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INTEGRAL INTERVENTION PROTOCOL WITH ECOLOGICAL VALIDITY FOR SCHOOL-AGE CHILDREN WITH A DIAGNOSIS OF HEMIPARESIA ASSOCIATED WITH CEREBRAL PALSY

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Abstract: Objective: Design a comprehensive intervention protocol with ecological validity for school-age children diagnosed with hemiparesis associated with cerebral palsy in Cali-Colombia. Method and materials: Mixed study carried out through a sequential explanatory design of two moments (DEXPLIS-2); which was organized in a quantitative stage (descriptive) and a qualitative stage (ethnomethodological). Bibliographic reviews (n=30), structured interviews with professionals (n=50), semi-structured interviews with family members (n=2), companions (n=2), caregivers (n=2), children (n=2) were carried out. and experts with experience in neurorehabilitation (n=5). The instruments included the RAE format, perception survey, conversation script, and validation format. Results: Three exercise modules (sensory, sensorimotor, integrative, productive, facilitators) connected in a two- and three-dimensional way, organized in three levels, appropriate to the context in terms of materials, instructions, and space, and with content validation (RCV = 0.90). Conclusions: The integral intervention protocols have as characteristics, (1) scientific evidence that supports the performance of the activities; (2) experiences of the actors on the materials and instructions to be used in the intervention; (3) recognition of the most favorable context to develop them; and (4) experiential validation of each exercise by experts.

Keywords: Cerebral Palsy, Neurological Rehabilitation, Clinical Protocols, Validation Study.

INTRODUCCIÓN

One of the main causes of motor disability in the pediatric population is cerebral palsy, which presents a great variety of permanent motor alterations (Díaz & Pedraza, 2022), such as hemiparesis, since this is a motor sequel caused by a lesion of the upper motor

neuron and is determined by the presence of muscle weakness of one side of the body, which makes it difficult to perform voluntary movements, motor and postural control on the affected side (Pinzón et al. 2020); which, compromises the performance of activities of daily life and necessary achievements for the development of activities in the school environment. It should be noted that children with hemiparesis maintain independence in daily life at times and most of those who suffer from this condition do not have associated cognitive difficulties (Meza & Isla, 2016).

Regarding the epidemiological figures, according to the World Health Organization WHO, in 2017 it was found that the prevalence in European countries is 1% of the total population, which corresponds to approximately 120,000 people with this condition; while in the United States the percentage is 4.41% and in Mexico it is 1.96%. In Central American countries, the prevalence remains low compared to the previous figures with 0.15% and in South America, specifically in Colombia, it is estimated that there are around 719,130 people, corresponding to 0.66% of the population (Ferrari & Machado, 2014).

On the other hand, up to now, the protocols and intervention programs for the population of children with hemiparesis-type cerebral palsy have focused on various specific techniques such as mirror therapy and the healthy limb restriction technique based on magnification tasks. of the motor recovery of the affected upper limb (Ferrari & Machado, 2014; Marín et. al., 2017). Techniques that tend to be applied in an artificial and mechanical office environment, far from the reality and daily life of patients, ignoring the principles of integral development.

Thus, the need for comprehensive protocols with ecological validity is evident, since most focus on focused, spurious, and

even non-interdisciplinary care (Universidad Tecnológica de Pereira, 2014; Caselles, 2016); even more so, if one considers the advances that the combination of multivariate procedures or treatments in a diversity of contexts has shown in the evolution of patients (Aspace Confederation, 2015; ICBF et al. 2010).

It should be noted that ecological validity, today, refers to the true experiences of the individual in daily life situations with respect to experimental conditions (Barrera et al., 2022; Bronfenbrenner, 1994). In this case, the content of the exercises of an intervention protocol should begin by recognizing the own experiences of family members, caregivers, companions, children, who were implicit in a previous therapeutic process, to get closer to the design of more natural, ecological exercises. and differentials. Thus, this work aimed to design a comprehensive intervention protocol with ecological validity for school-age boys and girls diagnosed with hemiparesis associated with cerebral palsy in Cali-Colombia.

MATERIAL AND METHODS

A mixed study was carried out, from the epistemology of divergent research, through a sequential explanatory design of two moments (DEXPLIS-2). Therefore, the methodological procedure was structured in a quantitative stage (type of study: descriptive) and a qualitative one (perspective: phenomenological and ethnomethodological), connected sequentially and systematically.

