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SUMARIO ▫ SUMMARY ▫ RESUMO

MLS Inclusion and Society Journal, a continuation of the International Journal of Inclusion Support, Speech Therapy, Society and Multiculturalism (RIAI) is pleased to present the December 2022 issue. In line with previous issues, the articles are divided into research and reflection, with current and impacting topics.

The first article deals with the impact of hearing impairment on the psychoemotional development of profoundly deaf people according to their family of origin. The lack of studies comparing the educational and social adaptation of the congenitally deaf population, depending on whether their parents are deaf or hearing, is the motivation for the present study. The results show significant differences in the level of anxiety between the two subsamples investigated, concluding that it is essential to ensure the understanding of the items by the deaf participants, due to the difficulty of the test for this group of individuals, since it is in what for them is

a second language.

We continue with the ICT pedagogical practice of IPES teachers in Cameroon. This paper presents the challenges faced by teachers in Private Institutes of Higher Education (IPES) in their teaching practices with ICT and also proposes some suggestions for improvement. The analysis shows the need to restructure the operation of the IPES. This restructuring should consist of redefining the strategic framework of the IPES and the different actors, as well as training them in the appropriate use of ICTs in their pedagogical practice, thus facilitating their access to ICT tools.

The third research article deals with the linguistic and attentional profile of people with mild cognitive impairment, who have difficulties in their language and attention. The aim of this study is to describe the characteristics of their language, and to determine the association between the age of the participants and their language, as well as to know if there is an association between their language and attention, concluding that there are difficulties in their language, especially in the lexicon, and in the comprehension of sentences; there is also a strong association between language difficulties and age; as well as in these difficulties and in attention and impulsivity.

In line with current scientific news, we present research on neuropedagogy for multicultural classrooms, relating neuromethodology with inclusion. The main objective of this article is to learn about neuropedagogy in order to apply neuromethodologies in multicultural classrooms for the inclusion of students. The results show different neuromethodologies that can be applied in the classroom, among which we highlight mindfulness, meditation, competency-based learning, project-based learning, game-based learning, cooperative learning, flipped classroom,

design thinking, gamification or a neuromethodology closely linked to the current technological era such as mobile learning.

The last research article deals with neuromarketing as a tool for decision making in the university context. The results show that marketing and educational marketing are not as important for Spanish universities as they are for Paraguayan universities. Both coincide in the importance of neuromarketing and strategic planning, so that marketing actions with a "neuro" approach could strengthen actions to attract potential students to universities, with neuromarketing strengthening the attraction of university students.

We close this issue with a thought-provoking article on neurocreativity, considered as a process linked to brain activity. This process is understood as a "capacity to create" as opposed to the notion of innovation that focuses on the "action of creating". Thus, people are more creative when they detect cognitive stimuli linked to brain noradrenaline levels, since it favors communication between networks.

Finally, this issue provides different lines of research and reflection that show the scientific activity both in ICT and in "neuro", showing the panorama of current research.

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IMPACT OF HEARING DISABILITY ON THE PSYCHOEMOTIONAL DEVELOPMENT OF PERSONS WITH PROFOUND DEAFNESS ACCORDING TO FAMILY OF ORIGIN

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Abstract. The lack of studies comparing the educational and social adaptation of congenitally deaf population, according to whether their parents are deaf or hearing, is the motivation for the present study. The aim was to determine the effects on the psychosocial development and anxiety level of profoundly deaf persons depending on whether their parents were deaf or hearing. The study sample comprised 12 deaf individuals aged between 24 and 67 years (M=38.92; SD=13.957; 66.7% women). We used the State-Trait Anxiety Inventory (STAI), adapted for deaf population by means of video in which a specialist in Spanish sign language presented each item, ensuring they were all understood. The results show significant differences in level of anxiety between the two sub-samples. It is essential to ensure deaf participants' comprehension of the items, due to the difficulty the test involves for this group of individuals, given that is in what for them is a second language. If participants were born in a family with

hearing parents or deaf parents it would help determine preventive elements and the actions to be implemented for all deaf children to be diagnosed as early as possible.

Keywords: anxiety, deaf, normally hearing, sign language

IMPACTO DE LA DISCAPACIDAD AUDITIVA EN EL DESARROLLO PSICOEMOCIONAL DE PERSONAS CON SORDERA PROFUNDA SEGÚN FAMILIA DE ORIGEN

Resumen. La falta de estudios que comparen la adaptación educativa y social de la población con sordera congénita, según sean sus padres sordos u oyentes, es la motivación del presente estudio. El objetivo era determinar los efectos sobre el desarrollo psicosocial y el nivel de ansiedad de las personas con sordera profunda en función de si sus padres eran sordos u oían. La muestra de estudio estuvo compuesta por 12 personas sordas con edades comprendidas entre 24 y 67 años (M = 38,92; DE = 13,957; 66,7% mujeres).

Se utilizó el Inventario de Ansiedad Rasgo-Estado (STAI), adaptado a la población sorda mediante un video en el que un especialista en lengua de signos española presentaba cada ítem, asegurándose de que se entendieran todos. Los resultados muestran diferencias significativas en el nivel de ansiedad entre las dos submuestras. Es fundamental asegurar la comprensión de los ítems por parte de los participantes sordos, debido a la dificultad que supone la prueba para este grupo de individuos, ya que es en lo que para ellos es una segunda lengua. Si los participantes nacieran en una familia con padres oyentes o padres sordos ayudaría a determinar los elementos preventivos y las acciones a implementar para que todos los niños/as sordos sean diagnosticados lo antes posible.

Palabras clave: ansiedad, sordera, normo oyentes, lengua de signos

Introduction

Most research in the deaf population has focused on language and intellectual development, while scant attention has been paid to the importance of emotional development in this developmental process. Additionally, few studies have been conducted in sign language.

Emotional intelligence has been described as a complex construct, composed of emotional, personal and social skills. The model of conscious emotional bonding intelligence (Vinculación Emocional Consciente, Autor, 2009, 2014, 2015, 2019) refers to "the ability to consciously bond with the emotion we feel at each moment", such that the nucleus of emotional intelligence lies in feeling and not in thinking about what we feel.

Anxiety is the consequence of rigidity or chronicity in the activation of the emotions of anger, disgust and fear. Thus, what we describe as anxiety can be measured by the acceleration of our nervous system (glutamate activation) as a rigid response to these three emotions (Autor, 2009).

The impacts of deafness on cognitive development are essentially related to linguistic and communicative isolation. A deaf person's language and communicative abilities logically affect their relationship with the peers (Hintermair et al., 2017;

Marschark & Spencer, 2010). It has been shown, for example, that deaf children's communicative abilities are positively related to the frequency of social interaction and the frequency of participation in associative and collaborative games (Hintermair et al., 2017; Wolters et al., 2012). Additionally, during interactions, deaf and hard of hearing persons, especially in the early years of life, tend to use a greater proportion of literal or current-action utterances about and speak less about abstract or symbolic concepts (Brown et al., 1997). In fact, any language impairment resulting from serious deafness limits the capacity for interaction, while the acquisition of any language (including sign language) permits the normal exchange of messages and concepts, limiting the negative consequences of hearing difficulties (Courtin, 2000; Bowman-Smart et al., 2019).

The effects of deafness on linguistic and cognitive development can vary greatly depending on the way in which family, society and culture react to, and interact with, a hearing impaired person (Bowman-Smart et al., 2019). Arguably, the impact of an individual's hearing impairment on their quality of life can be moderate or can be magnified by their social and family environment. The lack of communication and auditory stimulation, for example, can seriously compromise the psychological and social adaptation of children with hearing problems (Bowman-Smart et al., 2019).

The family plays a key role in the language acquisition process. Children with hearing parents normally exhibit a substantial delay in language development, which varies greatly according to the individual due to the influence of multiple factors that include, among others, early diagnosis, level of hearing loss, the time and type of intervention and individual characteristics (Hussain et al., 2021; Malaia et al., 2020). In contrast, when the deaf child's parents are also non-hearing, the impairment of language skills is not so evident (De Santis, 2011). From a more general perspective, the attitudes of the parents and their participation in their child's educational process and the social support received are aspects related to the social and academic development of deaf persons, especially in the early years of life (Calderón & Greenberg, 2000; Hussain et al., 2021).

The main cause of this disparity is likely the difficulty hearing parents have in communicating with their deaf child and transmitting them concepts and knowledge. Even if one of the parents commits to learning sign language, they are unlikely to become sufficiently proficient in a short enough time to satisfy the communicative needs of their child in the early years of their life.

According to Porter et al. (2021) hearing parents find the diagnosis of deafness much more traumatic. Indeed, when the child is very small and before diagnosis, they interact with their child naturally and spontaneously and their communication strategies are multimodal. When the suspicion of deafness emerges, something is lost and the situation often deteriorates once the diagnosis is established (De Santis, 2011; Meadow-Orlans, 2001; Porter at al., 2021).

Deaf populations are generally highly heterogeneous in their cognitive, social and emotional development (Fellinger et a.l, 2012). A number of studies have evidenced that children with hearing impairments often present difficulties in their social-emotional development (Dammeyer, 2010; Hogan et al., 2011; Overgaard et al., 2021; Pourmohamadreza-Tajrishi et al., 2013; Sidera et al., 2020). Furthermore, it has been extensively shown that social-emotional development is a predictor of mental health,

substance use, aggression, and academic and professional attainment (Kushalnagar et al., 2019; Wong, et al., 2020).

Two factors appear to have a direct impact on this development in deafness: language skills and social interactions. On the one hand, limitations in language development and difficulties in communication determine the presence of social-emotional problems (Overgaard et al., 2021; Sidera Morgan & Serrat, 2020) and make deaf individuals susceptible to facing social and psychological disorders (Kushalnagar et al., 2019; Pourmohamadreza-Tajrishi et al., 2013; Wong et al., 2020). On the other, difficulties in communication constrain the possibility of socialisation and compromise the quality and quantity of social interactions (Marschark & Spencer, 2010), and given that social-emotional development depends on the capacity to interact and the ability to show empathy (Rivers et al., 2013; Sidera et al., 2020; Tsou et al., 2021), problems of socialisation hinder the development of these skills.

Thus, it is important to study effects on profoundly deaf individuals' psychosocial development and their level of anxiety depending on whether their parents are hearing or non-hearing. Accordingly, we propose three hypotheses: 1) The level of anxiety in congenitally deaf individuals is different depending on whether the parents are deaf or hearing; 2) The level of trait anxiety is higher in congenitally deaf individuals of hearing parents compared to those of deaf parents; and 3) The level of state anxiety is higher in congenitally deaf individuals of parents that are hearing compared to those of deaf parents.

Method

Participants

This was a cross-sectional, correlation study using convenience sampling. The sample comprised 12 signing deaf persons aged from 24 to 67 years (M=38.92; SD=13.957; 66.7% women). The overall sample wad divided into two sub-samples according to the parents' hearing capacity, with one group whose parents were hearing (aged 25-54 years; M=40.33 and SD=13.837; 66.7% women) and one in which the parents were deaf (aged 24-67 years; M=37.5 and SD=15.241; 66.7% women).

All the participants were of legal age and voluntarily took part in the research.

All the participants were informed of the aims of the study, their right to drop out, the use that would be made of their data, the personal data protection law (Organic Law 2/2018, of 5 December, on Data Protection and Guarantee *of* Digital Rights), and they all signed documents stating they had been informed of and understood all the details of the research.

Instruments

To measure anxiety, we used the State-Trait Anxiety Inventory (STAI) (Spielberg et al., 1970; Spanish adaptation by Buela-Casal et al., 2015). It comprises 40 items, 20 measuring state anxiety and 20 measuring trait anxiety. Participants rate their level of anxiety on a 4-point Likert scale from 0 (never/almost never) to 3 (always/almost always)

in response to situations described in each item. The confidence intervals in this study were adequate (.946 and .938 for state and trait anxiety, respectively).

Given deaf people's frequent difficulties in reading and writing, we produced a tutorial video in which all the items on the STAI were transcribed into sign language. Participants could thus see the questions on the computer screen and had access to a corresponding recording of each item in sign language.

This ensured the items were understood by the signing participants and that they all comprehended the emphasis on the emotional content transcribed to sign language. This aspect was given great consideration, being a special element of the study.

Procedure

The sample was recruited through the Euskal Gorrak association, which assists deaf people in the Autonomous Community of Euskadi (the Basque Country). The participants were all members of the association and thus we used a convenience sample.

As regards the number of participants, there are no more than 12 members of Euskal Gorrak association with deaf parents, and thus 50% of the overall population in this study were deaf individuals with deaf parents. We then obtained a comparable sample of deaf persons of similar characteristics but with hearing parents. Given the extremely small number of deaf persons with deaf parents, we invited the whole population to participate, of whom 50% voluntarily accepted. The Euskal Gorrak association selected a sample of deaf persons with hearing parents that was equivalent in age and gender to the sample of deaf participants with deaf parents.

The participants were invited in groups of six to a meeting with the principal investigator in a specially prepared room with individual computers to explain the aims of the research.

Additionally, the Euskal Gorrak association provided sign language specialists to ensure participants understood the procedure and instructions and could use the computer and understand the task. The study was reviewed and studied by the Conduct Committee of the Euskal Gorrak association, to check the appropriateness of the study and to guarantee the study design was followed at all times and across all phases.

The time taken to administer the test was 10-25 minutes, depending on the time needed by each participant to understand the questions and respond.

Statistical analyses

First, to determine whether the groups were equivalent, we compared the ages and gender of the participants in each group, using the Mann-Whitney U Test and the Chi-squared test, respectively. We then compared the levels of anxiety between the two groups to test the study hypotheses. To do so, we evaluated the assumptions of normality and homogeneity of the variances of each group, and subsequently compared the levels of state and trait anxiety, using the Mann-Whitney U Test.

For each comparison, we calculated the effect sizes for non-parametric tests using Hedges' g, and followed the recommendations of Cohen (2013) for their interpretation. The sample was selected using convenience sampling, comparing age and sex. To test the

hypotheses, we used normality and homogeneity tests in the two sub-samples. The analyses were conducted using SPSS Version 26.

¶Results

First, Table 1 shows the descriptive statistics for the participants in the study depending on whether they are congenitally deaf individuals of hearing parents or congenitally deaf individuals of deaf parents. We compared age and sex between the two groups.

Table 1

Descriptive statistics for the measurement instrument

SEX	PARENTS	PD STATE	State Percentile	State Decatype	PD TRAIT	Trait Percentile	Trait Decatype
F	CD-HP	20	65	6	31	77	7
F	CD-HP	22	70	7	43	95	9
F	CD-DP	2	3	2	12	13	3
M	CD-HP	36	97	9	26	77	7
M	CD-DP	9	25	4	18	50	6
M	CD-DP	10	25	4	16	45	5
F	CD-DP	29	80	7	32	80	7
F	CD-HP	51	99	10	56	99	10
F	CD-DP	10	23	4	14	20	4
F	CD-DP	17	55	6	19	40	5

F	CD-HP	26	75	7	23	50	6
M	CD-HP	26	85	8	24	75	7

Note. F (female); M (male); CD-HP (congenitally deaf persons of hearing parents); CD-DP (congenitally deaf persons of deaf parents)

Second, the normality tests show that state anxiety and trait anxiety were distributed normally (KS=0.185 p=.200; KS=0.203 p=.183). The homogeneity tests revealed that the variances are homogenous between the groups in both state anxiety ($F_{(1.10)}$=2.424; p=.151) and trait anxiety ($F_{(1.10)}$; p=.537). Although the criteria of normality and homogeneity of the variances were fulfilled, owing to the small sample size, we decided to use non-parametric tests.

Third, we analysed the types of statistically significant relationships between some of the study variables. A comparison of the groups by age and sex revealed no significant differences according to age (Z=-0.480; p=.631) or sex (X^2=0; p=1). These results suggest the groups are comparable in their demographic aspects.

However, statistically significant differences were found in the analysis of state anxiety. There were differences between the groups (Z=-2.406; p=.016) and the effect size was large (Hedges' g= 2.008).

As regards the trait anxiety variable, the tests show differences between the groups (Z=-2,169; p=.030) and a large effect size (Hedges' g= 1.692). The deaf persons of hearing parents scored higher than those of deaf parents.

Presentación clara de los resultados obtenidos.

Discussion and conclusions

Studying deaf people and their level of anxiety according to the type of parents (deaf or hearing) is of great importance to determine their emotional status (Meadow-Orlans, 2001; De Santis, 2011; Wolters et al., 2012) and self-esteem (Woolfe & Smith, 2001).

