,* 2018; PEÇANHA *et al.,* 2021; VASCONCELOS *et al.,* 2020). Absence of signs and symptoms at birth in exposed babies does not preclude their being checked later in childhood. The high prevalence of asymptomatic cases at birth (65 to 83%) may delay the identification of the association between congenital syndromes (with or without late onset) and ZV infection in the mother during pregnancy. The results of these studies indicate that cognitive impairment may occur in the long term and suggest that children who are asymptomatic at birth, despite having been exposed to ZV during the fetal period, may still be susceptible to adverse outcomes in their development and health condition. Therefore, the structuring of intersectoral networks involving the educational system, health and social assistance is essential, for the integral monitoring of these children, now of school age (LOPES et al., 2018; PINTO; FERNANDES; BARROS, 2021; SÁ; PLETSCH, 2021).

To expand the educational and social participation of these children, as well as their quality of life, one of the central aspects highlighted in our research is the provision of specific supports and resources, such as assistive technologies (AT's) which according to the Brazilian Law for the Inclusion of People with Disabilities (LBI) - Law nº 13.146/2015 - are characterized as "[...] products, equipment, devices, resources, methodologies, strategies, practices and services that aim to promote the functionality, related to the activity and participation of people with disabilities or reduced mobility, aiming at their autonomy, independence, quality of life and social inclusion" (BRAZIL, 2015, p. 2).

In the case of children with multiple disabilities as a result of CZVS, assistive technology resources can favor the development of communication, because as they are mostly children with oral dysfunction, it is necessary to use alternative communication through boards or digital resources on tablets to promote communication, autonomy and participation in their choices in their everyday lives, at home or school. As pointed out by Rocha (2018) and Sá and Pletsch (2021), alternative communication (AC) is understood as an integral part of the area of assistive technology, and can involve from gestures and facial

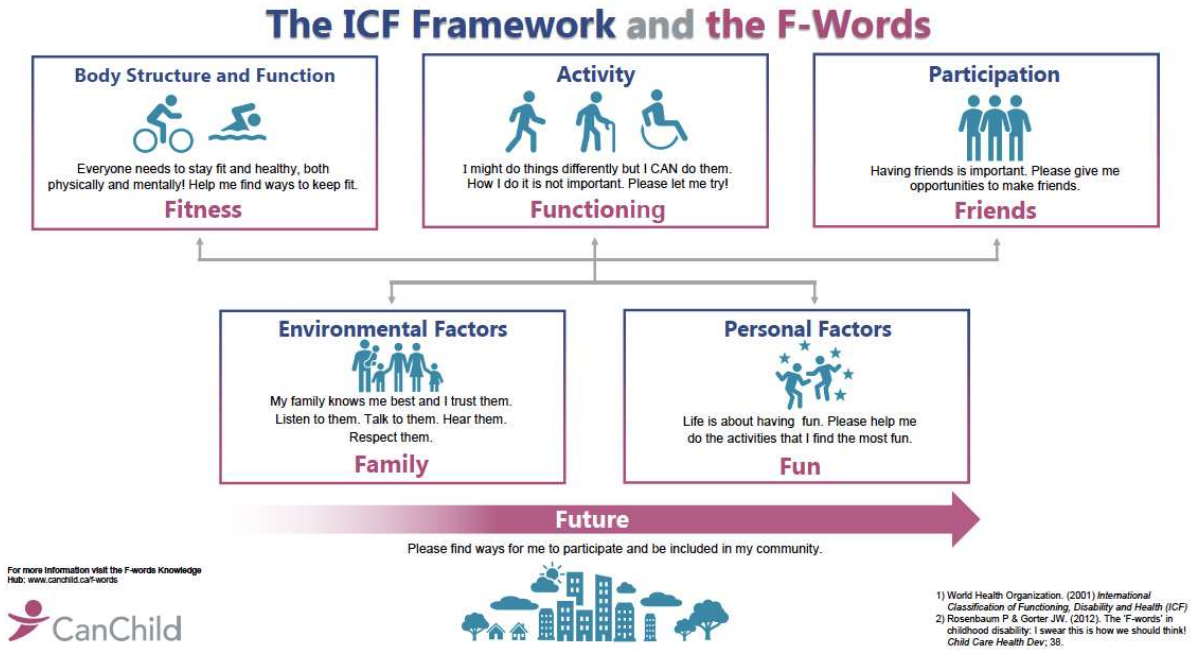
expressions to various graphic forms, as a way of communicating people who cannot use verbal language. Furthermore, it considers the purposes of promoting and supplementing speech and of guaranteeing a new communication alternative, if there is no possibility of developing it.