Stage 1: Quantitative. Initially, information was collected on health intervention strategies for boys and girls diagnosed with hemiparesis, through systematic review in evidence-based scientific and academic databases (SciELO, Science Direct, and Pubmed). Publications (n=30) with a time range of 10 years of publication (2010 - 2020), originally written in Spanish and responding to previously

established keywords, were reviewed. The information was systematized in RAE formats.

Additionally, in a second moment, the knowledge in pediatric neurorehabilitation of professionals (n=50) in disciplinary areas such as: physiotherapy, occupational therapy and speech therapy, who worked at the Ideal Foundation for Comprehensive Rehabilitation “Julio H. Calonje” was taken into account. ” (Cali-Colombia), through a survey-type structured interview format.

The format evaluates the perceptions of professionals on the contents proposed for the design of comprehensive intervention protocols: (component 1) need to create intervention protocols (items 1 to 8); (component 2) need to integrate different disciplinary areas (items 9 to 12) and (component 3) need for ecologically validated exercises (items 13 to 15). The statements are answered on a scale of 5 to 1: 5 (strongly agree), 4 (agree), 3 (undecided), 2 (disagree) and 1 (strongly disagree).

Based on the information collected, at both moments, a comprehensive intervention protocol organized into modules, strategies, and exercises (version 1) was built.

In stage 2: Qualitative. Initially, a contextual adaptation exercise of the protocol was carried out through a semi-structured interview with a group made up of family members (n=2), companions (n=2), caregivers (n=2) and (n=2) patients. , who had direct experience in neurorehabilitation processes for children with hemiparesis. For the process, a discussion script with open and circular questions was used.

Finally, in a second moment, the validation of the protocol was carried out with a group of experts (n=5) in comprehensive neurorehabilitation, collecting their impressions against the evaluative categories proposed by Lawshe (Gibson, 2015) and the ethnographic validity by contrast. (experiences

of the validators in the proposed exercises). In the process, a validation format adjusted to the proposals of the selected authors was used.

It should be noted that for the development of the different stages of the study, we had the endorsement of the Research Ethics Committee of the Faculty of Health of the Manuela Beltrán University, the permission of the entity where the research was carried out, and informed consent, as assents of the participants. In addition, the instruments used in each of the moments already described were previously validated by groups of experts in quantitative or qualitative methodology, as appropriate.

RESULTS

Stage 1: moment 1. A sample universe of 30 articles published in indexed journals between 2010 and 2020 and written in Spanish was obtained. Of this total, only 3 articles (10%) were found that talked about a comprehensive intervention in children with hemiparesis, since the rest focused on focused interventions and not interdisciplinary ones.

In the physiotherapy area, the number of exercises with the highest frequency of appearance were: mirror therapy, "therasuit" and restriction therapy (30%); followed by: tissue mobilization, cryotherapy and thermotherapy (21.1%); and, to a lesser extent, orthotics and vibration (5.3%).

In the area of occupational therapy, the number of exercises with the highest frequency of appearance were: mirror therapy, restriction therapy, and exercises with emphasis on the upper limb (73%); followed by: cryotherapy and proprioceptive stimulation (13.3%); and, less frequently, Bobath concept and cognitive techniques (6.7%).

Finally, in the area of speech therapy, the number of exercises with the highest frequency of occurrence were: myofunctional therapy and multisensory exercises focused

on the oral area (45.5%); followed by: facilitated voice emission, exercises for accent, rhythm and intonation and activities focused on fluency and narrative language (18.2%); and, to a lesser extent, direct stimulation of swallowing (9.1%).

Stage 1: moment 2. A descriptive analysis of the results obtained from the survey was carried out, from which it can be observed that the categorical value that occurred most frequently in the total set of items evaluated in the three components was: *totally of agreement* (5), with $SD = 0.63$ and $Mo=5$, which expresses that the favorable perception that the interviewed health professionals have in relation to the contents proposed for the design of the comprehensive intervention protocol with ecological validity for school-age boys and girls diagnosed with hemiparesis associated with cerebral palsy (Table 1).

The professionals ($n=50$) consider, from their experience, that it is necessary to build comprehensive intervention protocols in which rehabilitation exercises can be proposed with the participation of two to three disciplines (physiotherapy, occupational therapy, speech therapy) ($Mo = 5$) and, in addition, they can be applied in different environments of patient participation (home, park, school) ($Mo=5$). In addition, it highlights the importance of contemplating in the structural design the organization by modules, strategies and levels ($Mo=5$).