This study confirms the first hypothesis that anxiety in deaf population differs according to whether the parents are deaf or hearing. Having parents that are hearing at the moment of birth may lead deaf individuals to develop a higher level of anxiety compared to those whose parents are deaf. Courtin (2000) showed that deaf children of hearing parents typically receive fewer explanations and that these tend to be less complete, complex and abstract compared to those provided by deaf parents. This phenomenon, as well as limiting the child's possibility of greater development of language skills, reduces their opportunities to learn about social and emotional states and their characteristics (Marschark & Spencer, 2010). Besides, hearing parents find it

difficult to learn sign language and they prefer hearing and speech as their child's communication mode

Our findings also support the second and third hypotheses in that congenitally deaf individuals of normally hearing parents scored significantly higher on both trait and state. As mentioned, Meadow-Orlans (2001) reported that the diagnosis of deafness is much more traumatic for parents that are normally hearing, and, after the diagnosis, they begin to feel incompetent in their communication with their child and often feel blocked, leading to poorer stimulation at the very time when it should be stronger. The fear of not being understood and the shortcomings of the adult communication model generate a sort of "linguistic overprotection" (De Santis, 2011). This fear is often unconscious, leading parents to reduce the messages they transmit to the deaf child, limiting the linguistic complexity (Schlesinger, 1987 cited in De Santis, 2011; Druet & Escalante, 1998). Hearing parents tend to have a strong preference for their deaf to acquire adequate speech, to promote the inclusion of their children in the hearing world. Some of them appreciate sign language as the means of access to the Deaf community. However, most hearing parents do not know sign language when their child is diagnosed with deaf and acquiring proficiency in this mode of communication is a long and arduous process for them (Goldblat et al., 2020). However, deaf individuals felt closer to deaf parents and deaf siblings than to hearing parents and hearing siblings (Woolfe & Smith, 2001).

Similar studies are needed, which take into account the importance of assessing in sign language, in order to determine without the difficulty of being evaluated in a second language. Thus, results that are more representative of the deaf population would be obtained.

Further studies are necessary comparing different variables according to whether participants were born in a family with hearing parents or deaf parents. This would help determine preventive elements and the actions to be implemented for all deaf children to be diagnosed as early as possible and so receive the appropriate actions from the family and the correct health and social interventions needed to help avoid their emotional and social future being affected.

Finally, the present study is not without limitations. First, the sample size is very small, as we were obliged to reduce the sample of deaf participants of hearing parents as the population of deaf individuals of deaf parents is very reduced; in this case, 50% of the members registered in the Euskal Gorrak association. We believe that similar studies to ours would help give a greater capacity for the findings to be generalised, and, thus, it is important to continue investigating in this line. Second, it is key to place the emphasis on the first language of congenitally deaf persons, namely, sign language, considering that any other language is their second language. It would be of interest to see if this has an impact on results in future studies. Third, further studies are needed in deaf population using the adaptation of the STAI to sign language, in order to reliably measure its consistency with the original inventory.

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PEDAGOGICAL PRACTICES WITH ICT: CASE OF PIHE TEACHERS IN CAMEROON

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Abstract. This work has as objective to present the challenges faced by teachers of Private Institutes of Higher Education (PIHE) in their teaching practices with ICT, and to propose some answers. Based on the mixed method (Lynd & Lynd, 1929/1959), participatory observation is carried out in order to present the PIHE teacher. The data collection carried out highlights quantitative data and teachers' opinions about their teaching practice. From the academic qualification of the teachers, it emerges from the analysis of the results that the teaching body of the IPES is heterogeneous. We meet teachers from higher training schools, professionals in the field in their areas of competence, graduates who have completed five years of university training and obtained a Master's degree, engineering or equivalent, who are waiting to be recruited into a company, improvise as teachers. Teachers in the vast majority seem to present basic ICT skills, are aware of their importance in their teaching practice, but are not sufficiently supported in this process of change. The analysis shows the need to restructure the operation of the PIHE. This restructuring should consist of the redefinition of the strategic framework of the PIHE, the redefinition of the various actors and the training of the latter in the adequate use of ICT in their teaching practice while facilitating their access to ICT tools. In order to facilitate an effective pedagogical practice of PIHE teachers with ICT, it is important to ensure that they are trained, equipped and motivated.

Keywords: practical/pedagogical, ICT, training, teacher, PIHE

PRÁCTICA PEDAGÓGICA CON LAS TIC: CASOS DE LOS DOCENTES DE LOS IPES EN CAMERÚN

Resumen. Este trabajo presenta los desafíos a que se enfrentan los docentes de los Institutos Privados de Educación Superior (IPES) en sus prácticas docente con las TIC y asimismo propone algunas propuestas de mejora. Con base en el método mixto (Lynd & Lynd, 1929/1959), se ha realizado una observación participativa a fin de presentar al docente de los IPES. La recogida de datos nos permite destacar datos cuantitativos y las opiniones de los docentes respecto a su práctica docente. En cuanto a su calificación docente, se desprende del análisis de los resultados que el cuerpo docente de los IPES es heterogéneo. En este campo, encontramos profesionales de la docencia, profesionales de otros dominios, estudiantes con Máster, ingenieros o con grados equivalentes que, en espera de tener un empleo en una empresa, se improvisan docentes. La mayoría de los docentes parece tener habilidades básicas en TIC, es consciente de su importancia en su práctica docente, pero no tiene suficiente acompañamiento en este proceso de cambio. El análisis muestra la necesidad de reestructurar el funcionamiento de los IPES. Dicha reestructuración debería consistir en la redefinición del marco estratégico de los IPES y de los diferentes actores, así como la formación de los mismos en el uso adecuado de las TIC en su práctica pedagógica, facilitando así su acceso a las herramientas de las TIC. Para facilitar una práctica pedagógica efectiva de los docentes de los IPES con las TIC, es importante asegurar que estén capacitados, equipados y motivados para tal fin.

Palabras clave: práctica/pedagógica, TIC, formación, docente, IPES.

Introduction

Pedagogy can be defined as the art of educating or teaching (Houssaye, 2014). Pedagogic practice is made up of the different actions or activities carried out with the aim of educating or teaching. We therefore talk of pedagogue, educator or teacher. Pedagogy has undergone several changes. We started from a pedagogy in which the vector of knowledge was the teacher and the receiver the student (behaviorism), to a pedagogic practice in which the teacher and the learner are collaborators in the teaching/learning process, in which the tools of Information and Communication Technology (ICT) are integrated (connectivism). Today, teachers and learners pool their knowledge in the construction of new knowledge. This neologism in educational practice makes knowledge a common value which makes training and knowledge more accessible, provided that an ICT tool is available. Work carried out on ICT for technical and professional education within the framework of a study carried out in India, (Tran Thanh, 2014, p. 3) presents ICT as a tool for "améliorer l'accès à l'éducation en réduisant la distance entre les apprenants et les infrastructures ou les ressources, rendant ainsi l'éducation plus inclusive". Based on the work of Depover & Marchand (2002), Julia Tran Thanh presents the obstacle that temporal and geographical accessibility can be in the desire to train. Because of ICT, this obstacle can be overcome. ICTs thus give the possibility to anyone wishing to train, to acquire knowledge and skills through distance learning. However, these people should have a basic knowledge of the use of ICT. Distance learning should be seen from the outset as an educational concept rather than a technological one. In other words, reflection on the place of ICT in education should go beyond the aspect of access to first consider that of teaching and learning methods (Durampart, 2007).

The introduction of ICT into teaching practice requires teachers to relearn how to teach and learners to relearn how to learn. For this to be possible, teachers should review

the learning theories implemented in their teaching practices. Indeed, there are five major theories of learning: behaviorism (Good & Brophy, 1995), cognitivism (Bibeau, 1996), constructivism (Doolittle, 1999), socio-constructivism (Doise & Mugny, 1981) and connectivism (Siemens, 2005). A pedagogic practice with ICT requires:

- Computer equipment connected to a computer network and/or network of networks (Internet);
- Teaching/learning actors (teachers and learners) with basic knowledge in the use of IT tools;
- Motivation of each of these actors to use new teaching/learning techniques;
- The capacity of the actors of teaching/learning to go towards information, to exchange with others, to rub shoulders with other disciplines in order to build or update knowledge.

All of the aforementioned information refers us to two theories previously presented: The theory of socio-constructivism and the theory of connectivism. Our work is based on these two theories. Application of these theories could not be done without the presence of people trained and equipped for the transmission and sharing of knowledge: teachers.

The teacher is the person who has the responsibility to accompany anyone wishing to train, to acquire knowledge and/or skills, to achieve their objectives. Putting socio-constructivism and connectivism together, the teacher must be able to accompany the learners in the construction of their knowledge according to social reality. This must be done on the basis of the use of connected tools in order to broaden the possibilities that could arise without being totally on the sidelines of the current changes in the world. The implementation of connectivism is essential today in all countries of the world. The situation of the Covid-19 pandemic has strongly illustrated this. The place occupied by the teacher in the teaching/learning process makes his training in the use of ICT a modeling factor in the field of ICT in school (Tchameni Ngamo & Karsenti, 2008). According to Larner and Timberlake (1995), six variables determine the use of ICT by teachers: knowledge, anxiety, personal attitude, professional attitude, support, resources available at school. An imbalance between these different variables could have a considerable impact on the effectiveness of teaching practice with ICT. A teacher who is well trained in the use of ICT in his pedagogical practice will be better able to select the best tool or the best approach according to the objective targeted by his teaching. Support for learners during teaching will also be done in a simpler way, which will develop in the teacher a feeling of personal effectiveness, a very important human element in the successful integration of ICT at school (Isabelle, Desjardins & Bofili, 2012). To take the plunge, the teacher needs to be accompanied and not judged or even penalized. This, far from easy process calls for genuine support and collaborative work to ensure success. What completes this process is the endowment of the teaching/learning actors with the necessary ICT resources in the training centers.

The training centers that have aroused particular interest in the context of this research work are the Private Institutes of Higher Education (PIHE) in Cameroon.

Preliminary research on these IPES suggests that research on pedagogic practices with ICT in this training framework would seem to be non-existent. Whereas, these IPES

present themselves as professional training managers at the cutting edge of technology. In juxtaposing the information obtained from the sites *kamerpower.com*[1] et *cameroon-tribune.com*[2], it appears that the first PIHE in Cameroon dates as far back as 1960, set up by religious congregations. These PIHE provided only teaching in theology. They functioned as associations. It was in 1998 that secular private institutes for post-secondary education came into being. Nearly a dozen, the majority of these institutes are an extension of private secondary establishments. These institutes have a student enrollment of around four thousand three hundred and twenty-seven (4327). Observing the rapid development of the sector, the government decided to put in place a legal framework in order to ensure the quality and diversity of teaching offers. Then, in September 19, 2001, the Prime Minister, Peter Mafany Musonge, signed a decree setting the common rules applicable to private institutions of higher education. This decree defined the general provisions of these institutions, their missions and objectives, the conditions of creation, opening and extensions. It also defined the promoter of the institution and the teaching staff.

From what preceeds, it followed that the teaching staff of the PIHE were to be staff recruited in compliance with a procedure identical to that followed when recruiting the teaching staff of state universities. These staff, in accordance with article 26 of law N° 005 of 16 April 2001 on the orientation of higher education, are the permanent teaching staff of the PIHE. If we refer to article 11 of the decree on the special status of higher education staff (Cameroon P. R., 1993), as university assistants, the permanent teaching staff of PIHE should be responsible for tutorials or exercises and practical work for examination boards. They should evolve under the responsibility of professors, and lecturers. This implies that in the teaching staff of the PIHE, teachers of magistral rank should be included, in accordance with articles 9 and 10 of the previous decree, in order to provide the lessons, directed exercises and practical lessons. Alongside these permanent staff, the PIHE can call on temporary staff in order to complete the number of teaching staff. In accordance with article 45 of the aforementioned decree, temporary staff should obey the same academic requirements as permanent staff.

In view of with what the texts of laws present, and the expected results of the promoters of the PIHE, we wanted to go into the actual functioning of the PIHE to provide answers to these questions: Who are actually the teachers of the PIHE? Are they sufficiently equipped for a pedagogical practice with ICT as required by the theory of connectivism? Research on IPES being poorly documented in Cameroon, we considered it important to focus on this training sector so that adequate solutions can be found in order to improve it.

Method

[1] https://kamerpower.com/fr/evolution-historique-des-instituts-prives-denseignement-superieur-au-cameroun/amp/

[2] https://www.cameroon-tribune.cm/article.html/18311/fr.html/instituts-prives-de-lenseignement-superieur-cap-sur-de-nouveaux-defis

Design

Our research is conducted in Cameroon in the cities of Yaounde, Douala, Bafoussam, Ngaoundere and Maroua, within the PIHE. Training frameworks created for nearly two decades in Cameroon, the IPES offer professional training intended to equip learners for a good integration into the business world. Observing the new requirement of the industrial world which is the mastery of Information and Communication Technologies (ICT), we found it appropriate to focus on the pedagogic practices of PIHE teachers with ICT. Are they sufficiently equipped with ICT to ensure adequate training for future employees in the professional world? To answer this question, we proceeded to an observation of what is practiced within the PIHE. This observation allowed us to come up with a "definition" of IPES teaching staff. Then we distributed a questionnaire to collect the opinions of PIHE teachers concerning teaching practice with ICT.

Participants

The population that participated in our research is the teaching staff of PIHE in Cameroon (Yaounde, Douala, Bafoussam, Ngaoundéré and Maroua), more specifically, teachers of levels 1 and 2 of PIHE. These training levels correspond to the training levels preparing for the higher national diploma (HND).

Instruments

For nine years, we have observed the functioning of the PIHE both administratively and academically. As a training manager in one PIHE in the city of Yaounde, we have been involved in the process of recruiting teaching staff in this training framework. We also represented the promoter of the PIHE in which we practiced in several sectors bringing together the promoters of the PIHE in Cameroon and the officials of the Ministry of Higher Education. These meetings allowed us to discuss with our colleagues from other PIHE in order to inquire about the realities in their daily practices and the challenges they face.

The collection of the opinions of PIHE teaching staff with regard to teaching practice with ICT was done on the basis of a questionnaire in the cities of Yaoundé, Douala, Bafoussam, Ngaoundéré and Maroua.

Data Analysis

As part of our work, we have Observed the operation of the PIHE in order to highlight who are the actual teaching staff of the PIHE and then we collected their opinions via a questionnaire. This questionnaire allowed us to obtain both quantitative and qualitative information. Our analysis is mixed. This analysis brings together qualitative analysis methods and quantitate

ive methods in a research work. The combination of these methods is very present in disciplines such as anthropology, sociology, educational sciences (Lynd & Lynd, 1929/1959). The purpose of bringing these methods together is to realistically answer the research questions (Aldebert & Rouzies, 2014).

Results

Participatory Observation

Having been responsible for training in an IPES in the city of Yaoundé in Cameroon for seven years, we had to attend several meetings bringing together the heads of several PIHE. These meetings were an opportunity to share our experiences and learn from others. Observing what is done in a proportion of PIHE, there arises the difficulty of responding scrupulously to what the law says about teachers of PIHE. It would be difficult by observing the functioning of each PIHE in Cameroon to see a teaching staff

structured as required by the decree on the special status of higher education personnel. Because complying with this instruction would amount to having permanent staff who should be supported financially 12 months out of 12 months of the year. This is sometimes very difficult for promoters of PIHE to hold. So, the tendency would be to recruit more part-time teachers than permanent teachers, who will only be supported when they actually teach. Remuneration is based on the number of hours actually worked in the classrooms.

From there, here is what we could observe in the PIHE:

- In order to obtain from the academic supervision, the authorization of creation and opening, the responsibility of each course or specialty requested is occupied by at least one Doctor in the field of the corresponding sector or specialty. This person in charge could be a professor of a State University. Being in function in a public institution, he cannot therefore be a permanent teaching staff within the PIHE, this in accordance with article 48 of the decree fixing the common rules applicable to private institutions of higher education (Cameroon P. M., 2001). He is therefore a resource person and accompanies the PIHE in the monitoring of lessons and the supervision of teachers.
- In order to meet the teaching requirement, part-time teachers are recruited. Recruitment takes place at the beginning of each academic year. A recruitment committee is set up within the PIHE in the presence of the resource persons mentioned above. From the observation made, we found that the candidates can come from:
- Teaching staff in general or technical secondary education, depending on the areas of expertise;
- People working in the professional world. In this case, they may have a diploma corresponding to a BAC+5;
- Young graduates with BAC+5 levels who, in the midst of job search, need to take care of themselves and meet their daily financial needs;
- Young doctors who, awaiting recruitment as university assistants in State Universities, also need to take care of themselves and provide for their daily financial needs;
- State University teachers.