Assistive technology resources are organized or classified according to the functional objectives for which they are intended, which can be motor or sensory (BERSCH, 2008; ROCHA, 2014, 2018). In order to promote the communication and even functional writing of children who do not speak, communication boards and even software such as Boardmaker, are available in the multifunctional resource rooms of the Specialized Educational Service (SES), offered in the after school hours in a complementary way for students with disabilities and with Autism Spectrum Disorder (ASD) and, in a supplementary way, for students with high abilities/giftedness (BRAZIL, 2009). The concept of human functionality has been indicated for the assessment of disability and is provided for in the LBI – Brazilian Law of Inclusion (BRAZIL, 2015). From a biopsychosocial perspective, the assessment of disability, according to LBI, considers: impairments in body functions and structures; socio-environmental, psychological and personal factors; limitation in the performance of activities; and participation restriction. The origin of functionality as a premise for understanding the phenomenon of disability occurred in 2001, with the International Classification of Functioning, Disability and Health – ICF (WHO, 2007). The ICF understands functionality from the dynamic interaction between health problems, personal and environmental contextual factors. This is what we call the biopsychosocial model.

In the biopsychosocial model, disability is no longer understood as an attribute of the person, but as a result of social interaction and existing barriers. This perspective leads us to an approach focused on the subjects' possibilities and expectations of them and their families. Therefore, we have advocated a broad interaction between education and health professionals who work with children with CZVS and their families, in the establishment of actions and strategies that provide the development of their functionality at school and at home (SÁ; PLETSCH, 2021). To this end, one of the possibilities for action is the proposal of the F Words, developed by the CanChild group in Canada, which stands for My Favorite Words (Functionality, family, health, friends, fun and future). F Words were introduced in 2011, from a study by Rosenbaum and Gorter (2012), based on the structure of the ICF, with the aim of promoting the integral development of children with disabilities in which none of the actors involved in the intervention can be viewed in isolation, including families The authors point out that F Words really help people who work with children with disabilities and their

families to understand the problems they face in real life. Based on this study, guidelines were developed to work on favorite words, with families, health professionals and, more recently, an approach aimed at schools. For schools, the proposal is that teachers can work with other children in the class, so that they better understand their colleague with disabilities, thus favoring the participation of children with disabilities in activities carried out at school. The following figure systematizes this approach.

Figure 1 – F Words elaborated from the ICF



Source: CanChild (2012)

From this perspective, one of the central concepts is that of participation, which is complex and polysemic and can be analyzed in different ways. In the ICF, participation is defined as "involvement in every life situation", including family, school and community life, being crucial for children with disabilities because it directly affects their well-being, social relationships, mental health and physics. Along with the activity, the environment is a key determinant for promoting this participation. Here, we emphasize that it is very important that the child can be a child, that they can play, have moments of fun and share experiences with other children. Therefore, it is essential to know what the child likes to think of ways to make activities accessible for their participation. This helps the child build confidence and a sense of capability. Here, it is important to clarify the concepts of capacity and performance, namely: capacity is what we can do in the best way, while performance is what we normally do. Now, we know that performance improves with practice and, therefore, our primary

emphasis should be on promoting activities (ROSENBAUM; GORTER, 2012). We know that many children with disabilities can be deprived of experiences, and this can be associated not only with their health condition, but also with the lack of opportunities and access to an environment that facilitates this possibility.