However, prior to developing the qualitative stage of the study, with the information collected in the quantitative stage, the exercises found in the scientific literature were collected and organized according to the perceptions of health professionals about what the content should be. of the comprehensive intervention protocols (Table 2).

Stage 2: moment 1. The transcription and coding of the stories collected from the semi-structured interviews was carried out

| VALUE /ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| \hat{X} | 4,6 | 4,8 | 4,8 | 4,4 | 4,3 | 4,6 | 4,4 | 4,2 | 4,4 | 4,0 | 4,6 | 4,6 | 4,6 | 4,3 | 4,6 |
| Mo | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 |
| SD | 0,47 | 0,38 | 0,35 | 0,70 | 0,81 | 0,47 | 0,78 | 0,75 | 0,70 | 0,94 | 0,60 | 0,58 | 0,87 | 0,78 | 0,62 |

Table 1. Statistical data of the information of professional contribution according to the knowledge

| AREAS | LOW LEVEL | MEDIUM LEVEL | HIGH LEVEL |
|----------------------|--|---|---|
| Physiotherapy | Sensory motor techniques *Manual techniques such as tissue mobilization. * Sensory integration exercises of the cryotherapy and thermotherapy type. | Integrative techniques of hemispheres * Mirror therapy. * Restraint therapy. | Facilitation techniques * Therasuit. |
| Occupational Therapy | Sensory motor techniques * Sensory integration activities. * Exercises with emphasis on upper limb. | Integrative techniques of hemispheres * mirror therapy. * Restriction therapy. | facilitation techniques * Activities with Bobath therapeutic techniques and cognitive techniques. |
| Speech therapy | Sensory techniques * Multisensory exercises with oral emphasis. | Voice management and production techniques and speech production * Suprasegmental aspects of accent, rhythm and intonation. * Exercises focused on fluency. * Facilitated voice emission exercises. | Techniques for language stimulation * Myofunctional therapy. *Activities focused on narrative discourse. |

Table 2. Classifications of the exercises in the different areas.

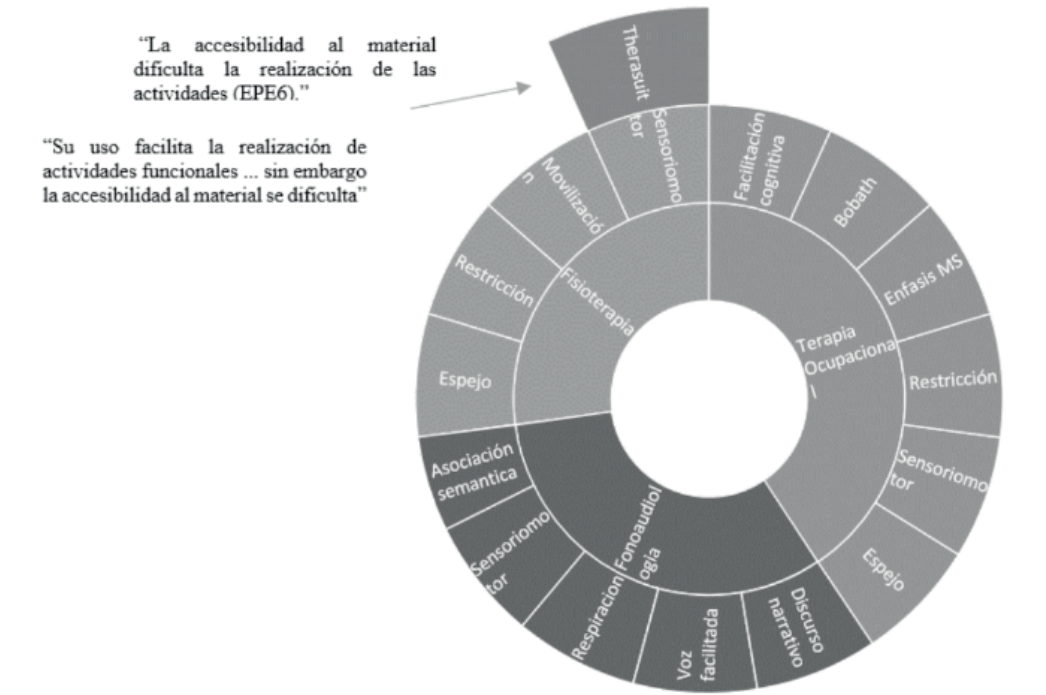


Figure 1. Result of the exercises for the final protocol.

thanks to the conversation script. Codes were assigned according to the order of appearance and the corresponding actor, as follows: Child Participation Experience (EPN), family member (EPF), caregiver (EPC) and companion (EPA). Then, a deductive categorical analysis of the experiences was carried out, through word counting and rooting, which were organized into materials, process and space, according to Gibson's theory (Gibson, 2015).