Teachers recruited at the end by the recruitment committee will be responsible for providing lessons to PIHE learners in accordance with the teaching program given to them and also the teaching method requested of them. It seems to be difficult, with regard to the observations made, to see among the teaching staff of the PIHE, the staff specially assigned to provide tutorials and practical work. In some cases, when this is observed, these are people with the equivalent of a degree.

- In order not to put themselves completely on the fringes of the law which requires PIHE to recruit permanent teachers within their teaching staff, some make the effort to supplement the number of their teachers with a few permanent teachers. In this case, the task of the permanent teacher would not be limited to teaching. In addition to teaching duties, he is assigned a position of responsibility within the PIHE and he also has the duty to provide a total of 300 hours of lessons per academic year.

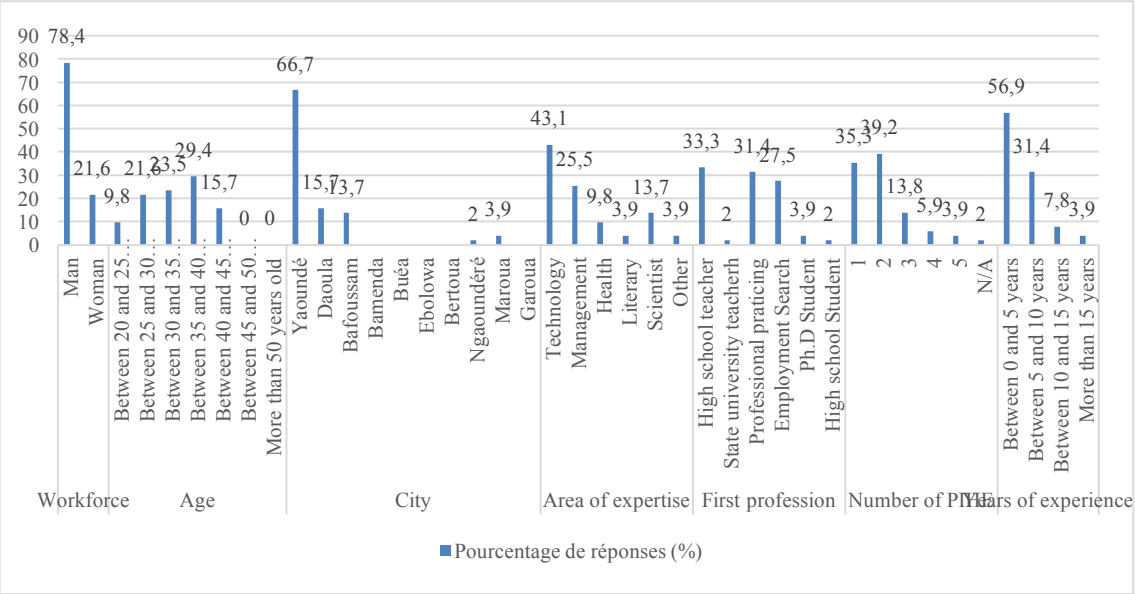
In this context of PIHE in Cameroon, integrating ICT into teaching practice seems to be a great challenge. Knowing the work entailed by the integration of ICT in teaching practice, and faced with a context in which teachers would be on the lookout for lesson hours in order to have a substantial remuneration, would it really be easy for them to consent to everything necessary so that the integration of ICT in their teaching practice is really a reality? From our experience in PIHE in Cameroon, complains from teachers seem to converge on the same issue: working conditions. The working conditions described by some teachers with whom we had to exchange seem to be a crucial problem that should be solved in order to make the framework conducive to the integration of new technologies. This point is one of the elements that we wish to verify. But already, what emerges from the observation carried out within the PIHE for more than seven years is that the teachers of the PIHE seem to face several difficulties in the integration of ICT in their teaching practice. Teachers try as best they can to comply with the legal texts, but are sometimes forced to find ways and means that can enable them to arrive safely.

The questionnaire

We have structured the questionnaire into five main groups, namely the attributes, the uses made of ICT, self-assessment of the basic notions of ICT, ICT tools in IPES, and finally, the opinion of IPES teaching staff on teaching practice with ICT.

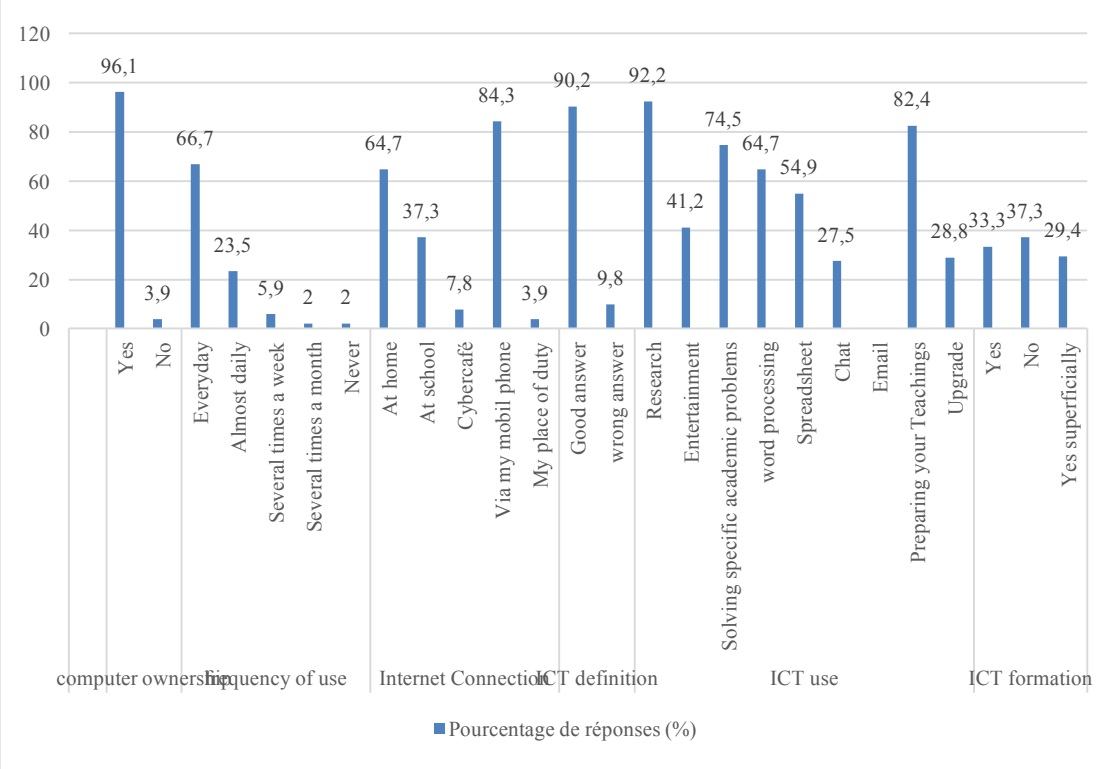
Our original intention was to collect data from 210 staff. However, we only collected data from 51 PIHE teaching staff. The difficulty encountered was the refusal of several PIHE to participate in the data collection. The world of PIHE being a highly competitive world, several managers of PIHE feared the closure of their PIHE if the results of our research had presented shortcomings. Knowing that a teaching staff intervenes at least in two PIHE of the same city; and can also intervene in the PIHE of neighboring towns, we believe that the size of our sample could shed light on information describing the reality in the PIHE in Cameroon.

The figure below presents the different attributes of the teaching staff surveyed:



Source: Results of data collection by questionnaire (2021)
Figure 1. Attributes of the teaching staff surveyed

The figure below presents the different uses of ICT made by the teaching staff surveyed:

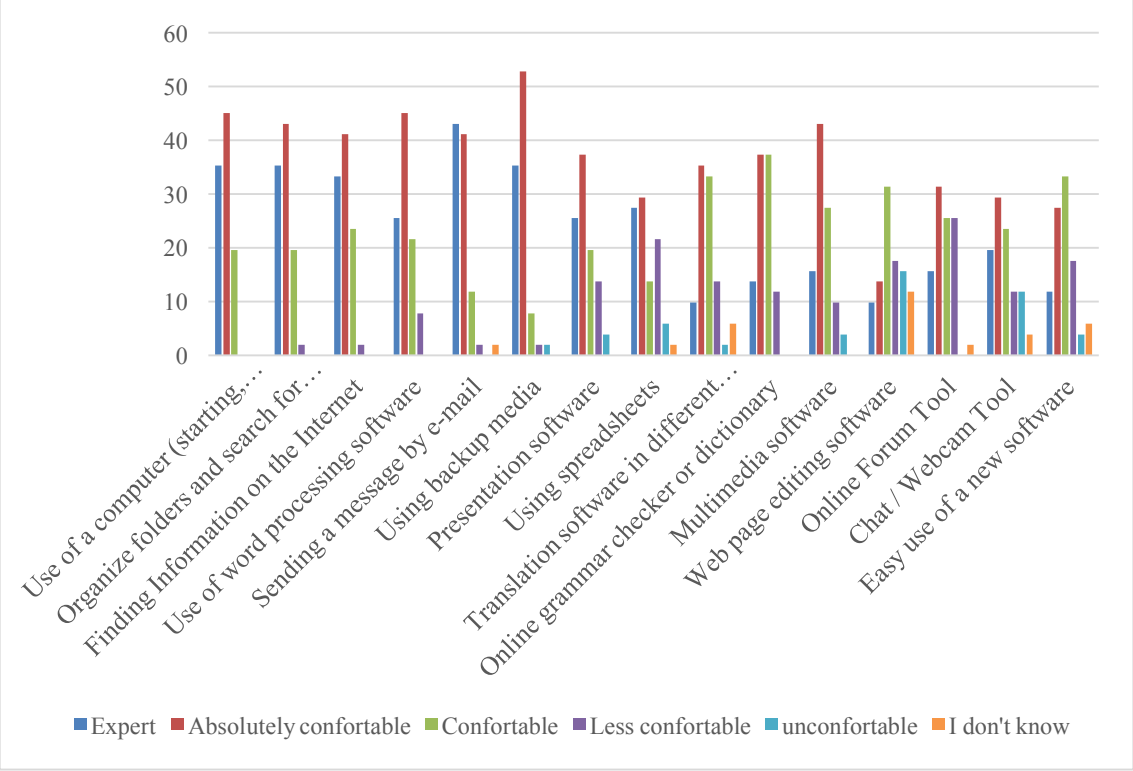


Source: Results of data collection by questionnaire (2021)
Figure 2. Personal use of ICT made by the teaching staff

It appears from the above data that the teachers of the PIHE are either teachers from higher training schools, or professionals in the field practicing in their field of expertise, or young graduates awaiting potential recruitment in a local structure. Those from training schools are slightly superior to the others. The definition of the acronym

ICT seems to be mastered by most teaching staff. 46 staff out of 51 gave an exact definition of this acronym. The other 5 confuse 'computing' and 'information' found in this acronym. Two teaching staff out of the 51 staff surveyed do not have a computer. This could lead us to note that more than 95% of PIHE teaching staff have computers. It can be seen that the proportion of teachers who use a computer very frequently is lower than the proportion of teachers claiming to have a computer. Out of the 49-teaching staff with a computer, 46 use it frequently and 3 use it only a few times a week. The deepened analysis of the data allows us to note that the 3-teaching staff who use a computer a few times a week are not professional teachers. Teaching professionals (graduates of higher training schools or teachers in state universities) have a computer and use it every day. This suggests that trained teachers seem to have become aware of the importance of some ICT tools in their teaching practice. The uses made of ICT by more than 50% of the population surveyed are documentary research on the Internet, the resolution of certain specific academic problems, word processing, Excel spreadsheet and the preparation of lessons to be taught. However, only 17 staff (33.3%) claim to have been really trained in the use of ICT in their teaching practice. The rest note a lack of training or training received superficially. No teaching staff provides information on the use of e-mail. Documentary research on the internet takes the gold medal with a percentage of 92.2%. Internet connections are mostly made either at the institution via the Wi-Fi connection available within it, or by using the data plan of the mobile phone. All staff who noted their internet connection at home also noted an internet connection via mobile phone. We can deduce that most internet connections are made at home via the mobile phone's data plan. This highlights the problem of access to an internet connection.

The figure below presents the results of the self-assessment of the basic notions of ICT:



Source: Results of data collection by questionnaire (2021)
Figure 3. Self-assessment of mastery of basic ICT notions.

We consider as:

- "Expert", someone who has mastered knowledge, who is able to transmit and can explore new knowledge in the mastered field.
- "Absolutely confortable", someone who has knowledge in a field, who is open to new knowledge in the field, but has reservations regarding the transmission of his knowledge.
- "Confortable", someone who can easily reproduce the knowledge received, but finds it difficult to leave their comfort zone to explore new knowledge. He limits himself to what he has learned and consequently has difficulty transmitting what he knows.
- "Less confortable", someone who is in the initiation phase. He still has doubts and is looking for his way. He does not master the notions learned but has started the learning process.
- "Unconfortable", someone who is not even in the initiation phase yet. He is still skeptical. He may have experienced and new knowledge but could not adhere.
- "I don't know", someone who hasn't even had the opportunity to test it yet, to use it. He is therefore not even capable of issuing an opinion.

The evaluation criteria used are classified into two main groups:

- Fit people: who said they were either "expert", or "Absolutely confortable", or "Confortable".
- Unfit people: who said they were either "Less confortable", or "Unconfortable", or "I don't know".

We evaluate the success rate of each item by assigning 1 point to each answer corresponding to the 'suitable' criterion, and 0 point to each answer corresponding to the 'unsuitable' criterion. The success rate of an item is evaluated using the following formula:

$$P_j = \frac{1}{n}\sum_{i=1}^{n} \gamma_i^j$$

With:

P_j : success rate of item j,

n: the number of items,

γ_i^j : response of participant i to item j.

The results obtained are presented in the table below:

Table 1
Success rate for items assessing basic notions of ICT among teaching staff

Availability Rated (item)	**Evaluation criteria**		**Item success rate**	
	Fit	**Unfit**	**Fit**	**% (Precision of 2 decimal places**
Use of a computer (starting, stopping, exploring files	51	0	1,0000	100,00
Organize folders and search for saved files	50	1	0,9804	98,04
Finding Information on the Internet	50	1	0,9804	98,04
Sending a message by e-mail	49	2	0,9608	96,08
Using backup media	49	2	0,9608	96,08
Use of word processing software	47	4	0,9216	92,16
Online grammar checker or dictionary	45	6	0,8824	88,24
Multimedia software	44	7	0,8627	86,27
Presentation software	42	9	0,8235	82,35
Translation software in different languages	40	11	0,7843	78,43
Online Forum Tool	37	14	0,7255	72,55
Chat / Webcam Tool	37	14	0,7255	72,55
Easy use of a new software	37	14	0,7255	72,55
Using spreadsheets	36	15	0,7059	70,59
Web page editing software	28	23	0,5490	54,90

Source: Results of data collection by questionnaire (2021)

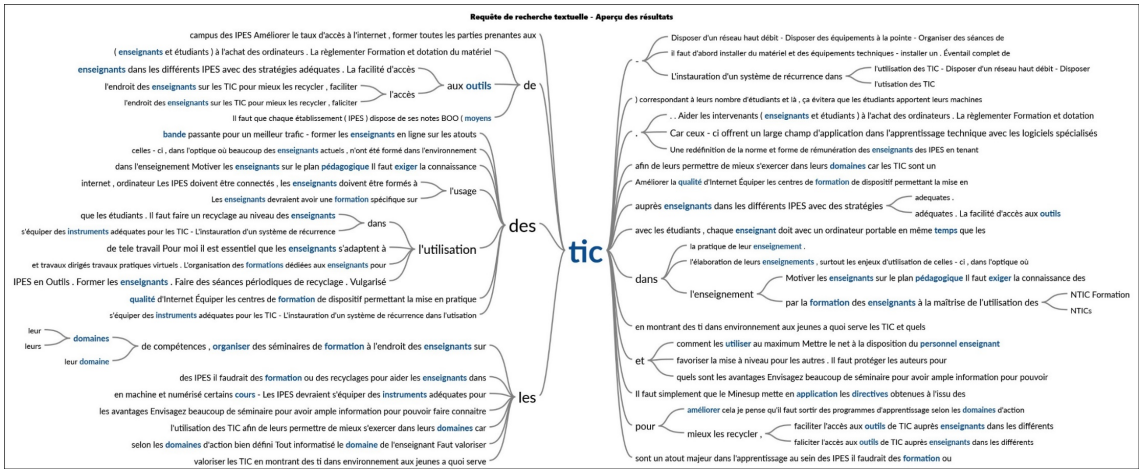
In view of the data collected in the table above, the basic notions of ICTs seem to be brought by a large proportion of teachers. An information in this table has attracted our attention. The sending of the e-mail seems to be mastered by 96.08% of the invested teachers. Yet, on the question on the use of the ICTs, none of them undertook to use e-mail. By approaching this information, the fact that the large proportion of internet connection is done via the mobile phone, one might wonder if that could not be a brake to the use of e-mail.

