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ECOLOGICAL VALIDITY IN PEDIATRIC NEUROREHABILITATION

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Abstract: Pediatric neurorehabilitation aims to address alterations subsequent to a neurological pathology, through mechanisms that seek to achieve comprehensive recovery. The ecological model of intervention proposes actions focused on the relationship of the human being with his natural environment, taking into account the events, experiences, feelings and customs developed in context. Unfortunately, traditional pediatric neurorehabilitation protocols do not take naturalness into account. In this sense, this trial aims to question the ecological validity of pediatric neurorehabilitation protocols to strengthen their comprehensive design. The review proposes to recognize the interactions that impact child development, such as the family, peers, the school environment, and socio-political and economic situations.
Keywords: Pediatric neurorehabilitation, ecological validity, ecological model, rehabilitation protocols.

INTRODUCTION

Bronfenbrenner (1976) proposed a proposal for child development from an ecological model in which he emphasizes the interrelation of the subject with the surrounding environment. Three levels are distinguished in the model: (a) internal level, the immediate level that contains the person, (b) secondary level, represented by the relationships between the different immediate environments, and (c) tertiary level, which infers that the action of the subjects depends on or is affected by decisions made in places where the person is not present (Pérez, 2004; Bronfenbrenner, 1976, 1987).

Within the ecological model, 4 systems are also demarcated: Initially the microsystem, being environments where the closest relationships predominate; mesosystem, as the interrelation between two or more *microsystems* of active participation; exosystem, which includes the micro and mesosystem; *macrosystem*, being the environment that includes different aspects such as culture, linguistics, beliefs, etc.; Finally, the *chronosystem*, which denotes the moment in which the person lives and how this impacts the conformation of their micro, meso, exo, and *macrosystems*. This ultimately raises an understanding of the subject in relation to his experiences throughout development, which is made up of components such as process, context, time and person (Dulcey-Ruiz 2010; Hernández et al., 2021).

However, it must be added, people's lives are related to internal and/or external factors, being constituted from the physical, social and attitudinal environment, generating an individual relationship of a positive or negative type which influences participation. that the subject has within a community (Hernández et al., 2021; Bronfenbrenner, 1976, 1994). This way, different elements that make up interrelationships that directly impact the development of the child are integrated, since the response to these systems shapes their development, just as the context influences it according to the quality of interactions in which they participate directly.

Bronfenbrenner suggests that some of the closest interactions are the family, peers, and school environment, which are described as microsystem elements within the ecological model, as they are integral components in the child's daily existence (Logan et al., 2012; Bronfenbrenner, 1994, 1987). While socio-political and economic situations are perceived as those in which, although there is no direct interaction with the child, non-participatory interactions are offered which result in an impact within the different systems. Additionally, as a relevant factor within the above, time as a cross-sectional component both in chronological age, as well as in the historical period in which these

interactions occur and exposure to it, directly impact the aforementioned factors (Dulcey-Ruiz, 2010).

In this sense, the recent conception of comprehensive pediatric neurorehabilitation is closely linked to the ecological model, since it is based on the relationship established by the subject with the environment, on the understanding of a complex subject, taking into account the experiences, the feelings and customs, previously established (Hernández et al., 2021).

The ecological validity seeks precisely to guarantee that the rehabilitation procedures take the patient/subject as the main actor within the conditions of their real environment. In this regard, Neisser (1976, cited by Valle, 1985) refers that ecological validity refers to the need for equivalence between experimental conditions and those of real life; Likewise, Silver (2000) adds that it is important to take into account various aspects within the intervention carried out, such as the relationship of the similarity of the intervention with the behaviors carried out within the natural environment and the information that the patient provides about participation. of other people in their daily life.

This way, through this article we intend to question the ecological validity of traditional pediatric neurorehabilitation protocols to strengthen their comprehensive design. In this sense, the text reviews the concepts of neurorehabilitation and ecological validity and also establishes the principles and challenges of designing protocols in pediatric neurorehabilitation with ecological validity.