In this article, the emphasis will be on participation in school, including unstructured (e.g. friendships, play), organized (e.g. sports and playground play, arts) and classroom activities (e.g. group work, carrying out the tasks). In a recent systematic review of 1828 articles, Maciver et al. (2018) signaled that the participation of children with disabilities is restricted in school compared to their peers, which can have significant lifelong consequences for performance, quality of life, and well-being. That is, students with disabilities (in this case, with multiple disabilities) end up participating less in structured and unstructured activities at school, an aspect that affects their experience and social interaction. In the words of Maciver *et al*. (2018, p. 23), participation in school can be systematized as follows:

> School participation includes active and meaningful activities (from a personal or socio-economic perspective) that are necessary or desired to fulfill the student's role within or outside the school context. Participation in school is not just classroom activity, school work or achievement. Participation includes school events, travel, sports, arts, and adult relationships and peer friendships. School participation can be understood in terms of how much, how often and what activities the child does (frequency), as well as their subjective experience (involvement).

In Brazil, the concept of participation in school is little used to guide pedagogical practices based on evidence and more effective. In general, the concept is discussed in the light of principles contained in official documents that define educational inclusion as access, participation and learning (BRAZIL, 2008). This discussion is centered on the social model of disability, which tends to focus on the participation of these people from the angle of political and civil rights, but not on how it affects human functioning, learning and the development of individuals. Granlund *et al*. (2012), in a study carried out in Sweden, found that political documents present the concept of participation, focusing much more on aspects related to the accessibility of the school environment than on the subjective experience of effective involvement in school activities.

For example, in children with disabilities, especially those with more severe multiple disabilities, functional skills are elements that can affect their participation in activities at home or at school, which, according to Maxwell and Koutsogeorgou (2012), include doing the activity and engage in such experience. According to the same authors, involvement in

school activities is greater when thinking and doing coincide. To this end, it is necessary to promote the development of the child's communication in order to structure language and thought through the appropriation of the symbolic system, as already evidenced in our previous research (ROCHA; PLETSCH, 2018; SÁ; PLETSCH, 2021). That is, alternative communication is an instrument that the subject uses as a mediator between himself and the world around him to communicate, express his feelings and desires. Therefore, when we do not promote communication through alternative resources, the participation of these subjects is impaired. In addition, their autonomy to choose when and how to participate ends up not being developed.

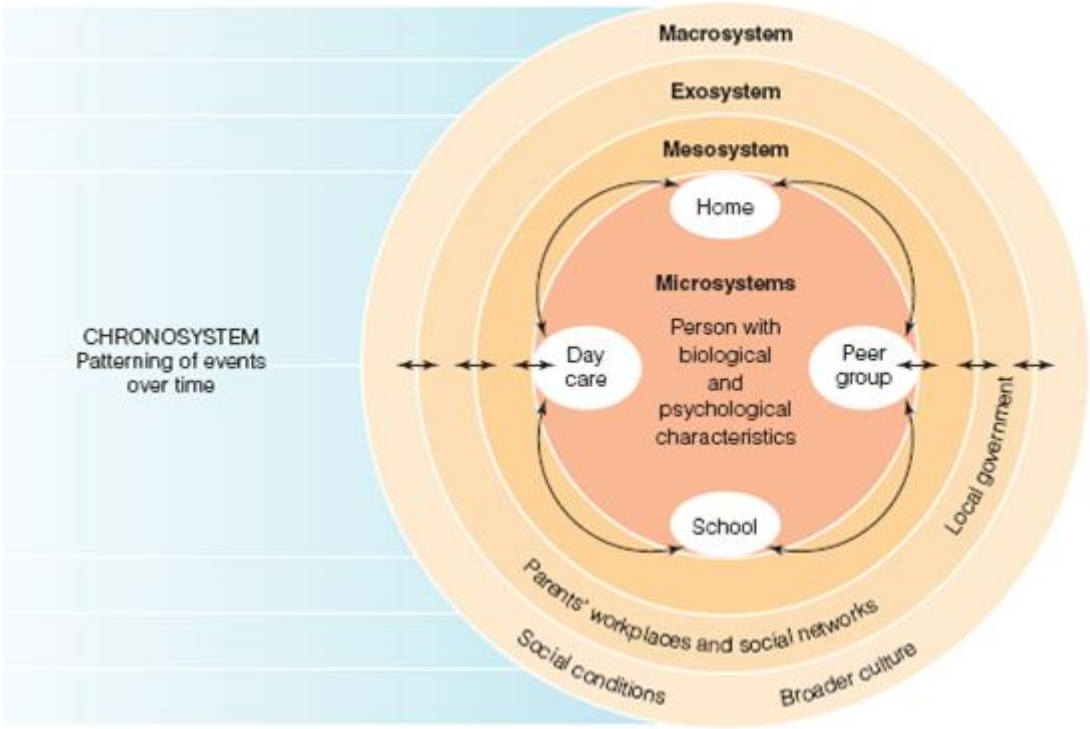
This means that, for the schooling of children with multiple disabilities without verbal communication, it is necessary to offer resources that can imply the use of instruments from the simplest, handmade, to the most technologically complex and expensive. Resources can be classified according to their technological density (low, medium or high), as indicated by the ICF itself. As examples, of low technology we can mention the artisanal communication boards, of medium technology the soundboards with the use of the computer and of high technology we can mention communication mechanisms that use infrared sensor coupled to glasses and computer, as was used by the physicist Stephen Hawking.