Twenty-five teachers present ICTs as a requirement in PIHE, twenty-and-one affirm no, while, the five, claim that some PIHE require the use of ICTs in educational practice. There is a lack of uniformity in the actions carried out within the PIHE in Cameroon. On the other hand, the teachers in their majority (96.1%) recognize the positive impact that the use of ICTs in educational practice could have on the quality of teaching / learning. Of the 51 people responded, 4 affirm their lack of knowledge of the theories of learning. They are respectively PhD students, field professionals, graduates looking for a job. It can be noted that they have not received training which could explain their lack of knowledge of the theories of learning. However, we note that some field professionals, or some jobs granting that have not received specific teachers' training, report to know some of the learning theories. The difference is made at the use of these theories. To the question on learning theory used in the context of educational practice, there is a disparity of theories used. What comes highlighting the idea that some of the PIHE teachers do as they can to fulfil the teaching requirement without necessarily being trained for this purpose. One of the actions to be conducted to ensure successful use of ICTs in teaching / learning could be the training of trainers for this purpose.

Using the NVIVO software, we have made a lexical analysis of the different collected notions, which allowed us to highlight the most commonly used words clouds:

Source: Results of data collection by questionnaire (2021)
Figure 4. Most clouds of the words frequently used by the teachers invested.

The encryption by NVIVO feeling that identifies positive or negative attitudes allowed us to highlight the words in this cloud of words that could express the opinions of the teachers concerned. The synapsy built around these words with root words ICT is as



Source: Results of data collection by questionnaire (2021)
Figure 5. Synapsy of words expressing the opinions of teachers

The analysis of this synapsy shows that in the investigating staff, an emphasis is laid on the teacher training component and the component of access to ICT tools like computers and access to internet. Teachers' own presenting their training needs in the field of ICT in educational practice, and also a need for recycling of earlier knowledge acquired. They are aware that knowledge is evolving and they cannot sit on their acquired knowledge and stop learning. A redefinition of the standards and forms of teachers' renumeration within the PIHE is also highlighted. They put forward the additional work that ICT introduction could be made in their educational practice and also put the protection of intellectual property. The PIHE equipment in ICT tools is not put in rest. The personal information is particularly on this aspect. It would be difficult for them to use ICTs in their educational practice if the teaching framework is not equipped. The ICT popularization in teaching / learning is also an element raised by teachers. According to them it should be depended on the awareness of the different actors of teaching / learning. This awareness could intend to understand the different actors and benefits they could derive from the use of ICTs in their practice. The availability of teaching / learning actors and new techniques in their professional practice is not slovenly.

Discussion and conclusions

Our aim throughout this work, was to highlight the pedagogical practices of the PIHE in the relation to ICT. We were able, because of some observation of the reality in some PIHE and the collection of data via a questionnaire, to bring out some elements of the reality of the teachers of the PIHE and their teaching practice.

The training framework in private institutes of higher education, seems to be a training framework in full structuring. A remarkable work has already been done in this sector. Nevertheless, in order to secure this training framework for the new realities of the world, particular attention should be given to find solutions to the difficulties identified there. In the context of educational practice with ICTs, one cannot ask for a teacher to use the ICTs in his educational practice, without making sure that he has all the

necessary skills to carry out this mission. The process of recruiting teachers in the PIHE today in Cameroon, does not seem to verify the ability of future teachers to use ICT. It is true that seeing the current situation in Cameroon, it may be difficult to make tests of the skills of the teaching practice with the ICTs to candidates for a teacher post in the PIHE. However, a training of new recruits to educational practice with ICTs, before their first instruction, could be a beginning of solution. It is important to also raise here that the equipment of the PIHE with ICT tools to be integrated into educational practice is a step as important as training of trainers. If we do not use the notions received during training, it will be very difficult to develop skills.

In view of the data we were able to collect from PIHE, it would seem that PIHE (Promoter) meets some difficulties in the equipment of their training framework. Promoters tend to prioritize other expenditures and put this component at the secondary level. Faced with this reality, an interface of the state, the promoters of the PIHE in the equipment of their training framework would be a significant encouragement. Because, by the opening of the PIHE, the promoters accompany the state in the formation of the population. Education being one of the responsibilities of a state to its population and one of the fundamental rights of that population. This encouragement would not only allow developers to develop this aspect in their training center, but would allow the academic tutorship to have a greater look at what is actually realized in the PIHE.

During this study, we faced data collection difficulties that did not allow us to reach the fixed sampling. Nevertheless, to overcome this difficulty, we have associated with our search by questionnaire (Baumard & al, 1999), a participatory observation (Cuq, 2004) resulting from our professional experience within the PIHE. In order to highlight this training framework that seems currently not documented in Cameroon, one of the research axes on which it would be interesting to look at is:

- PIHE equipment in ICT tools for educational practice at the forefront of technology**.** We could put forward the lack of ICTs ' equipment in educational practice within the PIHE. This point deserves special attention, because we cannot use something that is not put at our disposal.

The PIHE appear to be a training frame very solicited by people looking for an inscription in higher education. Registrations in private institutions in higher education have quintupled, from 3% in 2007 to 16% in 2017. These statistics show that PIHE occupy a special place in Cameroon in socio-professional training. The interest in addressing this training framework to make a convenient framework for teaching / learning is no longer to demonstrate.

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PERFIL LINGÜÍSTICO Y ATENCIONAL DE LAS PERSONAS CON DETERIORO COGNITIVO LEVE

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Resumen. Las personas con deterioro cognitivo leve tienen dificultades en su lenguaje y en su atención. En este estudio se pretende describir las características de su lenguaje, y determinar la asociación entre la edad de los participantes y su lenguaje, además de conocer si existe una asociación entre su lenguaje y la atención. Se lleva a cabo un diseño descriptivo correlacional desde un enfoque cuantitativo, en este estudio han participado 31 adultos con deterioro cognitivo leve a los que se les ha aplicado el test Peabody, Neurobel y el Test de las Caras-R. Se han observado múltiples dificultades en el lenguaje de los participantes y se ha observado una asociación moderada entre la edad y el emparejamiento palabra hablada-dibujo; la comprensión de oraciones, la denominación de dibujos y la denominación de acciones. También existe una asociación fuerte entre la expresión y comprensión del lenguaje y la atención; además de una asociación entre el lenguaje y la impulsividad, siendo esta asociación más fuerte en la expresión, que en la comprensión. Se concluye que sí que existen dificultades en su lenguaje en especial en el léxico, y en la comprensión de oraciones; además existe una gran asociación entre las dificultades en el lenguaje y la edad; además de en estas dificultades y en la atención y en la impulsividad. Lo que es de gran utilidad para plantear una posible intervención no farmacológica con esta población.

Palabras clave: lenguaje, deterioro cognitivo leve, atención, vocabulario.

LINGUISTIC AND ATTENTIONAL PROFILE OF PEOPLE WITH MILD COGNITIVE IMPAIRMENT

Abstract. People with mild cognitive impairment have difficulties in their language and attention. The aim of this study is to describe the characteristics of their language, and to determine the association between the age of the participants and their language, as well as whether there is an association between their language and attention. A descriptive correlational design was carried out using a quantitative approach. 31 adults with mild cognitive impairment participated in this study and were administered the Peabody, Neurobel and the Faces-R tests. Multiple difficulties were observed in the participants' language and a moderate association was observed between age and the spoken word-drawing pairing, sentence comprehension, picture naming and action naming. There is also a strong association between language expression and comprehension and attention, as well as an association between language and impulsivity, with the association being stronger for expression than for comprehension. It is concluded that there are indeed difficulties in their language, especially in the lexicon, and in sentence comprehension; there is also a strong association between language difficulties and age; as well as in these difficulties and in attention and impulsivity. This is very useful for considering a possible non-pharmacological intervention with this population.

Keywords: language, mild cognitive impairment, attention, vocabulary.

Introduction

Mild Cognitive Impairment (MCI) was first described by Flicker et al. (1991), but Kral (1962) earlier used the term senescent forgetting to refer to dementia and defined it as the inability to recall relatively insignificant parts of past experiences on certain occasions. Later, in 1986, a panel of experts proposed the term age-related memory impairment (Crook et al., 1986). The International Psychogeriatric Association created the term age-associated cognitive decline (Levy, 1994). Since then, the concept has been enriched, with multiple descriptions of situations between deterioration or loss of various functions and dementia. According to Petersen et al. (1999), this theoretical construct has the following characteristics:

- Presence of a subjective memory problem, preferably corroborated by an informant.

- Evidence of an objective memory impairment with cognitive tests above normal for age and education (1-2 standard deviations).
- Preservation of general intellectual functioning.
- Activities of daily living are essentially preserved (basic criterion in the differential diagnosis with established dementia).
- Absence of dementia

According to Weiner (2010), MCI can be defined as the gray zone between normal cognitive aging and early dementia. People with MCI show greater mnesic impairment than expected for their age but do not meet the criteria for dementia. ICD-11 (World Health Organization, 2018) and DSM-V (American Psychiatric Association, 2014) list MCI as a diagnostic category. The diagnostic criteria in the DSM-V (American Psychiatric Association, 2014) are as follows:

- Evidence of moderate cognitive decline compared to the previous level of performance in one or more cognitive domains (complex attention, executive function, learning and memory, language, perceptual motor ability, or social cognition) [...].
- Cognitive deficits do not interfere with the ability to be independent in activities of daily living (e.g., retains complex instrumental activities of daily living, such as paying bills or following treatments, but needs to make greater effort or resort to compensatory or adaptive strategies).
- Cognitive deficits do not occur exclusively in the context of a confusional syndrome.
- Cognitive deficits are not better explained by another mental disorder (e.g., major depressive disorder, schizophrenia). Specify whether, due to Alzheimer's, frontotemporal lobe degeneration, disease can cause neurocognitive disorders, so a differential diagnosis is needed (p. 641).

This category is important because in this population the annual rate of dementia is 10-15%, while it is 1-2% in the general population (Petersen et al., 2001). Petersen et al. (2018) publish data on the prevalence of MCI and indicate that it is 6.7% in those aged 60-64 years, 8.4% in those aged 65-69 years, 10.1% in those aged 70-74 years, and 14.8% in those aged 75-79 years, and 25.2% in those aged 80-84 years (Petersen et al., 2018). The prevalence of neuropsychiatric symptoms is higher in subjects with MCI than in age-matched cognitively healthy controls; as 35-85% of MCI patients are known to have depression, irritability, apathy, anxiety, agitation, and sleep problems that is associated with subsequent cognitive impairment (Martin & Velayudhan, 2020).

For Petersen et al. (2018), there is no high-quality evidence to support pharmacological treatments for mild cognitive impairment. In patients with MCI, physical and cognitive training (for at least 6 months) is likely to improve cognitive symptoms.

For WHO (WHO Guidelines Approved by the Guidelines Review Committee, 2019), age is the main known risk factor for cognitive decline, but in recent years, several studies (NICE, 2015; Kane et al., 2017; Prince et al., 2014; Livingston et al., 2017) have shown that the development of cognitive decline and dementia is related to other factors: educational attainment, physical inactivity, tobacco use, unhealthy diet, and harmful alcohol consumption. As well, certain medical conditions, such as hypertension, diabetes, hypercholesterolemia, obesity, and depression, are associated with an increased risk of dementia. Other potentially modifiable risk factors may include social isolation and

cognitive inactivity. In addition, cognitive stimulation therapy or cognitive training can also be performed. The National Institute on Aging (NIA), United States, has pointed to cognitive training as an intervention aimed at preventing or delaying the onset of age-related cognitive decline, MCI, or Alzheimer's disease-like dementia (Kane et al., 2017). Therefore, it is necessary to know the language of these people, to know what difficulties they have, and to know in what sense the speech therapy intervention should be performed; and more taking into account that some of the linguistic difficulties they present may improve after speech therapy intervention (Juncos-Rabadán & Pereiro-Rozas, 2002; González-Martín et al., 2019).

Language in Mild Cognitive Impairment (MCI)

People with MCI have difficulties in their language skills (González-Martín et al., 2019; Mueller et al., 2018). Although information can be found in this regard, the language skills studied so far are restricted, with verbal memory, verbal fluency, semantic fluency, and naming being among the most frequent (Taler & Philips, 2007).

Rodríguez et al. (2018) explain that people with mild cognitive impairment present a decline in lexical processes; De la Hoz et al. (2021) explain that there are difficulties in their vocabulary and lexical processes and talk about difficulties in pseudoword processing and access to meaning; in this sense, Juncos-Rabadán et al. (2010) determine that there are also a number of difficulties related to naming and word memory; since, together with verbal fluency, they are predictors of the evolution of MCI towards dementia. According to Rodriguez et al. (2008), older people with MCI also present more pronounced tip-of-the-tongue phenomena than healthy elderly people, which implies a greater use of paraphasias.

According to De la Hoz et al. (2021), the second most affected area in people with MCI is the production of narrative discourse. In this sense, Flicker et al. (1991), Alonso-Sánchez et al. (2018), and Taler & Philips (2007) determine that these patients have difficulties in verbal fluency, propositional density, and grammatical complexity, which could cause them to have difficulties in their narrative discourse (Johnson & Lin, 2014). In addition, they perform shorter sentences and lower performance in autobiographical narrative (Chapman et al., 2002). It also affects narrative discourse, the errors they make when using complex sentences, the reduction in the number of words they include in their sentences, and some slight syntactic errors (such as problems when coordinating verb number and tense) (Mueller et al., 2018). In addition, there is a reduction in the ability to maintain discursive topic (Machado-Goyano et al., 2018).

Another area in which alterations are detected is in listening and reading comprehension, as it can be difficult for them to remember information and understand passive sentences (De la Hoz et al., 2021).

Method

A descriptive correlational design is carried out from a quantitative approach (Hernández-Sampieri & Mendoza-Torres, 2018). Thirty-one adults diagnosed with Mild Cognitive Impairment participated. The Peabody Picture Vocabulary Test (Dunn et al., 2006), Neurobel (Adrián et al., 2015), and the Faces Test - R. Test of Perception of Differences - Revised (Thurstone & Yela, 2012) were applied.

Study objectives and hypotheses

The hypothesis of the study is to prove that there is an association between age, intensity of cognitive impairment, attention, and impulsivity with the different language characteristics of people with mild cognitive impairment.

As a result of this hypothesis, the objectives of this research have been developed, which, in general, are (a) To describe the language characteristics of people with mild cognitive impairment. (b) To determine the association between the results of the age of the participants and the results of the Neurobel (Adrián et al., 2015). (c) To analyze whether there is an association between the results of the Faces-R Test (Thurstone et al., 2012) and the results of the Neurobel (Adrián et al., 2015).

Participants

In the study presented, the sample is intentional, consisting of 31 adults with mild cognitive impairment, 41.9% of whom are men and 58.1% women. In order to reach this sample, the people admitted to a social-health center were analyzed, obtaining a total population with a diagnosis of mild cognitive impairment of 58 adults. After applying the exclusion criteria to this population, a total sample of 31 participants was obtained. The age of the participants is between 57 years and 95 years, with a mean of 81.48 years (σ=9.24). The mean center stay is between 5 months and 24 years and 8 months, with a mean of 2 years and 10 months (34.63 months) (σ=53.88). Some 77.4% have primary education, 9.7% have secondary education, and 12.9% have university education. All patients attended the center for physiotherapy, occupational therapy, psychosocial therapy: groups, psychotherapy, labor therapy, etc. As can be seen, this is an older sample, institutionalized in a social-health center.