The reports show the priority that the summoned actors assign to the patient as a subject in the construction of rehabilitation strategies; This is how they suggest that the materials should be easily accessible and that interventions should preferably be carried out with items found in their homes. the actors expressed that "they have to see or ask how they have at home and likewise do the tasks or activities" (EPF12) and also that it is not "so clinical and office-based, rather things that are easily accessible and what have the children at home with their parents" (EPC15); This appreciation was then taken to adapt the materials and facilitate their accessibility during the proposed interventions.

In the same sense, the stories also suggest that the materials should be varied and playful, the actors expressed from their experience that "it was very cool because every day was something different and more complicated" (EPA3) and "things were done differently." a simple and playful way for the girl, so she wouldn't get bored" (EPF20).

Talking about the instructions, The actors expressed that the boy or girl was given verbal stimuli such as *"I told him: well, here you are going to walk along this edge, then you are going to climb this mesh and you must use your two hands, it does not matter if it is difficult for you, the important thing is that you do it"* (EPA9) and *explanatory commands such as "we said what we were going to do, for what*

and why, we also told him that there was no set time that he will try to do it his way" (EPC8); therefore, it was described in each exercise prior to the development of the activity, that the therapists should take at least 5 minutes of the session to guide and motivate the boys and girls regarding what is going to be done; In addition, one of them reported that *"I liked to go because they did not grade me like in school"* (EPN9) , so, the aspects to take into account were considered the need not to perform positive or negative stimuli after a session.

Lastly, the application space could be adapted to two major aspects: (a) joint activities with friends, because the children reported that "it was going well for me, I liked going and I had friends (EPN1); therefore, it is proposed to invite a close friend of the boy or girl to at least one session per area so that they carry out the activities together and, in all the activities, a companion must enter because it was evidenced that , burdens can be created for the caregiver because they reported that "although the truth is exhausting", there are days when you get up and say, today I don't want to do anything! Because all the responsibility fell on me" (EPC12); That is why, you should try to involve your entire family nucleus because in one of the experiences the response was obtained "very few times I went in to see how they did the exercises because I felt sorry" (EPA2).

(b) carrying out outdoor activities, several actors alluded to "we went out to the park and he had to balance on the games" (EPA5) and "outdoor spaces could be added (EPF13); Based on this, in the section on the development of the activity, the variation of leaving the office to a free area for the development of the session was raised; For example, a park.

Based on the information collected, the contextual adaptation of the protocol was carried out, which led to a new version that

was submitted to expert validation (version 2).

Stage 2: moment 2. It was observed that the Content Validity Index (RVC=09) reflects that the exercises designed are valid for experts; not only from a content criterion, but from an experiential criterion.

In this sense, in front of the sensory exercises, they affirmed that: *“facilitates motor learning processes through feedback” (EPE3), “Allows perceptual discrimination of temperatures, response to stimulus (EPE1)” and “remarkably favors the affected hemibody” (EPE2).*

Regarding the mirror and restrictive exercises, they expressed that: *“I have observed the importance of managing the technique by restriction, since it allows the increase in the functionality of the affected upper limb (EPE6)” and “promotes the integration of the affected hemibody for the development of integrative activities facilitating selective motor control” (EPE7).*

Regarding the facilitation exercises, they stated that: *“these activities from the Bobath concept are very important to promote functional movement at an integral level” (EPE18) and “with these activities the child achieves greater alignment and control, also facilitates the development of gross and fine motor skills (EPE19).”*

Lastly, they expressed the importance of language stimulation exercises, saying that: *“promotes the development of verbal and written language, which favors their communication and school performance” (EPE22).*

However, the therasuit exercise required to be replaced by other psychomotor exercises, because it requires difficult-to-access materials, which reduces its applicability in context and makes it less natural. This despite having obtained a favorable report in the systematic review on techniques carried out in stage 1: moment 1.

In short, the contextual adaptation and the validation of experts led to the last adjustments of the comprehensive intervention protocol with ecological validity (version 3) (Figure 1).