Regardless of the available resource to be used, it is necessary to focus on the child's functionality, through observation and attentive listening to professionals and family members involved in child care for an effective assessment of their needs. For this, it is essential to ensure, in addition to material resources, human resources as supports or support in this process. These include all professionals and caregivers who, in the case of children with CZVS, have focused on the mother, as evidenced by several studies (AZEVEDO; FREIRE; MOURA, 2021; FLEISCHER; LIMA, 2020; LIMA; SOUZA, 2021; MENEZES *et al.*, 2018; PLETSCH; MENDES, 2020). Promoting intervention programs and alternative communication focusing on the family (or in this case the mother), considering the routine and social reality of the child, has shown promise in the international scientific literature (ROSENBAUM; GORTER, 2012).

Still in theoretical terms, we used the references of the bioecological and systemic theory of human development by Uri Bronfenbrenner. This theory argues that the interaction between different factors (child, family and social/community environment) and the quality of these relationships favor child development based on four nuclei: the person, the process, the context and time. According to Bronfenbrenner, human development involves a series of factors that are interrelated to the personal characteristics of each one from birth, which are

transformed according to the context and the social and cultural reality in which each person lives. The figure below systematizes Bronfenbrenner's theory showing the dynamism and interrelationship between the nuclei that constitute it.

Figure 2 – Synthesis of Bronfenbrenner's bioecological theory



Source: Elaborated from Bronfenbrenner (2012) / Chegg.com

It is important to remind that the microsystem is characterized by the direct environment in which the person has personal experiences in the family, school, day care center. The mesocrosystem occurs when there are interrelationships and reciprocal influences between two or more environments in which the person actively participates. The macrosystem, on the other hand, includes elements of the system that do not involve the person as an active participant, but in which events occur that affect what happens in one of the microsystems, and the exosystem is formed by the global pattern of ideologies, beliefs, values, religions, forms of government, cultures and subcultures present in people's daily lives (BRONFENBRENNER, 2012; SÁ; PLETSCH, 2021).

Based on these premises, we present the results of an investigation on the use of assistive technology resources to promote communication and participation of children with CZVS from the conceptions of education professionals. It is important to mention that the arrival of these children at school is still little investigated, since most of the studies

developed so far were in the area of health and social assistance (VIANA, 2021). In this sense, this article brings important contributions on the paths and possibilities for their schooling.

Ethical and methodological research procedures

The research was carried out during the execution of a Continuing Education Program that integrates a multidisciplinary project, approved by the Ethics Protocol 135/2021, process nº 23083.031153/2019-40, structured in three axes, namely: 1) child and family; 2) school and teachers; 3) intersectoriality, in which a set of studies and intersectoral actions have been developed between education, health and social assistance in the promotion of schooling and the integral development of children with CZVS in the Baixada Fluminense (PLETSCH, 2018; 2019). The project is made up of about 50 researchers from the Federal Rural University of Rio de Janeiro (UFRRJ), the State University of Rio de Janeiro (UERJ), the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), the University of State of Santa Catarina (UDESC) and the Oswaldo Cruz Foundation (FIOCRUZ) with members of the National School of Public Health (ENSP) and the Fernandes Figueira Institute (IFF).