The criteria for sample selection are as follows:

- Patients diagnosed with Mild Cognitive Impairment, i.e., with an MEC-35 score of 24-35 points.
- Patients who collaborate and participate in the test.
- That the cognitive impairment is not caused by medical conditions, which may be present but are currently under control and do not now appear to be influencing their cognitive status. For example, there are several cases of patients with cardiac, infectious, endocrinological (e.g., diabetes) conditions, etc. Medical conditions that may cause cognitive impairment but, in the current state, are treated and controlled, and it can be reasonably inferred that they are not now influencing this. There are also other difficulties that may cause cognitive impairment (depression, etc.) that are also ruled out in the differential diagnosis performed.

Techniques and Instruments

Several instruments are used; the first is the Mini-Examen Cognoscitivo (MEC-35), it is the Spanish version (Lobo et al., 1980) of the Mini-Mental State Examination (MMSE) of Folstein et al. (1975). It explores the following areas: Temporal and spatial orientation, Immediate memory, Attention and calculation, Delayed memory, Language and praxis. The cut-off point is 24 for people aged 65 and over. Above these figures is considered normal cognitive functioning and below is considered possible cognitive impairment. Although below 24 may be normal in the geriatric population, taking into account age and level of education (Lobo, 1999).

The second is the Peabody Picture Vocabulary Test (Dunn et al., 2006), which aims to assess the level of receptive vocabulary.

Also applied is the Neurobel (Adrián et al., 2015), which is a brief neuropsychological battery used to assess oral expression and comprehension. In the oral comprehension dimension, four tasks are included: phoneme discrimination task, auditory lexical decision task, spoken word-drawing matching task, and sentence comprehension task; while in the production dimension, four other tasks are included: repetition task, picture naming task, action naming task, and sentence completion task. The higher the score on each of the variables, the higher the proficiency in that skill.

The last one applied is the Faces Test - R. Difference Perception Test - Revised (Thustone et al., 2012), which evaluates the skills required to perceive similarities and differences in a set of three faces in which one of them is different. In this test, we obtain four results: number of hits, number of errors, number of hits minus errors, and the Impulsivity Control Index (ICI).

Procedure and data analysis

The data collection process is carried out by a speech therapist and a geriatrician working in an interdisciplinary manner. The evaluation of the participants is individual, with a duration of 1 hour and a quarter divided into three sessions. First, all participants are informed of the study and sign the informed consent form. Subsequently, the tests are applied in the order in which they have been presented previously, and finally the statistical analysis of the results is carried out. The SPSS 24.0 software for Windows is used, which allows us to perform a descriptive analysis and the Kolmogorov-Smirnova normality test indicates that the sample does not have a normal distribution since the significance level of all the variables to be analyzed is less than 0.05, so it was decided to perform nonparametric statistical tests such as Spearman's Rho test.

Results

Clear presentation of the results obtained. Table 1 shows the descriptive statistics of all the variables, the minimum and maximum obtained for each variable are explained, as well as the mean and standard deviation.

Table 1
Descriptive statistics of all variables

	N	Minimum	Maximum	Media	Standard deviation
MEC	31	24	30	26.35	1.314
Months entered	31	5	296	34.63	53.88
Age	31	57	95	81.48	9.24
Neurobel phoneme discrimination	31	1.00	11.50	7.94	2.46
Neurobel auditory lexical decision	31	5.50	11.50	9.31	1.53
Neurobel spoken word-drawing pairing	31	8.00	16.00	13.55	2.01
Neurobel sentence comprehension	31	2.00	12.00	6.50	2.54

Neurobel repetition	31	2.50	11.50	8.53	1.91
Neurobel designation of drawings	31	4.00	12.00	8.74	2.36
Neurobel share denomination	31	3.00	12.00	7.42	3.02
Neurobel complete sentences	31	.00	12.00	5.58	2.74
Neurobel understanding	31	27.00	49.50	37.00	6.16
Neurobel expression	31	15.50	46.50	30.27	7.67
Neurobel Total	31	45.00	91.00	67.27	13.15
Faces test. PD Hits	31	3.00	34.00	10.00	7.82
Faces test. PD errors	31	.00	35.00	7.68	6.73
Faces test. Hits minus Errors (PD)	31	-25.00	33.00	2.77	11.32
Faces test. ICI (PD)	31	-53.84	100.00	21.77	42.56
Peabody CI	31	55.00	127.00	79.87	17.17
Peabody PT	31	.10	96.00	16.53	26.44

Table 1 shows that all participants have mild cognitive impairment since they have a score on the MEC between the required for inclusion. If we focus on the Neurobel results, we observe that there are greater difficulties in expression (30.27) than in comprehension (37) since in this test the lower the results the greater the difficulties in this area. On the other hand, we are going to analyze the results of the Neurobel subtests whose maximum score can reach 12, which are all except the spoken word-drawing pairing. In order of greatest to least difficulty are the following: sentence completion, sentence comprehension, action naming, phoneme discrimination, repetition, picture naming, and finally auditory lexical decision. In addition, it is observed that they have some difficulties in vocabulary comprehension (Peabody IQ=79.87) and a high ICI (21.77).

Table 2 below shows the results of Spearman's Rho test for the results of age and many other variables. The same analysis was also performed with the time entered, but it was decided not to show the results in the Table since the p-value of this correlation indicated that there was no correlation in these.

Table 2
Spearman's Rho test between the age score and different variables

	Age	
	Correlation coefficient	Sig. (bilateral)
Neurobel spoken word-drawing pairing	-.384	.000
Neurobel sentence comprehension	-.335	.000
Neurobel designation of drawings	-395	.000
Neurobel share denomination	-.395	.000

Table 2 shows how all the values presented are associated with each other; since Sig. (bilateral) on all these occasions is less than 0.05. To understand Table 2, it is necessary to know that when the correlation coefficient is between 1 and 0.5 or -1 and 0.5 there is a strong association; when it is between 0.49 and 0.3 or -0.49 and -0.3 there is a moderate association and when it is less than 0.29 or - 0.29 it is a weak association. If the result is positive, it indicates that when one variable increases the other also increases; and if the result is negative, it indicates that when one variable increases the other decreases. Therefore, it can be determined that in all cases there is a moderate negative association. This indicates that when age increases the Neurobel results shown in the Table decrease, so age is a determinant.

Table 3
Spearman's Rho test between Neurobel comprehension, expression, total and different variables.

	Neurobel understanding		Neurobel expression		Neurobel total	
	Correlation coefficient	Sig. (bilateral)	Correlation coefficient	Sig. (bilateral)	Correlation coefficient	Sig. (bilateral)
Neurobel Phoneme discrimination	.759	.000	.544	.002	.665	.000
Neurobel Auditory lexical decision	.587	.001	.476	.007	.563	.001
Neurobel spoken word-drawing pairing	.658	.000	.637	.000	.676	.000
Neurobel sentence comprehension	.655	.000	.494	.005	.597	.000
Neurobel repetition	.334	.067	.531	.002	.460	.009
Neurobel designation of drawings	.558	.001	.755	.000	.697	.000
Neurobel action denomination	.780	.000	.860	.000	.859	.000
Neurobel complete sentences	.624	.000	.751	.000	.727	.000

Neurobel understanding	1.000	-	.818	.000	.942	.000
Neurobel expression	.818	.000	1.000	-	.955	.000
Neurobel Total	.942	.000	.955	.000	1.000	-
Faces test PD hits	.584	.001	.569	.001	.619	.000
Faces test PD errors	-.375	.038	-.358	.048	-.367	.042
Faces test - hits minus errors (PD)	.641	.000	.573	.001	.639	.000
ICI face test (PD)	.352	.052	.466	.008	.426	.017
Peabody PD	.779	.000	.649	.000	.749	.000
Peabody CI	.787	.000	.592	.000	.707	.000
Peabody PT	.787	.000	.593	.000	.708	.000

Table 3 shows the association between Neurobel scores and other factors. This time there is an association between all the variables analyzed except between Neurobel comprehension with Neurobel repetition (Bilateral Sig. = 0.067 > 0.005) and the other pair: Neurobel comprehension with the ICI Faces Test (PD) repetition (Bilateral Sig. = 0.052 > 0.005). Almost all Neurobel variables have a strong association with the Peabody, indicating that vocabulary comprehension is strongly related to having good results in language comprehension and expression and in total language. In addition, this strong association between the two Neurobel dimensions and the total score can also be observed with the Faces Test scores (Hits and Hits minus errors), but it has less association with the Faces Test scores errors and with the ICI. This indicates that there is also a strong association between attention and impulsivity with the different language parameters.

Discussion and conclusions

The objectives that were pursued have been met since, on the one hand, the language characteristics of people with mild cognitive impairment have been described, observing difficulties in different linguistic competences (González-Martín et al., 2019; Mueller et al., 2018). This is important since several dimensions have been analyzed, and so far, these types of studies are restricted studies related to verbal memory, verbal fluency, semantic fluency, and naming have been emphasized (Taler & Phililps, 2007); but no studies have been found that relate impulsivity and attention of these participants with their language as has been done in this research. Although, there are studies that describe difficulties in attentional and inhibitory processes and information processing (Aguilar, 2018; Juncos-Rabadán & Pereiro-Rozas, 2002). Especially, in healthy aging population (Allain et al., 2005; Treitz et al., 2007) since it is known that normal aging is characterized by a slowdown in information processing, which in turn involves an alteration in the selection and wakefulness processes that are intimately connected with attentional processes (Aguilar, 2018).

The second objective has also been met in which the association between the results of the age of the participants and the Neurobel results has been determined. In this regard, a moderate association was observed between age and the spoken word-drawing pairing, sentence comprehension, picture naming, and action naming. This indicates that age is a determinant, and the older the participants are the more difficulties they have in these areas. This is not surprising since this view is supported by other relevant authors such as Facal et al. (2009) and Puyuelo & Bruna (2006) who indicate that age is a determinant in both expressive and comprehension language skills (Facal et al., 2009; Puyuelo & Bruna, 2006). Although, it is true that these studies do not focus only on people with MCI but on people with healthy aging. Taking into account the results presented in this article, it can be determined that these age-associated difficulties are most noticeable in the lexicon (spoken word-drawing matching as well as naming of actions and drawings). These difficulties are observed in the studies of Pereiro et al. (2006); but no other studies have been found that focus only on sentence comprehension, but there are difficulties at the level of expression of complex sentences (López-Higes et al., 2010) and also in difficulties in general verbal knowledge (Verhaeghen, 2003).

On the other hand, it is observed that there is a moderate association between Neurobel scores and each other since they all measure different language parameters. The same is true for the Neurobel results and the Peabody results because the Peabody measures vocabulary comprehension. Some authors such as Puyuelo and Bruna (2006) state that vocabulary is usually maintained in the MCI group thanks to experience and practice with language on a daily basis; but it is true that although it is usually maintained, they do have difficulties in semantic memory, access to vocabulary, and fluency to find words in their spontaneous speech (Bataller & Moral, 2006); but in addition to finding these results in this study, the correlation of this vocabulary with other language skills has also been observed, which leads us to conclude that it is a priority to work on the semantic dimension in people with MCI when performing speech therapy in this population.

The last objective was to analyze whether there is an association between the results of the Faces-R test and the results of the Neurobel test. It is observed that there is a strong association between the expression and comprehension of language and the totality of this with the successes of the Faces Test, which indicates that there is an association between these and attention. There is also an association between language in all its measures and impulsivity, although this association is stronger in expression than in comprehension. These results are important because until now it was known that difficulties in sustained attention may be key to the prediction of cognitive impairment (Pérez-Díaz et al., 2013), but this has not been explored in depth, and an analysis of associations between language and attention, as has been done in this study, has not been carried out.

It is necessary to consider a series of important limitations of this study: firstly, all the participants in this research were institutionalized in a socio-sanitary center, which has meant that all of them had a daily stimulation typical of life in these institutions; something different from the language stimulation received by a person living alone or in company at home; secondly, it must be taken into account that the sample is limited; and thirdly, this study should be continued, comparing this population with others, in order to be able to achieve generalizable results.

But even so, this work has reached several important conclusions. The first conclusion is that people with MCI have certain difficulties with their language in general. In particular, it has been determined that people with MCI show worse results in spoken word-drawing matching, sentence comprehension, picture naming, and action naming the older they get. It is also concluded that there is a strong association between expressive and comprehensive language skills and vocabulary comprehension. There is also a strong association between expressive and comprehensive skills and attention; and there is also a moderate association between language expression and comprehension and impulsivity. This result is novel, not having been previously studied in other scientific articles. All these results are very useful to be able to carry out a correct evaluation and non-pharmacological intervention with this population.

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NEUROPEDAGOGY FOR MULTICULTURAL CLASSROOMS: NEUROMETHODOLOGY FOR INCLUSION

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Summary. The main objective of this article is to learn about neuropedagogy in order to apply neuromethodologies in multicultural classrooms for the inclusion of students. For this purpose, a bibliographic review was carried out in which updated articles and book chapters were collected that dealt with neuropedagogy and neuromethodology as an inclusion strategy in today's classrooms, which are pluricultural contexts. The results obtained have been different neuromethodologies that can be applied in the classroom, among which we highlight *Mindfulness*, meditation, competency-based learning, project-based learning, game-based learning, cooperative learning, *flipped classroom*, *design thinking*, gamification or a neuromethodology closely linked to the current technological era such as *mobile learning.* In conclusion, we can highlight the need for these neuromethodologies in student learning in order for them to become future active citizens in society. Together with the need to train teachers and future teachers in neuropedagogy with the ultimate goal of implementing these neuromethodologies in the classroom and to attend to the diversity of students in an inclusive way in a school that is for all, based on equity and educational quality.

Key words: neuropedagogy, neuromethodology, multicultural, inclusion, classrooms.

NEUROPEDAGOGÍA PARA LAS AULAS PLURICULTURALES: LA NEUROMETODOLOGÍA PARA LA INCLUSIÓN

Resumen. Este artículo tiene como objetivo principal es conocer la neuropedagogía para aplicar las neurometodologías en las aulas pluriculturales para la inclusión del alumnado. Para ello se ha llevado a cabo una revisión bibliográfica en la que se han recogido artículos y capítulos de libro actualizados que trataban la neuropedagogía y la neurometodología como una estrategia de inclusión en las aulas actuales, las cuales son contextos pluriculturales. Los resultados obtenidos han sido diferentes neurometodologías que pueden aplicarse en el aula, entre las que destacamos el *Mindfulness*, la meditanción, el aprendizaje basado en competencias, el aprendizaje basado en proyectos, el aprendizaje basado en el juego, el aprendizaje cooperativo, *flipped classroom*, *design thinking*, gamificación o una neurometodología muy ligada a la Era Tecnológica actual como es el *mobile learning.* A modo de conclusión se puede destacar la necesidad de estas neurometodologías en el aprendizaje del alumnado para que sean futuros ciudadanos activos en la sociedad. Junto con la necesidad de formar al profesorado y a los futuros docentes en neuropedagogía con el objetivo último de implementar estas neurometodologías en el aula y atender a la diversidad del alumnado de forma inclusiva en una escuela que sea para todos desde la equidad y calidad educativa.

Palabras clave: neuropedagogía, neurometodología, pluricultural, inclusión, aulas.

Introduction

We are currently witnessing a boom in neuropedagogy as a step beyond neuroscience applied to education. Thus, congresses and training courses on neuropedagogy are beginning to appear in Spain due to the imperative need for training in this branch of neuroscience for today's teachers. This is because we live in a society of continuous change in which many cultures coexist, which leads to multiculturalism in our classrooms and the inherent need for the inclusion of students in the school.

However, according to Hernandez (2022) it is possible to find the term neuropedagogy in the scientific literature, but there are no entries to international impact journals that investigate the term or show its components.

Similarly, as De Barros (2022) points out, neuromethodology does not present research in global databases either.

Since multicultural contexts imply the coexistence and coexistence of different groups from different cultures, in these contexts it will be necessary to work on the group identity process (Lapresta and Huguet, 2006).

Therefore, an inclusive school must prepare students to identify and accept cultural diversity in order to be able to develop in a multicultural context, becoming aware of and rethinking their own cultural identity to break with the prejudices and limits established throughout history with the aim of building societies that live together in cultural diversity and accept the cultural differences of others, even sharing customs (Arnaiz and De Haro, 2003).

Currently in force in Spain is Organic Law 3/2020, of December 29, which amends Organic Law 2/2006, of May 3, 2006, on Education, known as LOMLOE. The principles of this law are inclusion and participation, quality, equity, non-discrimination

and equality in access and continuity in the educational system and universal accessibility for all students. In addition, it advocates that in primary education it should be a priority to ensure educational inclusion with personalized attention to students and their needs, guaranteeing participation and coexistence (Government of Spain, 2020). In other words, the LOMLOE goes one step further than equality, equity, which is characterized by offering each person the necessary help to achieve the same objectives as their peers, since this is the basic principle of inclusion and this is the basis of educational quality, participation and equal access without discrimination based on personal, physical, ethnic, etc. issues.