NEUROREHABILITATION

Neurorehabilitation has been defined according to Bayona (2011) as the plastic capacity of the Nervous System together with its possibility of being neuro-modulated, referring to the capacity of neurons to alter electrical properties in response to biochemical changes, a result from hormonal/synaptic stimulation; Additionally, according to the World Health Organization (WHO), cited by León-Sarmiento et al. (2009), refers that "neurorehabilitation is an active process through which individuals with an injury or disease can achieve the most optimal recovery possible, which allows them the greatest physical, mental and social development, to integrate into the environment "(p. 128).

In accordance with the above, the concept of ecological approach becomes relevant within the neurorehabilitation intervention; since, it takes into account the natural context of the subject. It is therefore suggested that the activities proposed for pediatric neurorehabilitation must focus on daily tasks, instead of standardized training protocols; since, they lead to a poor generalization of therapeutic results, because they do not allow to identify improvement in the daily life of the patient, as they are tasks that are possibly isolated from their daily performance (Zimmermann et al., 2014; Vázquez-Gómez et al, 2022; Echemendia (1977, cited by Valle, 1985), 2021; Ospina & Serrano, 2009); as proposed by Bronfenbrenner (1994), who states that "an investigation is considered ecologically valid if it is carried out in a natural environment and with objects and activities of daily life" (p. 67).

Therefore, Tórrico-Linares et al. (2002), raise the need for health assessment and intervention instruments to have ecological validity over time, taking into account the interaction with the environment and the impact it entails on the person and the consideration of the possible needs of the individual. patient, as well as their closest environments (Buitrago et al., 2022).

This is why the concept of ecological validity has been questioned; since, although

multiple intervention protocols designed in the area of pediatric neurorehabilitation use it as a form of common action, they do not reflect the realities understood from daily life and natural physical contexts necessary for patients, but rather in controlled environments (Borg, 2000; Korman et al., 2015; Torriani-Pasin et al., 2021).

ECOLOGICAL VALIDITY

Ecological validity is defined as the need for equivalence between experimental conditions and those of real life, if theories formulated based on experimental data are to be applied to actions or behaviors that occur in natural environments; which are the ones that ultimately need to be explained. On the other hand, ecological validity can be understood as the point to which actions can be generalized or not (Valle, 1985). In the context of therapeutic intervention, reference is made to the degree to which the performance of the intervention performed corresponds to the performance of the real world; Therefore, ecological validity does not apply to the intervention itself, but to the inferences drawn from its application (Chaytor & Schmitter-Edgecombe, 1999).

Multiple studies have been carried out seeking to provide ecological validity to the evaluation tools used from the rehabilitation area, which favor the generalization and reliability of the results in daily life (Ehling et al., 2019; Silva et. al. 2020: Buitrago et al 2022). Therefore, ecological validity calls for the execution of an evaluation and approach that manages to demonstrate the difficulties that may arise in the real world of the patient and not only what is evidenced in controlled environment tests; since the results obtained could be irrelevant to the real situation (Holleman et al., 2020; Grewe et al., 2014; Labbé et al., 2017).

By making use of the ecological model during the assessment and intervention of neurorehabilitation, the professional can achieve a better understanding and vision of the real functionality of the subject within situations of daily life, for which reason specialized tests in specific activities fail to provide the approach previously raised (Zimmermann et al., 2014); That is why ecological validity has become relevant as a key piece in the process of pediatric neurorehabilitation. since, the questions asked move away from being questions of a diagnostic nature in order to establish the location of the lesion, to be turned into questions focused on the particular abilities and limitations of each patient in their day-to-day life; which allows inferences to be made about their state of health (García-Molina et al., 2007; Valdés, et al., 2023; Barrera, et al., 2022; Poncet et al., 2017; Buitrago et. al. 2022).

PRINCIPLES OF VALIDITY

According to Silver (2000), there are two important aspects within ecological validity: The first is related to the similarity of the test with the behaviors that are required within a natural environment and, the second, aspect to the extent that the scores of tests predict behaviors. In order to achieve ecological validity, a test must provide information about the patient participating in daily life, and not simply represent a construction of the world which it is intended to recreate.

VanBerkel et al. (2020), in their research "Dimensions of ecological validity for usability evaluations in clinical settings", establish the requirements for a study to have ecological validity; It was described below:

1. Roles of the patient: It is referred to as the representativeness of the objective participant sample, which implies that the study design must be centered on the subject, who provides information and participates in the same evaluation, balancing the participant's time and the

study requirements.