The Continuing Education Program for 50 education professionals was developed in a municipal education network in Baixada Fluminense, in Rio de Janeiro. Teachers from common Early Childhood Education classes, teachers from Specialized Educational Assistance (SEA), educational advisors, pedagogical coordinators, school directors and agents to support inclusion in the area of health and education participated. It is important to say that part of the results of this Program were published in a previous article (PLETSCH; ARAÚJO; ROCHA, 2020).

Lasting 120 hours, the Program started in a face-to-face format, but due to the global pandemic caused by the new "coronavirus" (SARS-CoV-2), declared by the World Health Organization on March 11, 2020, it started to be developed in online format with synchronous activities via the Zoom platform and asynchronous via Facebook's online digital platform, from February 2020 to October 2020, as widely discussed by Pletsch, Araújo and Rocha (2020).

All the phases of the Program were structured in a collaborative way with the management team of the participating Municipal Network, based on the demands presented by the school teams that received in their Early Childhood Education classes, in the years 2019 and 2020, children with SCZV, in dialogue with the National Curriculum Guidelines for

Early Childhood Education of 2009 (DCNEI) – Resolution nº 5, of December 17, 2009 (BRASIL, 2009), considering ten axes, namely: 1) Knowing the reality; 2) Posture, movement and food; 3) Interaction and Communication; 4) Games; 5) Right to Learn; I; 6) Right to Learn II; 7) Collaboration and Intersectoriality; 8) Individualized Educational Planning (IEP); 9) Family; 10) And now? Life goes on (OBEE DATABASE, 2019-2020).

During the Program, different procedures were used to systematize/structure the data: face-to-face and online questionnaires, semi-structured online interviews, records on the online digital platform of Facebook and portfolios with the participants' records about their own training process. For this article, we will only use the data contained in online digital portfolios and records made by participants during asynchronous activities.

For data analysis, Bronfenbrenner's references were important to discuss the conceptions of the participants of the Continuing Education Program on the use of assistive technology resources, whether low or high cost, in promoting communication and children's participation with CZVS in educational activities.

Assistive technologies, communication and participation of children with CZVS

The investigation data revealed, from the beginning, the anxiety of teachers and other professionals in receiving children with multiple disabilities in their schools as a result of the CZVS In fact, the lack of knowledge of teachers with the arrival of these children in common teaching classes, which we call inclusive classes, has been a constant in our investigations (PLETSCH, 2015; ROCHA, 2014; 2018) During the activities of the Continuing Education Program, it became clear that teachers and other education professionals do not question the arrival of children in their classes, but they indicated a lack of knowledge about how they should act, mainly to promote communication and interaction of these children with the rest of the class. To illustrate how the Program participants were appropriating new strategies and concepts about language and communication, we highlight the following excerpt, extracted from the training portfolio of one of the teachers:

> *I learned that the act of communicating is comprehensive and that it cannot be reduced to the acquisition of language, that gestures, facial expressions and even looks can demonstrate feelings and positions, without any use of sounds. Participating in the activities of the Program provided me that the absence of language or deficient language is not an impediment for the subject to communicate. It is necessary to observe the conditions that each subject presents and stimulate both communication and learning, so it is important to keep in mind with other forms of communication that meet the needs of each student. From the text "The self and the other: we build*

> *knowledge about communication through touch". First, we were introduced to concepts and classifications of multiple disabilities and what these individuals have in common. We also learned about the difference between alternative communication and alternative tactile communication. It became clear that we can build our pedagogical material for alternative communication based on the reality of our students (Early Childhood Teacher who has a child with CZVS, registration carried out in the first semester of 2020).*