Studies and research on neuroscience clearly highlight its beneficial contribution to education (Ruiz and Kwan, 2020). Neuroscience aims to participate in offering new knowledge to teachers to change and improve their teaching-learning process. Therefore, teachers will have to be attentive and know what aspects they can include in their pedagogical practice in a way that benefits students and brings more quality to their teaching. Therefore, it is important to know well all those neuroscientific strategies that can be applied in the classroom and avoid those fallacies about the teaching-learning process that have been created around neuroscience, known as neuromyths, i.e., they should base their practices on studies that are already validated (Flores, 2022).

Thus, neuroeducation arises to improve education and teaching techniques, that is, the teaching-learning processes, based on knowledge of other sciences related to the brain with the restructuring of pedagogical practice. It is an interdiscipline and a transdiscipline in which neurologists, psychologists and pedagogues work together and collaboratively to make education of quality and contemplate all people in an equitable manner (Luis and Marcelino, 2020).

Today our classrooms are multicultural, which means that we must take into account the inclusion of students from neuroeducation. According to Borsese (2022), neuropedagogy is a way of helping to know and enhance people's abilities, which is why it is necessary in schools. For it is linked to a cultural view of teaching that honors reflection and metacognition, rather than the usual efficiency and speed to which the educational system is accustomed. That is to say, class work should be based on creating cognitive processes to build their knowledge in an autonomous way. This implies a pleasant climate in which learning creates feelings and emotions with its consequent motivation, through the connection of the contents with reality.

With neuropedagogy in the classroom, the brain sequence of the students' diversity will be possible, according to the idea of Borsese (2022) in environments that promote learning through affective development and adaptability of the brain with flexibility and plasticity. It is important to increase the brain's potential, so students will learn in a multisensory and interdisciplinary way and teachers will take into account the brain diversity and learning styles of their students (Esteban et al., 2022).

According to Palomares (2022), neuropedagogy is a discipline that seeks to develop the potential of our brain to increase our learning capacity. Furthermore, as Palomares (2022) states, according to Esteban et al. (2022) and Borsese (2022), is a discipline that is based on emotions, motivation, classroom climate, respect for different learning rhythms, memory, movement and social interaction.

Therefore, neuropedagogy, according to Pérez (2022) is a science that studies the way in which neurons and their brain connections are activated, through teaching and

learning processes so that brain activity is fully developed. Therefore, neuropedagogy causes brain changes that improve the teaching and learning process. Neuropedagogy is, therefore, an applied science to study new forms of education through the correct use of neuropsychological resources, i.e. cognitive and affective, so that the student can learn in different and adequate scenarios for personal growth.

In other words, neuropedagogy is a science that studies education from a neuroeducational perspective, with the aim of configuring, from education, neurotheory and neuromethodology, with its practice that is neurodidactics (Hernández, 2022).

Therefore, we need to know what neurodidactics is. It can be qualified as a new discipline that arises with the progress in neuroscience. Neurodidactics deals with the analysis of the bases of the brain that are involved in the teaching-learning process. Through neurodidactics we try to understand and enrich the teaching processes. That is, neurodidactics bets on knowing the functioning and brain structures that are responsible for learning (De Barros and Hernández, 2018).

Neurodidactics is the application of knowledge about education in the classroom. Neurodidactics is very important as it is linked to emotions and thoughts building neural bases for learning, memory and emotions that are daily stimulated in the classroom (Perero and Rodriguez, 2020).

For neuroeducation to be effective in the classroom, teachers can use various techniques or methodologies that make student learning meaningful. Some examples of this would be: encouraging an appropriate classroom climate in which students feel comfortable and safe. Together with a good organization of the classroom and the environment, in a personal and relaxed atmosphere with teachers and peers, etc. (Luis and Marcelino, 2020; Moreno et al., 2020).

This means that creativity, the ability to synthesize, understand, analyze or develop skills in all subjects that make up the school curriculum should be encouraged, because this way learning can be taken from the classroom to everyday life, that is, learning can be applied in day-to-day life as it will go beyond the walls of the school. That is why neuropedagogy attaches so much importance to emotional learning, which will provide students with tools that will enable them to recognize, regulate and express emotions at school and in life outside the school (Luis and Marcelino, 2020; Moreno et al., 2020; Hernández, 2022).

From neuroscience and education, multiple didactic strategies are advocated, along with attractive materials to make the teaching-learning process better and motivating and, in turn, enable students to acquire knowledge and understand their environment so that they can make significant contributions to society. To motivate learning, materials must be attractive (Luis and Marcelino, 2020).

Thus, according to Professor and Dr. According to Barros (2022), for our educational system to be of quality, it is essential to talk about neuromethodology from a neurodidactic perspective. Following this idea, he also states that teaching methods must be transformed into neuromethods. Thus, neuromethodology will be considered essential for teacher training. Thus, neuromethodology can be defined as the group of strategies,

methods, techniques, instruments and didactic resources that integrate technology and inclusion for an innovative and quality education on a neuropedagogical basis (Melero, 2022).

Therefore, the aim of the article is to learn about neuropedagogy in order to apply neuromethodologies in multicultural classrooms for the inclusion of students.

Methodology

Design

The design of this research has been a literature review of scientific papers and articles related to neuropedagogy through neuromethodology for inclusion in multicultural contexts.

Search strategies

The search strategies followed were, first of all, a search in international databases including the terms neuroscience, neureduction, neuropedagogy, neuromethodology, inclusion and multicultural contexts. In none of the searches of the above databases was the year of publication limited.

Selection criteria

The inclusion criteria followed were based on the studies being conducted through neuropedagogy for inclusion in multicultural contexts with emerging neuromethodologies. On the other hand, articles that did not show anything related to neuroscience, neuropedagogy, neuroeducation, neuromethodology, inclusion or multiculturalism were excluded.

Data extraction

A search of international databases was carried out for data extraction. From the total results of these databases, we selected about 30 documents, including articles and book chapters, after reading their abstracts, which contained relevant information for this review

Data analysis

The analysis of these articles has allowed us to detect the different neuromethodologies available through neuropedagogy for inclusion in multicultural contexts.

Results

It is necessary to highlight the following neuromethodologies:

Mindfulness: helps the teacher to effectively manage stress academically and emotionally. This improves emotional self-regulation, decreases the level of stress, increases attention and concentration and also helps students to be resilient, creative and positive (Luis and Marcelino, 2020). Some studies also show a decrease in childhood depression, which leads to a better quality of life for students and increased levels of attention (Palomero and Valero, 2019).

Meditation and relaxation: also helps self-control, improves concentration and attention, self-awareness of the body and the environment, decreases anxiety, among others (Luis and Marcelino, 2020). In addition, according to several studies carried out, meditation in the classroom causes students to become aware and self-confident, which leads to the development of empathy and improves their ability to relate socially with others (Vargas, 2010).

Cooperative learning: which is carried out with group work to improve attention, involvement and knowledge acquisition as the person is involved with other people (Hernández, 2022). In addition, it is also a strategy that improves classroom coexistence and implies a relationship with others, which leads to the development of social competence (Gracía, Traver & Candela, 2001).

Project Based Learning: or PBL, is an innovative teaching-learning strategy to educate and at the same time try to create an active society with meaningful learning, which implies an active role of the students who construct their learning and make it more enriching (Zambrano et al., 2022). Project Based Learning involves forming teams composed of people with different profiles, disciplinary areas, professions, languages and cultures who work together to carry out projects to solve real problems. These differences offer great opportunities for learning and will prepare students to work in a diverse and global environment and economy (Galeana, 2006).

Competency-based learning: o ABC for the acquisition of knowledge and development of generic or transversal skills that will enable students to apply their learning to the context in which they develop (Hernández, 2022). Therefore, in view of the new requirements of the context, many countries have sought to develop training proposals that guarantee integration, comprehensiveness, transferability and applicability of knowledge, relevance and evidence of results. Some of these features have become evident in the so-called competency-based educational approaches and models (Villa and Poblete, 2007).

Game-Based Learning: or ABJ is based on the game to learn (Conellà et al., 2020). It is an innovative and practical methodology that makes students feel motivated and involved in their learning (Martín and Pastor, 2020). In addition, the teacher will have the role of learning guide and will mediate in the emotional, cognitive and educational

processes of the students, which leads to an improvement in the students' academic results and more motivation towards learning (Martín and Pastor, 2020).

Flipped Classroom: or Aula Invertida in Spanish, is a model in which the students assume the role of teacher and are the protagonists of their learning, while the teacher is a guide (Hernández, 2022). To do so, students will have to work on their topic at home beforehand. Through this methodology it is possible to work on empathy, since it is necessary to position oneself in the place of the other (Melero, 2022).

Gamification: it is not the same as ABJ. With this method, play is the basis of the teaching-learning process. This technique is intended to contribute to the social and psychological behavior of the students and to encourage participation in the game. With gamification, game elements are used in non-playful contexts through student roles and with active participation through intrinsic motivation to obtain meaningful and functional learning as a result. Learning is taken as positive and motivation, curiosity, effort and cooperation are worked on in the classroom (Hernández, 2022).

Design Thinking: it is a phased approach to create various innovative solutions according to the needs and characteristics of each person, since multiple issues are worked on. Creativity is worked with essays until innovative ideas emerge and this makes the students' motivation to learn high (Melero, 2022). It is usually confused with *Visual Thinking*. However, *Visual Thinking* is one of the visual tools based on mental maps of images that can be used in *Design Thinking* (Chon and Sim, 2019; Hernandez, 2022).

Mobile Learning: is a new strategy that aims to make students learn through different technological means such as cell phones, tablets, consoles, iPads, etc. It is an innovative and motivating methodology for students as it is very contemporary to the technological revolution in which we live. In addition, it also benefits from the exchange of opinions, knowledge, reflections, etc. through forums, blogs, Wikis and this will generate learning (Melero, 2022).

Discussion and conclusions

Therefore, the neuromethodology, since it is based on the best way of learning according to the neurodiversity of people, will be based on the Universal Design of Education (UDE) contemplating theories on inclusion, together with constructivist, cognitivist, behavioral, plurisensory and multisensory, as well as contextual theories, according to Martínez et al. (2022) from the perspective of quality education and equity with a Universal Learning Design (ULD) with materials focused on the teaching-learning process valid for all students regardless of their personal characteristics and educational needs (Delgado, 2021).

Teacher training in multiculturalism is essential to reformulate the school structure and promote the development of intercultural educational policies. Therefore, changes aimed at educational reform to achieve a democratic and intercultural society must favor the training of teachers to carry out intercultural school practices, curricular reforms and promote the educational principles required by cultural diversity in society. To this end, spaces for discussion and debate should be created to help teachers reflect on and acquire

the philosophy, methodological skills, social, political and moral commitment involved in the practice of an intercultural educational project (Escámez, 2002).

For schools to be inclusive it is necessary for teachers to be trained or have experience in inclusive environments (Guevara and Zacarias, 2016). However, teacher training should not be from an individual perspective to develop their profession in isolation, but should be from a joint perspective that allows them to participate in the teaching activity (Giné and Durán, 2017). Since teacher training will make teaching and environments of quality for the improvement of the center, which will lead to a sustainable education in accordance with the UN Sustainable Development Goals SDGs for 2030.

While it is true that neuropedagogy is an emerging term in recent years, authors such as Hernández (2022), point out the imminent need to establish neuropedagogy in the training of teachers in the 21st century.

Thus, as Fernández (2022) and Pérez (2022) point out, in order to be sure that teachers develop our didactic actions in appropriate learning environments that favor the comprehensive development of students and the use of personalized and participatory methodologies in accordance with inclusive education, it is necessary to include neuropedagogy in the curriculum of the degree in Education.

In short, according to the conceptualizations presented in this article, it is necessary to train teachers from neuropedagogy so that the teaching-learning processes are based on neuromethodologies in accordance with the cultural diversity of the student body that we find in Spain today, since it is necessary for education to be inclusive and to offer the same opportunities for all and to educate in interculturality so that when this interculturality is overcome by education, it gives way to a transcultural education in which different customs are shared among the students, passing first through the intraculturality that entails knowing and valuing one's own culture. In this way, education will be of quality, equitable and sustainable, and students will be seen as inclusive citizens, capable of solving their daily problems.

In addition, the students' motivation to learn is also evidenced by the innovation and the active role of the students in the neuromethodologies. We must not forget that we are working with children and that we must involve them and motivate them so that they can learn. Therefore, I believe that in addition to all the inclusive neuromethodologies in multicultural environments that have been exposed, we must always rely on "People Based Learning" because children, as individuals and future citizens must feel the excitement and acceptance during learning and this will be achieved in comfortable environments for them where all people are equally respected and included.

The main limitation of this article has been the scarcity of research on neuromethodology for inclusion in multicultural contexts. Therefore, a proposal would be to continue with quantitative and qualitative research about neuromethodology to further expand this field of research with the foundations laid by Dr. De Barros in 2022 to advance and improve our educational quality and equity and achieve the utopia of a school for all that has been pursued for so many years by knowing how the brain of each person works with minimally invasive techniques such as those being initiated by Dr.

Hernandez in 2022 using the EPOC helmet to learn about the electrical impulses of the brain during the teaching-learning process.

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NEUROMARKETING AS A DECISION-MAKING TOOL IN THE UNIVERSITY CONTEXT

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Summary: The research stems from neuromarketing, defined as the application of neuroscientific methods to analyze and understand human behavior in relation to markets and commercial exchanges. The general objective is to "analyze neuromarketing as a strengthener of university student recruitment". In order to respond to this objective, a non-experimental, descriptive, explanatory, correlational and regression design, with a quantitative methodology, is used from an interpretative paradigm. The sample by convenience is 1,733 participants, where 35% corresponds to the Universidad Columbia del Paraguay, 35% corresponds to the Universidad Autónoma de Madrid and 30% corresponds to the Universidad de Jaén. The data collection instrument has been designed ad hoc and validated in terms of content and construct. The analysis of the descriptive and correlation data, and the significant differences of Kruskal-Wallis, show as main results that marketing and educational marketing are not as important for the Spanish universities as they are for the Paraguayan university, coinciding both in the importance of neuromarketing and strategic planning, so that marketing actions with a "neuro" approach could strengthen the actions to attract potential students to universities, being neuromarketing a strengthener of the attraction of university students.

Keywords: neuromarketing, quality, university, higher education, decision making.

NEUROMARKETING COMO HERRAMIENTA EN LA TOMA DE DECISIONES EN EL CONTEXTO UNIVERSITARIO

Resumen: La investigación surge del neuromarketing definido como la aplicación de métodos neurocientíficos para analizar y comprender el comportamiento humano en relación con los mercados y los intercambios comerciales. El objetivo general es “analizar el neuromarketing como fortalecedor de la

captación de estudiantes universitarios". Para dar respuesta a este objetivo se utiliza, desde un paradigma interpretativo, un diseño no experimental, descriptivo, explicativo, correlacional y de regresión, con una metodología cuantitativa. La muestra por conveniencia es de 1733 participantes, donde el 35% corresponde a la Universidad Columbia del Paraguay, el 35% corresponde a la Universidad Autónoma de Madrid y el 30% corresponde a la Universidad de Jaén. El instrumento de recolección de datos se ha diseñado ad hoc, siendo validado en contenido y constructo. El análisis de los datos descriptivos, de correlación, y las diferencias significativas de Kruskal-Wallis, nos arrojan como resultados principales que el marketing y el marketing educativo no son tan importantes para las universidades españolas como lo son para la universidad paraguaya, coincidiendo ambas en la importancia del neuromarketing y la planificación estratégica, por lo que las acciones de marketing con enfoque de "neuro" podrían fortalecer las acciones captación de potenciales estudiantes a las universidades, siendo el neuromarketing un fortalecedor de la captación de estudiantes universitarios.

Palabras clave: neuromarketing, calidad, universidad, educación superior, toma de decisiones.