2. Environment: Space in which contextual realism must be guaranteed while taking into account patient safety and the specific requirements of the study design, being key to understanding the usability of the product; this way, it needs to be limited to satisfy practical and ethical concerns of the product – study, which suggests that real-world phenomena can be simulated in controlled environments.

3. Training: It refers to the quantity and availability of training material that can and is expected to be accepted by the user before and during the use of the product – study.

4. Scenery: It is considered as the broader context in which the product-study is evaluated, being a real scenario; which not only provides the researchers with the environment where the tasks will be developed, but also allows to guarantee that the participants commit themselves, because the objectives of the subject are built around it, in order to form scenarios that cover use of the product from start to finish.

5. Patient Participation: It refers to the deep knowledge offered by the realistic interaction between the professional and the user. In particular, to carry out a study where neurorehabilitation intervention with ecological validity is proposed, what was described by Silver (2000) in his research must also be taken into account *"Ecological validity of neuropsychological assessment in childhood traumatic brain injury"*, who highlights that it must be considered whether the intervention is applied to an adult or a child, since children present immature abilities that are expected to change and develop; However, although there is an expected time to meet different neurodevelopmental milestones, not all skills are developed at the same time; therefore, the family, social and educational context of the patient must be considered.

6. Software: It is the degree to which the integrity of the software and the simulated data subjects represent the breadth of real-world use cases. Data is often simulated during research in order to avoid jeopardizing the health and privacy of the patient.

7. Hardware: Effect of prototype fidelity on the ecological validity of the study. However, considering that Hardware is the physical and tangible support of a computer system, the concept of ergonomics is taken into account, seen as the interaction between the person and the environment, in order to generate healthy and comfortable environments that promote the increase in productivity (Pérez, 2017).

CHALLENGE IN PROTOCOL DESIGN

From a traditional approach, the evaluation and intervention in rehabilitation is carried out taking into account, mainly, an approach from the pathology and not from the particularity of the patient; This way, the person is perceived as segments of a body in which intervention is intended, whether due to an affected limb, affected movement, altered cognitive functions, etc.; which predisposes to an approach from the same segmentation approach that, although it can be addressed in parallel in different spaces, does not result in a complete integration of the function in parallel with the daily performance of the person, when naturally the acquisition processes are achieve comprehensively.

This is why the challenge of going beyond the traditional approach and transcending the rehabilitative role arises; Therefore, when intervening a person who presents

a neurological pathology, the intervention from pediatric neurorehabilitation is not aimed solely at mitigating the limitations that arise due to this, understanding the above as sequelae at the cognitive, motor, sensory level, among others. others; but also, how these can interfere in the performance of their daily lives. Although several of these limitations or difficulties can be understood due to the visible commitment, other more specific ones are difficult to identify, since a clinical environment is used that does not take into account the particularity of the patient, understanding the daily life of the person, as they are its physical, social, cultural context, etc.; which limits the knowledge of his performance on a day-to-day basis and does not allow generalizing the results of his particular evaluation and intervention.

Therefore, ecological validity becomes relevant not only in the initial evaluation of a patient, but also in the design of his intervention plan, where not only the neurorehabilitator's perspective is integrated from what he observes as limitations and/or strengths, but also also the person and their context, and as according to them, rehabilitation makes sense and relevance.

CONCLUSION

Ecological validity plays a fundamental role in the field of pediatric neurorehabilitation, in which the natural environment in which the individual lives and develops is taken into account, allowing a better understanding of the person's functional capacity and also addressing the needs, considering the capacities or skills with which it counts.

This review allows us to glimpse the need to continue conducting research that promotes the design of protocols with ecological validity, understanding the individuality of the person (microsystem, mesosystem, exosystem, and macrosystem); which will allow these to be applied and adapted in different population groups taking into account their contexts; This way, it can be applied in different pathologies, transferring the intervention from assistance to the person's daily life, allowing to assertively determine the functional capacity of the individual in daily life.

Additionally, in the design of protocols, procedures, among others, focused on the pediatric population, it is important to have knowledge of the neurodevelopmental milestones to be evaluated or intervened and how they are presented in different contexts, recognizing children as main actors in the construction of their natural environment and the interactions that are established in it.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

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