DISCUSSION

According to the scientific literature, the rehabilitation process of children diagnosed with hemiparesis in the school stage is in charge of three disciplinary areas such as physiotherapy, occupational therapy and speech therapy. These disciplines, when working in a multidisciplinary manner, significantly improve the patient's proprioception, gait, and cognition (Perlaza, 2015; Ortiz et al., 2000). However, it is relevant to start promoting interventions in a comprehensive and interdisciplinary manner.

In this sense, the integral intervention protocol with ecological validity, proposed from this study, contemplates specific exercise modules by area that are connected to each other, in a two- or three-dimensional way. In addition, several of the exercises are carried out outside the office, since the experiences of daily life are recognized as personal and non-transferable, as well as inherent to the rehabilitative act (Rentería, 2004).

The protocol contemplates exercises with sensory, sensorimotor, integrative, productive, facilitative and stimulation techniques. In addition, it recognizes restrictive techniques, because according to the evidence, they promote cortical reorganization by stimulating the use of the affected lower or upper limb, thus generating a specific improvement (Eliasson et al., 2011; Durand et al., 2018). At the same time, it is beneficial to continue the traditional use of mirror therapy exercises as cognitive alternation (DeLuca et al., 2017; Kirton et al., 2016; Juste-Cuesta et al., 2016).

The area of speech therapy includes exercises that favor speech, language and other aspects depending on the degree of

severity of cerebral palsy and other difficulties associated with it (Ayala-Paredes et al., 2017). These interventions are not specific and static; therefore, they vary depending on the context of the boy or girl (Perlaza, 2015; Sakzewski, et al., 2015).

It should be noted, simple and easily obtained materials are proposed, which makes the interventions look accessible and real, but not, alien to the immediate context of the boy or girl and limiting when following the therapeutic process in each real context. . In addition, explanatory instructions are proposed, because it is important to recognize the why and for what of an exercise, so that greater feedback on the action-result and contextual adaptations in the spaces can be generated (Barrera et. al., 2022; Díaz & Pedraza, 2022).

The protocol also contemplates real participation environments such as parks, streets and classrooms, and the inclusion of real actors such as family and friends. This plays an important role in motivating the intervention by the boy or girl, since the natural spaces in which the person has previously developed are used (Romero, 2011).

In short, it is important to note from the results that the construction of being and the development of one's own life is determined not only by a biological process, but also psychological and cultural (Espinoza et. al. 2012). The comprehensive intervention protocol with ecological validity proposed in this study allows us to recognize the contributions of the evidence-based intervention, as well as the naturalness of the actions carried out by the actors around hemiparesis in school-age children. Undoubtedly, interventions in pediatric neurorehabilitation must begin to understand how subjects see their own world, because each one of them has their own significant experiences that develop at every moment of

their processes as social beings (Espinoza et. al. 2012).

CONCLUSIONS

Intervention protocols generally propose artificial and unnatural activities, because they do not take into account the real dimensions of the subject and, therefore, cannot be extrapolated beyond a clinical context. In addition, their interventions do not cover the entirety of the disciplines in charge of rehabilitation, tending to work for a different objective (fragmented) and not contemplating teamwork (interdisciplinary).

These protocols should (1) be based on scientific proposals that support the use of rehabilitative exercises from the evidence-based intervention; (2) involve the experience of family members, caregivers and/or companions, in the adequacy of the materials to be used in the intervention and in the construction of the instructions to develop the process; (3) recognize the most favorable context in which the most relevant situations for the subjects towards whom they are oriented are supposed to develop; and (4) validate the experience of professionals who have worked in rehabilitative action.

This supposes a divergent view of pediatric neurorehabilitation in which the different positions that have been built on the intervention make sense. Assume a critical reading of reality, but at the same time pragmatic in proceeding. This is how, the social neurosciences stand then as the contemporary response to the emerging scenarios in which human development is contemplated in an integral and not parceled way.

Lastly, it is advisable to start making complex readings of human reality that allow us to recognize the naturalness, ecology and diversity within which the subjects we call patients are immersed. Favor procedures of ecological validity of the assessments and

interventions that we know and that we design to make them more real and powerful. In itself, moving away from mechanical and artificial procedures with which we return to the curiosity, uncertainty and investigative creativity inherent in neurosciences.

CONFLICT OF INTERESTS

The authors declare they have no conflict of interest

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