Introduction

The research conducted is based on marketing, understood as "a social and managerial process through which different groups and individuals obtain what they need and want by creating, offering and exchanging products with value for others" (Kotler, 1984, p.40) (Kotler, 1984, p.40). The objective is clearly to increase sales, but also to build customer loyalty, increase the visibility of brands, products or services and manage a brand, creating good relationships with consumers in the long term. For this research, educational marketing was analyzed, which can be defined as the set of actions or strategies that allow satisfying the educational needs of the environment, which can be local or international, as well as the educational needs of their families and environment. (Núñez, 2014)

Marketing is focused on a population that has changed during the last decades in its own nature, having to resort to more and more ingenious systems of advertising to sell basically the same products, with this has been the look towards neuroscience, which implies a knowledge of the brain structure and its functioning; the knowledge of neuroeducation allows the teacher to understand the characteristics of the nervous system and the brain, thus relating this knowledge with the behavior of students, in order to subsequently be able to make and design a coherent learning proposal (Campos, 2010) and, likewise, to know the thinking structures of potential university students, applying neuromarketing, defining it as the application of neuroscientific methods to analyze and understand human behavior in relation to markets and commercial exchanges.

Peter Drucker stated in 1954 that "marketing is not a department; it is the company as a whole seen from the customer's point of view", with this definition it can be considered that the creation of value for the customer should be the competence of all the people working within the organization or institution and not exclusively of the marketing staff.

Kotler defines marketing as: "a social and managerial process through which different groups and individuals obtain what they need and want by creating, offering and exchanging products with value for others". In this definition, factors such as need, desire, demand, customers, products, satisfaction and cost can be found.

Marketing helps the company to focus on the customer and try to satisfy them in what they really value. (Sainz de Vicuña Ancín, 2016)

When organizations use marketing appropriately and achieve a differentiation over the competition, it is because they effectively carried out an action that generated value for the customer and, if innovation is added to marketing actions, it could be said that business competitiveness is guaranteed.

Marketing has been entering different activities, not only those related to commerce, giving rise to different aspects such as service marketing, studies oriented to consumer behavior and satisfaction, and with it the emergence of relationship marketing, among others.

Based on the aforementioned concept, marketing could be considered as the channel between the industry or company and the consumer, where both obtain benefits, offering tangible or intangible goods, also called services.

The concept of marketing is not only framed in what refers to sales, it goes deeper into areas such as logistics, production, commercialization and after-sales of the good or service.

The objectives of marketing are clearly to increase sales; but so are building customer loyalty, increasing the visibility of brands, products and services, managing a brand, creating good relationships and long-term ties with consumers, partners and suppliers, and educating or orienting the market.

Since the origin of mankind, human beings have had to obtain goods to satisfy their needs. With the passing of time, as human beings ceased to be nomadic and began to settle in semi-fixed places, it allowed a new period to begin, the factor of the division of labor and with it, the possibility of exchanging goods and services, thus creating value to satisfy needs.

With the creation of value and the exchange of goods to satisfy needs, marketing begins, which is nothing more than a social process of exchange that each of the actors in this system carries out to satisfy desires or needs. (Maltifano et al., 2016)

Marketing creates and delivers value, to satisfy the needs and desires of consumers, and also defines, measures and values the potential market, quantifies it and measures its potential profit. Likewise, marketing involves certain strategies, techniques and practices whose main objective is to generate value for the brand, the product or both, thus attributing greater importance to a specific public or target public.

José María Sainz, defines marketing as "the responsible process aimed at identifying, anticipating and satisfying customer needs in order to build customer loyalty, so that the company can achieve its strategic objectives". (Sainz de Vicuña Ancín, 2016)

From the definition of Sainz and other authors, human needs are mentioned as a determining factor for decision making or for the implementation of strategies. Each human being possesses a level of needs or values in order to satisfy each of his or her needs.

Educational marketing has contributed to the process of change in the education sector, regardless of the level of education in both the public and private sectors, especially in the field of higher education. The objective of any marketing department can be considered first and foremost to increase turnover or in this case enrollment, but it also works on positioning, visibility, retention and loyalty.

Universities must ensure that people seeking professional training come to their institution. In recent decades, word of mouth or word of mouth and the recommendations or experiences of people close to them have been the main channel for attracting students, but the process of making a purchase decision or linking with a university for those interested in pursuing a university degree has evolved.

The trends towards digital marketing are giving an interesting turn to the decision making process of buyers, interested people do their own research by visiting the websites of universities, their social networks, google information of the institutions that interest them and, with the accumulation of that information is that they end up making a decision for affiliation to an institution.

In educational marketing, it is not only aimed at increasing turnover or visibility, it has a much deeper purpose, which is the continuous improvement of the product offered, obtaining a strategic vision and aiming at differentiation from the competition. Another important objective is to generate loyalty and a sense of belonging, creating experiences, moments and experiences that are unforgettable for our consumers. If the university is able to generate this feeling, students and alumni will be the best marketing element the institution can count on.

Another very important element is visibility, creating notoriety outside the academic institution, which is why the creation of communication campaigns with impact must be taken into account, taking care of the image that the educational institution wishes to transmit.

Education, considered as a service within marketing, adopts communication or marketing activities to meet the needs of customers, in this case, students and, not forgetting teachers, for whom internal marketing or endomarketing strategies must be applied. Educational marketing actions are carried out with these two audiences in mind.

The area of neuroscience is a field of study that is gaining more value today; this field applied to the educational and business environment acquires a relevant nuance giving rise to what is known as neuroeducation and neuromarketing for the specific case of marketing in the educational field.

Neurosciences were incorporated as a tool in the area of knowledge within psychology and economics. The main reason for this incorporation is to understand the relationship that may exist between the mind and the body of the human being; to analyze the cells that are connected, forming systems that in turn generate the sensory perceptions of human beings in their daily activities, thus providing an answer for marketing actions that seek to know the consumer behavior and the factors that indicate in their purchase. (Maltifano et al., 2016, p. 53)

From the neuroscientific perspective, the brain is a holistic element in which learning is generated when different brain functions and areas are activated, in

contrast with research that understands that the cerebral hemispheres are independent, i.e., that each activity has a specific area of the brain to develop it (Bueno and Forés 2018). In this sense it is necessary to clarify that although it is true that there are specialized brain areas for each of the actions such as vision, speech, mobility, among others, it is important to mention that when performing any of the tasks mentioned above, apart from activating the main area involved in that task, the involvement of various brain areas is also observed, understanding the brain from this perspective in a holistic way (Figueroa and Avella, 2019).

According to Campos (2010), it can be said that emotions play an important and fundamental role in decision making; therefore, a good understanding of human emotions and working with them could help people's decision making.

Following Campos, this mention can be applied not only to educational actions within the classroom; this can be extrapolated to people's day-to-day actions, human beings could be considered as emotional and not only rational people.

Therefore, the emotional brain has a close relationship with the main perceptual areas, based on this premise, it can be conceived that these areas can positively influence the emotional state of the speakers (Padilla, 2005).

According to Meléndez (2012), executive functions allow us to achieve specific objectives through a logical and structured design. Therefore, the importance of these in the achievement of learning is understood, since they facilitate the structuring of information and modulation of our brain activity (Véglia and Ruiz, 2018). In this same

line, Punset (2007) had already clarified that executive functions are those higher order cognitive functions that depend on the attention and memory systems.

The relevance of executive functions is evident, given that they are capable of modulating our brain activity for the sake of achieving the goals we set for ourselves, due to the fact that they depend directly on attention and memory (Santa- Cruz and Rosas, 2017).

Considering the relevance of the functions of the executive functions in the decision making process, it can be determined that, from neurosciences oriented to marketing, these functions could be enhanced.

For the education of the future, neuroscience will be a very important support, as it will collaborate with studies to learn how the brain learns. It is known that neurons receive information from the outside, this information is processed and actions are executed according to the analysis previously performed. (Llorente Alonso, 2017)

Neuromarketing is known as the science that studies how people act when making a decision in the purchasing process. This study has been growing in recent times, with the objective of improving the effectiveness of marketing strategies and campaigns that seek to know consumer behavior in greater depth and to accompany them in making decisions for the purchase or selection of a product or brand.

Neuromarketing is a discipline that uses techniques based on scientific principles, which investigates the way in which people think and make decisions; a process that happens most of the time unconsciously.

In fact, it is a word composed of two terms: neuro (which refers to neuroscience and the study of the brain) and marketing (the discipline that deals with advertising, propaganda and market research).

In the 1990s, brain function began to be studied, and marketing decided to take this knowledge and apply it. He utilized the scientific techniques and technology used by neuroscience and discovered their practical commercial utility.

The beginning of neuromarketing arose from the concern for customer service, quality, loyalty and brand loyalty, which would later be lost with the economic crisis in the 1990s in the United States (Jones & Monieson, 1990). Prior to this concept, marketing based its activities on the four P's or Marketing Mix, Jerome McCarthy's Theory (McCarthy, 1964): Product, Price, Place, Promotion.

A year later, the concept of the four Cs, a customer-oriented concept, was introduced. Robert Lauterborn (1990), suggests a consumer-oriented version, in which he integrates mass marketing, focusing on market niches, taking into account the cost, expectations, communication and convenience of the user or customer.

Many marketing experts make use of neuromarketing, in some cases even without knowing it. Many are not new inventions, but were already in use because they worked and Neuromarketing research has found the scientific background for their effectiveness.

The impulses of neuromarketing came to complement the daily life of human beings, for example, the use of colors or colorimetry to generate different sensations on a product, environment or commercial premises. Other examples could be: background or ambient music, scents, characters or influencers, gondola location or differentiated product space within the store.

Although neuromarketing is still considered an experimental science, this science studies the effects that marketing actions, impulses, advertisements and other communication actions generate in the human brain; the purpose of this science is to be able to predict consumer behavior. It could be considered as a specialized model of market research, which focuses directly on the reactions or feelings that a marketing or communication action generates in the consumer and its influence.

Néstor Braidot (2009) defines neuromarketing as an advanced discipline that researches and studies the brain processes that explain people's behavior and decision-making in the fields of action of traditional marketing: market intelligence, product and service design, communications, pricing, branding, positioning, targeting, channels and sales.

Neuromarketing answers with a greater degree of certainty to many of the questions that have been asked in relation to: the stimuli that an advertisement should contain to achieve a greater degree of impact, the level of repetition in each medium for a campaign to be effective, the sensory stimuli that a product should contain to achieve customer satisfaction, the best strategy regarding price, the way to seduce customers so that they stay longer at a point of sale, increase their volume of purchases and return, or the type of training that a sales force should have to be competitive. (Al & Del, 2014)

Neuroscience linked to different areas of economics and psychology have been incorporated as tools to understand the consumer buying process. The purpose of these studies is to understand the interrelationship between the body and the mind of the consumer, in order to understand the sensory perceptions that human beings have in their daily lives, generating responses in marketing, thus improving their impulses and strategies for customer acquisition, retention and loyalty (Malfitano, Arteaga, Ramano, & Scinica, 2007)

From the above, the question arose: "Could marketing actions with a "neuro" approach strengthen student recruitment actions?" and the objective of "analyzing neuromarketing as a strengthener of university student recruitment".

In order to meet the objective, the starting point was a conceptualization of marketing, educational marketing, some theoretical aspects of neuroscience and neuromarketing.

In the methodology, a descriptive, non-parametric design was established.

Method

The research aims to "Analyze neuromarketing as an enhancer of university student recruitment". It is also guided by a series of specific objectives such as: To describe the decision-making process of first semester students in their university decision; To identify the elements that higher education institutions take into account in the process of attracting students; To show the bases that constitute neuromarketing in a university context; To determine the relationship that exists between neuromarketing and the "quality" factor when selecting a university.

The research has applied an interpretative paradigm, since it has not attempted to make generalizations from the object studied. It is non-experimental, cross-sectional, explanatory, descriptive, correlational and regression.

In the proposed research, the quantitative approach has been chosen, since it seeks basic knowledge, and at the same time, knowledge applied to decision making and actions for change.

The quantitative approach is appropriate for this research, since quantification is a fact that will be taken into account to understand the reality studied. For this case, a Likert scale was used and SPSS V.27 was used as the software for data analysis.

As for the research subjects, the choice to establish them as a population follows certain selection criteria, so as to ensure on their part the understanding of the object of study (Flick, 2018). The population must have the necessary knowledge and experience to provide understanding of the study results (Bautista, 2009).

For the research, a total sample of 1,733 informants was obtained. This population was determined based on the following criteria (to be part of the sample, it had to meet at least one of the criteria below):

a) Be a first year student.
b) Be a student of Universidad Columbia del Paraguay, Universidad Autónoma de Madrid, Universidad de Jaén (Spain).

Therefore, the choice of the 1,733 participants in the selected sample was based on convenience. Of the total population selected, 35% corresponds to the Universidad Columbia del Paraguay, 35% corresponds to the Universidad Autónoma de Madrid and the remaining 30% corresponds to the Universidad de Jaén. It is also mentioned that, of the total, 1082 are women and 651 are men.

The data collection instrument, the Likert scale, has been designed in a manner consistent with both the objectives and the target population. This type of scale is used to evaluate the level of agreement or disagreement on a topic. This type of scales are excellent for measuring attitudes, reactions and level of knowledge of a person in relation to a subject, among other aspects. This scale is usually divided into sections that respond to the different study variables.

The Likert scale developed for this research consists of 38 items, divided into five variables of analysis: marketing, educational marketing, neuromarketing, education and quality, strategic planning. The degree of response, affecting the level of acceptance, of the 38 items was established in a linear fashion from one to five, in the following order: (1, Strongly disagree: 2, Disagree; 3, Indifferent; 4, Agree; 5, Strongly agree).

Another of the central axes that guided the research methodology was the operationalization table. This table has followed a process through which the elements of the study are specified in order to be able to make them visible during the course of the research.

The construction of the data collection instrument required the creation of an operationalization table to measure the methodological knowledge of the research, thus delimiting the variables, the specific objectives and the items of the methodology applied.

For content validity and construct validity, the calculation of the Competence Coefficient (K) was carried out, the mean of the K was 0.91, so it is deduced that it is of a high level of competence in the subject. Some questions were readjusted without affecting the meaning of the questions. A pilot test was also carried out with a subgroup of the sample before performing the test on the total sample, thus detecting comprehension difficulties for some questions or those that generated doubts. Once the pilot test had been carried out and the results were satisfactory, the content of the instrument was considered valid.

Data recording, digital coding and statistical processing were carried out with SPSS V.27. To test the null hypothesis, Barlett's test was performed, and the result was .00, so the null hypothesis was rejected at the 5% significance level.

The KMO was performed, obtaining a result of .833, which led to the factor analysis.

For reliability, Cronbach's Alpha and the test of two halves were calculated. Cronbach's Alpha on the 38-item scale yielded a score of .907, so the scale is considered to be excellent.

In the Guttman two halves test, it has yielded a length score of .800, which shows reliability in the data, due to its proximity to 1.

Results

As mentioned above, five dimensions were carried out, from the country perspective, and the results were as follows:

Table 1. Results by dimensions between Spanish and Paraguayan universities

Dimensions	Spanish universities	Paraguayan university
Dimension A (Marketing)	(2.9) "Indifferent."	(3,6) "Indifferent"
Dimension B (Educational Marketing)	(3,2) "Indifferent"	(3,9) "Agreed"
Dimension C (Neuromarketing)	(3,9) "Agreed"	(4.0) "Agree"
Dimension D (Higher education and quality)	(3,4) "Indifferent"	(3,8) "Agreed"
Dimension E (Strategic planning)	(3,8) "Agreed"	(4.0) "Agree"

In the correlations performed, the highest correlations can be considered: C11-C12 (.825**), people who consider that the social environment influences the consumer, also consider that the social factor affects these decisions; E33-E32 (.675**), people who think that they remember advertisements in traditional media, also mention that they remember advertisements that appear in their social networks and D18-B8 (.659**), people who consider that the institutional image influences the decision to enroll in college, consider that the institutional image influences the choice.

Among the lowest correlations, the following can be considered: A1-B7 (.001), i.e., university selection by location, does not influence with the years of trajectory of the institution; A2-D5 (.001), where university selection by recommendation of friends does not influence with that the university infrastructure is synonymous with quality and the correlation C11-D20 (-.032), where the social environment influences university selection, is not related to the efficiency of the university marketing campaigns.

As a result of the correlations between dimensions, the following stands out:

Dimension A (Marketing) correlates with dimension B (Educational Marketing) at .546.

Dimension B (Educational marketing) correlates with dimension D (Higher education and quality) at .630.

Dimension C (Neuromarketing) correlates with dimension E (Strategic Planning) at .539.

Dimension D (Higher education and quality) correlates with dimension B (Educational marketing) at .630.

Dimension E (Strategic planning) correlates with dimension D (Higher education and quality) at .601.