As we can infer from the excerpt collected, the Professor recorded a set of learnings that she believes are necessary to work with her student with the CZVS, mainly about language and the different modes of communication. In this regard, during the Program the participants showed that they needed to review their understanding of language as a category linked only to verbal communication. The data recorded on the digital platform show that the synchronous and asynchronous activities developed expanded this understanding considering speech, writing, drawing, symbols, tactile symbols, gestures, facial expressions and the use of alternative communication resources individually elaborated with images and photographs or through previously existing programs, such as Boardmaker, mentioned here. In this regard, the record in the training portfolio shows this understanding: "we express ourselves in several ways, not only with oral language, in this way children with disabilities can communicate through communicative acts, such as: looking, vocalization, verbalization, gestures, scream, anger and cry, forming a set of communicative habits understood by family members and by those who live closely with these children" (Record in Portfolio, second half of 2020). For Marçal (2018), when language and its different modes of verbal, visual, tactile, digital, bodily expression are recognized, complex associations are also built between words, actions and concepts, which in turn are formed in the interaction with the environment. and with each other.

It was also evidenced in the records on the online platform that the teachers understood that the lack of communication in children with multiple disabilities can lead to their isolation in the classroom and, consequently, impair their participation in activities and their educational and social development. They also recorded that the interaction by looking at the child, the use of resources, objects or tactile symbols can be used to introduce initial forms of communication, always respecting the scientific indications that are already valid. One of the teachers even reported that "the use of assistive technology materials and resources can be an opportunity to explore communicative functionality, as I have cases of students in which feedback occurs with eye movement and facial expression, parts of the forearm, and

not of the hands, as we are usually used to" (Record in training portfolio of a teacher who works with children with severe multiple disabilities, second semester of 2020).

The importance of eye interaction was recorded by Sá and Pletsch (2021) during a research that analyzed the participation of children with CZVS in activities at home. The researchers showed that the mothers who participated in the study reported that they know their children not only by the look and smile, but also by the way they cry. The authors also signaled the importance of their involvement in promoting alternative communication programs. The evidence present in the form of communication recorded here cannot be ignored, mainly because we are discussing aspects of the schooling of children with severe multiple disabilities, who are not verbalized. Rocha (2018) in her doctoral thesis showed the need to recognize small gestures, including through the look, as a starting point to introduce alternative communication resources, such as the use of cards containing, for example, the choice of food, and the indication by blinking to show the child's understanding of the meaning of yes or no about what they want to eat.

The relationship between the agents of two different microsystems (school and family) according to the bioecological perspective is fundamental, as it expands the possibilities of appropriation by children of the symbols and strategies used and their consequent development. There is little point in using certain strategies in the child's family routine and using more structured ones at school. This often ends up confusing the child.. One of the teachers recorded in her training portfolio that "I think the integration of all school and family is important for a good development of these communication techniques. Thus, all the tools used for this development will always be used and the student develops better results" (Record in training portfolio, second semester of 2020). Another teacher followed in the same direction when saying that:

> *We need to be connected for child work to be successful. We are involving parents in alternative communication, we share pictures so that the work with the student is not fragmented. The school should not do an isolated work, so we need the participation of the family in this process (Registration on a digital platform of a teacher who works in Early Childhood Education with a child with CZVS, first semester of 2021).*

These reports indicate that the bioecological perspective, using the references of the F Words proposal by Rosenbaum and Gorter (2012), based on the structure of the ICF, which proposes joint action with the families of children with disabilities, is an important and necessary initiative to the development of the same. Our research also verified that the participation of families and the provision of interactive activities in the classroom among

children, not only to favor their communication and participation, ends up expanding their school and social inclusion. To this end, the collaborative work between the teacher of the common teaching class, the teacher of the multifunctional resource room and the inclusion support agent were highlighted as essential in this process.

Another aspect that the project participants reported was that the introduction of strategies and even communication cards during the games is characterized as a promising initiative. For example, in order to play, the child must somehow select, either by looking or tilting the head or body, the card with the symbol playing. In Early Childhood Education, play is part of the activities developed with children so that they appropriate different concepts and superior psychological processes, such as attention, concentration, memory, ranking, classification, among others, in an interactive way with their classmatesIt is also at this educational level that actions are promoted for the child to participate, explore, express and get to know each other. The research by Fernandes, Santos and Mercado (2019), carried out with mothers, showed how playing was important for the development of children with multiple disabilities as a result of CZVS. Research data revealed that play and toys were important in the development of the two children who participated in the investigation. Playing through the mediation of an adult telling stories was also evaluated as positive in the development of communication in children with autism (DELIBERATO; ADURENS; ROCHA, 2021). It is evident here that introducing alternative communication strategies in Early Childhood Education with play as a central axis (which involves low-cost resources) can be a potentiating initiative to promote communication and children's participation in school activities.

For one of the teachers: “Of course, games and toys are excellent for all children, mainly because they bring children together and favor communication, in the adult-child, child-child relationship” (Registration on an online platform, second half of 2020). Still on the strategies used, a teacher reported that she has in her classroom “a sensory box containing different materials, with different textures, shapes, colors, features, for the child’s exploration and I am attentive to the observations to mediate (the look, touch , hand over hand, grip movement, pointing)” (Registration on online platform, second half of 2020).

Corroborating this statement, we bring the reference of the research by Marçal (2020), which brings knowledge closer to the areas of design, health and education, and allowed the strengthening of actions aimed at reducing barriers, including communicational ones, through toys built specifically for children. sensory and communicational needs of children, or as called by the author, the “sensitive objects”. This experience allowed the consolidation of

inclusive practices through the mediation – through play – of the relationships between subjects, based on the power place of children with disabilities. This is what the author defines as different modes of interaction.

Still on the games and uses of pedagogical objects, we highlight the project "Caixa e Bacia", developed in a multidisciplinary way, aiming at the construction of stimulation resources for children aged 0 to 3 years with the CZVS, described by Marçal (2019). In this project, according to the author, it started from the understanding that it is in the act of playing that the child discovers space, time, experiences sensorialities, builds awareness of the body and discovers different ways of expressing themselves. It was also understood that it is through the body in movement and interaction that the child perceives the world and builds body language and non-verbal communication. That is, it perceives that the body expresses itself. The use of pedagogical objects or toys, in this case in miniature, was also highlighted in the research by Moreira (2021), in the development of alternative tactile communication for children with multiple visual sensory impairments.

Another point highlighted by the teachers about the strategies to introduce and use alternative communication with children with CZVS is that it is necessary to pay attention to the needs of each child. The following excerpt shows the concern of one of the teachers on this issue:

> *In choosing categories, I believe that the ideal is to assess the needs of each student and, thus, invest in what he responds best to. I've always used AC, but I see that it needs to be reinvented for each student, in each class. Check which are the abstraction difficulties, which sensory channels respond, if it is necessary to use some other assistive technology resource to support. These resources and strategies work as instruments to compensate for the limitations presented, collaborating in the teaching and learning processes of these children (Registration on an online platform of an educational counselor, second half of 2020).*

Reflecting on extracts from portfolios and records on the digital platform, the importance given by the research subjects to the involvement of children in activities and participation in the school space from playful activities, using play as a strategy, is highlighted. In the words of Teacher Maria, "playing can favor coexistence, participation, exploration, expression, getting to know each other. It is very important for our children with a disability to experience all these aspects during the Early Childhood Education period" (Record in the portfolio, second semester of 2020). This shows that teachers in their practices, at the level of the social environment, according to the Bronfenbrenner model, recognize the importance of offering opportunities for participation in an inclusive perspective, promoting

an experience with all children in the classroom. In summary, the research indicated that the development of alternative communication can occur with quality through low-cost assistive technology, associated with participatory strategies that value the use of toys and pedagogical objects in the classroom, commonly existing in Early Childhood Education. In other words, it is possible to develop communication using resources and playful activities, in order to encourage the participation of children with CZVS in school activities in a more meaningful way, thus giving more quality to their educational inclusion. Likewise, the study showed that the bioecological theory of Bronfenbrenner (2012), articulated with the proposal of F Words elaborated by Rosenbaum and Gorter (2012), provides important subsidies for the elaboration of strategies that promote the communication and participation of children with multiple disabilities as a result of CZVS. Additionally, this investigation suggests that collaborative action between teachers, support professionals (either in education or health) and family members is central to school learning and improving these children's quality of life.

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