As can be seen, the dimensions are interrelated and, in turn, it can be observed that:

B D, D B (.630) and the one with the lowest correlation is C E (.539)

In the descriptive analysis, it was observed that in dimension A (Marketing), the participants are indifferent when choosing a university because of its location, the recommendation of friends or relatives, or its fees. However, they disagree that marketing actions are the decisive factor in consumers' decision making, and agree in choosing a university based on the careers it offers.

In dimension B (Educational marketing), the subjects agree that the education and culture of young people influence the way they understand the communication campaigns

of the different universities, that the years of trajectory of the university are very important when deciding; finally, that the institutional image influences the selection of the university, whether private or public. However, they are indifferent to the fact that a good educator is a good marketing professional and that a marketing professional is an education professional.

In dimension C (Neuromarketing), the participants agree that the social environment and culture influence the consumer, that sensory and perceptual factors are decisive in the decision making process, as well as that the effects of purchase or use experiences are decisive in the decision making process, that emotional intelligence influences the acceptance and purchase decision of a product, as well as that neural networks generated with previous experiences of use or purchase affect the purchase decision, and finally, that neuromarketing actions focused on the brain system of consumers manage to affect their decision-making power.

Dimension D (Higher education and quality). In this dimension, there is agreement that the institutional image influences the decision to enroll in a university, as well as the quality of the service provided. Likewise, they agree that the communications made by the universities transmit quality in the education they offer, that the teaching component and the infrastructure of the universities are synonymous with quality, as well as the student exchange activities, control and monitoring tools and that the careers are accredited. On the other hand, the participants are indifferent about whether the universities' marketing campaigns are efficient, whether the years of permanence in the market are synonymous with quality in education, or about the loyalty of students and promotions carried out.

In dimension E (Strategic Planning). The participants agree on the importance of remembering the advertisements that appear on social networks, the advice of people they know when making a decision, the importance of the university building student loyalty and providing efficient support to its students, as well as seeing and hearing testimonials from students and graduates of the university and the possibility of finding good classmates and understanding professors to help them in their professional training. In spite of what has been said, indifference is shown to the recall of advertisements appearing in traditional media such as TV, radio, magazines or newspapers.

Once the descriptive analysis by items has been carried out, the general conclusion is that the subjects of Spanish universities are indifferent to marketing, educational marketing and higher education and quality. On the other hand, they agree with the neuromarketing aspect and strategic planning. Regarding the Paraguayan university subjects, they agree with educational marketing, neuromarketing, higher education and quality and strategic planning, but are indifferent to marketing. All this clearly shows us the differences between the different countries, coinciding in the importance of neuromarketing and strategic planning.

¶

Discussion and conclusions

Among the most outstanding conclusions, the description of the decision making process in first semester students is considered first, it has been observed that they show indifference in their choice processes in terms of location, friends' recommendations or price, and the marketing actions carried out are of little importance, the key point being the careers offered by the universities. It is clear that, in spite of the publicity campaigns that are carried out, in the end what determines the choice is the academic offer of the house of studies.

In terms of identifying the elements that higher education institutions take into account in their student recruitment process, an unimportant aspect is whether the educator "sells" the university well, with elements such as the education and culture of the prospective students, the university's years of experience and the institutional image shown being more important.

Regarding the neuromarketing dimension and the "quality" factor when selecting a university, the institutional image influences the decision to enroll in a university, as well as the quality of service provision and teachers.

Finally, the relationship between neuromarketing and strategic planning can be concluded that the recall of advertisements that appear in social networks and not in traditional media is decisive, as well as the advice of acquaintances and testimonials from other students or graduates.

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NEUROCREATIVITY: ANALYSIS AND EDUCATION OF CREATIVE THINKING

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Summary. The creative process is linked to brain activity. This process is understood as a "capacity to create" as opposed to the notion of innovation that focuses on the "action of creating". Thus, people are more creative when they detect cognitive stimuli linked to brain noradrenaline (neurotransmitter) levels, as it favors communication between networks. The frontal lobes are highlighted in emerging studies of creative thinking in relation to executive functions. Projected neural connections is a technique known as neuroimaging with the purpose of deriving information on brain restructuring and brain plasticity. Neuroimaging techniques make it possible to analyze the activity of the nervous system and to observe the development of learning skills. Throughout history, there has been talk of inspiration in sleep, or there has been talk of connectivity between the two hemispheres to favor creativity, or another agent of interest linked to the creative process, among others, is mental blocking. Different agents or perspectives of the creative process. And, finally, some activities that contribute to the use of creativity in their execution are proposed.

Keywords: creativity, brain, neuroscience, neuroimaging and neurotransmitters.

NEUROCREATIVIDAD: ANÁLISIS Y ENSEÑANZA DEL PENSAMIENTO CREATIVO

Resumen. El proceso creativo se encuentra ligado a la actividad cerebral. Dicho proceso se entiende como una "capacidad de crear" en contraposición a la noción de innovación que se centra en la "acción de crear". De este modo, las personas son más creativas cuando detectan estímulos cognitivos enlazados a los niveles de noradrenalina cerebral (neurotransmisor), ya que favorece la comunicación entre las redes. Los lóbulos frontales se ponen de relieve en los estudios emergentes del pensamiento creativo en relación a las funciones ejecutivas. Las conexiones neuronales proyectadas es una técnica que se conoce como neuroimagen con la finalidad de derivar información de la reestructuración cerebral y plasticidad cerebral. Las técnicas de neuroimagen permiten analizar la actividad del sistema nervioso y observar el desarrollo de habilidades en el aprendizaje. Asociadas a la creatividad, a lo largo de la historia, se ha hablado de la inspiración en el sueño, o bien se ha hablado de la conectividad entre los dos hemisferios para favorecer la creatividad, u otro agente de interés ligado al proceso creativo, entre otros, es el bloqueo mental. Agentes o perspectivas diversas del proceso creativo. Y, para finalizar, se plantean algunas actividades que contribuyen a emplear la creatividad en sus ejecuciones.

Palabras clave: creatividad, cerebro, neurociencia, neuroimagen y neurotransmisores.

Introduction

Throughout the centuries, creativity has been the focus of several studies. In Plato's *The Banquet (* 385-370 B.C.), the author defines the concept of "poiesis" as "the cause that converts anything we consider from non-being to being". Therefore, an approach to the notion of "creative process". Today, if we review the concept, we can see that it is defined as "the faculty to create" or as the "capacity to create" according to the Royal Spanish Academy. That is, as "the faculty of producing something": new and/or original ideas, new and/or original materials, and so on. A faculty and/or capacity that must be understood in the social and historical context in which they are developed, taking into account pre-existing knowledge. More recently, neuroscientific research is attempting to provide inputs that contribute to the understanding of the act we call creativity.

In today's society, it is important to be able to provide solutions to various problems, whether expected or not, and for which imagination, versatility and adaptation are tools for finding the most efficient and "elegant" solution to a given problem, the notion of "elegance" being understood as a simple and/or not excessively complex solution. Tools intertwined with critical thinking. In addition, we find another tool with emotional essence that influences in a notorious way, curiosity, facilitating learning.

In 1926, Wallas proposed four phases in the creative process from the perspective of information:

Phase 1: Preparation.

Regarding information: Basic knowledge and attitudes are established on which the foundations of the creative process will be built.

Regarding the problem: It is the moment when the mind is predisposed in a concrete approach to the problem in order to tackle it.

Phase 2: Incubation.

Regarding information: The information is analyzed, processed and the focus is on the data of interest.

Regarding the problem: It gives the sensation of moving away from the problem, which is internalized in the right hemisphere.

Phase 3: Lighting.

Regarding information: Key data is found that transforms the first information into a second response.

Regarding the problem: The problem is restructured and inspiration occurs and the creative idea moves into the zone of consciousness.

Phase 4: Verification.

Regarding information: The information is contrasted with other information to elucidate the veracity and/or validity of the same, as well as the possibility of a more efficient one.

Regarding the problem: An assessment is made of the usefulness of the result in view of the problem posed.

On the other hand, Chávez (2001) distinguishes three phases from the perspective of the intervening subjects:

Phase 1: Association-Integration: The senders and receivers of information associate and become aware of it internally and externally.

Phase 2: Elaboration: The subjects involved use their talents to originate the creative idea or solution to the problem.

Phase 3: Communication: The idea and/or solution is shared.

Two perspectives of the same reality whose main focus is on the information or on the subjects of the problem posed, respectively. Two visions that respond to the same situation, and whose approaches may be of interest depending on the angle from which one wishes to highlight them. A situation that has as its epicenter the study of creativity, which is linked to various mental functions and components of each individual (Chávez *et al*., 2004). On the other hand, a consequence of this study is innovation, since it is understood as the "action of creating, modifying, and/or altering something by introducing novelties, according to the Royal Spanish Academy. That is to say, while creation refers to the capacity and/or faculty to create, innovation refers to the action of creating and/or modifying. An action whose ultimate purpose is to influence either the historical, social or scientific context, etc., at the time it arises.

Creativity and innovation are useful when establishing learning situations to meet the diversity of talents and abilities of students, and having as tools curiosity, emotions, imagination, versatility and adaptation when designing different activities.

This paper presents a review of several authors and studies based on neuroscience and creativity in order to deepen the understanding of the cognitive functions involved in cognitive development. Knowing these aspects can help to lead to practical results in the educational context, and therefore, to project a "path" to follow in order to establish the teaching of students. Within this broad framework, the study of cases with neuroimaging samples is also of interest, since it allows us to investigate the understanding of cognitive processes in creativity.

Neuroconcepts

In recent years, neuroscientific findings are not inconsistent with the methods of neuropsychology, but together they contribute to the study of the human nervous system. One of the main challenges is to circumvent reductionist perspectives based on the expression of cognitive constructs that define creative processes (Dietrich *et al*., 2015). The manifestation of creativity requires a theoretical synthesis through the conduit of neuroscience and its neuromethodologies in order to provide answers.

Through neurological development, the executive functions of brain activity linked to creativity can be observed. Knowledge of creativity is extensive, as it involves numerous brain structures and functions, as well as various neurotransmitters. Heilman's (2016) research pointed out that innovation requires divergent thinking and disconnection through frontal networks. He also mentions that creative people need to take risks and find novelties, attitudes that energize the "ventral striatal reward system". It also exposes the importance of associative and convergent thinking, operations that promote the annexation of neural networks. Thus, people are more creative when they detect cognitive stimuli linked to the levels of brain noradrenaline (neurotransmitter), since it favors communication between these networks.

Nowadays, the different brain areas can be connected, thus, the brain has a globalizing role. Fuster (2022) alludes that higher cognitive functions are located in the prefrontal cortex, where the neuronal bases are located. This same author mentions that this area is in charge of managing the complex information that circulates to the brain (formulating strategies, finding solutions, elaborating plans...), in order to provide a social response in relation to the context and to facilitate the execution of the actions of the motor cortex. However, it should be considered that the prefrontal cortex is the last part of the brain that does not finish developing until about the age of 20

Based on the latter assumptions, the generation of creative ideas occurs between the frontal and temporal lobes (Rodriguez, 2021). The frontal lobes come into contact with other regions of the brain according to the type of creativity being performed through different neurological pathways. For example, when semantic information is required, it is connected to the temporal lobes or if ideas are constructed, they are associated with the basal ganglia and the right angular gyrus, among other subcortical structures (González, 2018).

The existence of different brain areas leads to an exchange of information during the creative action. Jung and Haier (2007) formulate a list of all brain areas involved, supported by a sample of their functional and structural neuroimaging studies. Thus, neuroimaging or imaging is a technique that projects neuronal connections through an image in order to transmit information on brain restructuring and brain plasticity (Euroinnova Formación, 2022).

Consequently, brain regions become key pieces to understand the neurophysiology of the brain in the creative dimension. Likewise, neuroimaging techniques make it possible to analyze the activity of the nervous system and observe the development of learning skills, as well as to measure the characteristics of the brain and detect particularities. Consequently, neuroimaging becomes a new teaching neuromethodology to learn about the student's brain, learning style, creativity, among other aspects of interest (Sanz, 2022).

Creative brain

Creativity has a complex scheme integrated by different functions. Through these functions, the various brain areas can be determined. As mentioned in the previous point, the frontal and temporal lobes are closely linked to creativity, however, other areas may contribute in different processes (Gonen-Yaacovi *et al*., 2013). The promotion of higher cognitive skills (cognitive flexibility, spatial reasoning, verbal fluency...), including executive functions, provides a solid network of knowledge focused on the creative process. All these tasks are linked to the frontal lobes, however, the linkage that originates with other brain areas guarantees this creative process (Heilman, 2016).

It has been observed that the basis of the structure of cognitive ability encompasses frontal, parietal and occipital brain areas, as well as the relationship between cognitive functions and the creativity index of the individual (Zhu *et al*., 2022). Attention, memory, language and executive functions have an impact on the creative process, which is why the prefrontal area is one of the brain regions that is most activated (Tapia *et al*., 2017).

In relation to other brain areas, other authors such as Gómez (2020), Mora (2017) and Blanco (2014) affirm the importance of the corpus callosum as a bridge between the cerebral hemispheres and creative processes. Along these lines, the corpus callosum can be defined as a structure formed by nerve fibers that creates a link between the right and left hemisphere of the brain (Fernandez, 2022). This allows the interrelation between the different areas of both hemispheres, which is a distinctive element in the course of the creative processes. Being synchronized, it enables the unification of the information directed to the brain.

Creativity encompasses several stages that deal with various neural bases, including: preparation, critical capabilities, innovation, elaboration of creative resolutions, and creative productivity (Heilman, 2016). In order to enhance them, it is necessary to understand their aspects. In this line, creativity encompasses functional schemes formed by an *ad hoc*division:

- *Brain function*

In various studies, such as that of Chen *et al.* (2016), examined the link between cognitive flexibility and creative performance in which the immersed difference of the medial prefrontal cortex and frontal lobe fractions was observed, with a larger size disparity existing in relation to divergent creative cognition. Thus, the frontal lobes apparently occupy an important place in the axis of creativity.

Analogously, several studies have shown the existence of brain areas related to creativity. Burgess-Chamberlain (2016) noted increased gray matter in individuals with visual perception. Thus, it can be inferred that the decisive elements of creative innovation are the connections that influence thinking and image making. For its part, verbal creativity is closely related to the left parieto-temporal areas of the brain, located within Brodmann's area 39 and 40 (Brodmann, 2010). Areas linked to problem solving through creative cognitive processes

Similarly, Chávez-Eakle *et al*. (2012) found a connection between brain blood flow and the level of creativity in several areas such as: "left middle frontal gyrus, right inferior parietal lobe, right straight gyrus (...)". This indicates that the blood fluid connects with creativity, involving emotional and cognitive brain processes. The left superior temporal gyrus helps to establish ideas and, in addition, the limbic system directs physiological reactions in the emotional aspect (Hurtado *et al*., 2017).

From this approach, creativity is not only about specific areas of the brain, but about the whole brain in its plenitude. Its functionality is supported by various developmental contexts, e.g., neurological conditions in infancy.

- *Neurotransmitters of the nervous system*

There are certain common contexts in which individuals experience fleeting ideas, for example, in states of recreation or drowsiness. Creativity is enhanced when different channels are activated and emerge in the most unexpected circumstances. This production of ideas is interconnected with the prefrontal cortex and the development of artistic ability (Bermeo and Urquina, 2021).

The activity involves *insight* (the phase of inspiration or illumination, the famous: "*Eureka*!"), creative schemes offer solution paths of a fleeting and automaton-like nature. Although it is true that this activity can also be carried out using analytical thinking with a more conscious and progressive method. Beaty, *et al*. (2015) conducted a study in which a task specific to divergent thinking was executed: Generate a second use for everyday instruments. In this activity, the uniqueness and fluency of the ideas provided was estimated, thus observing the coordination between neural networks linked to spontaneous thinking, cognitive control and functional recovery mechanisms. In the words of Estanislao Bachrach (2014): "It is the mental activity where a revelation or *insight* occurs in the brain and results in a new idea or action that has value."

The brain activates neurotransmitters to provide cognitive responses. As a result of the creative process, these biomolecules facilitate communication between neurons. This exchange of information is closely linked to dopamine (known as the "pleasure hormone"), a neurotransmitter linked to happiness and pleasure in the brain, emotions that affect motivation and creativity (Guillemin and Lemke, 2013). Likewise, the noradrenalinealso acts as a hormone and neurotransmitter, since it directs the tasks of the organs and cells of the nervous system, as well as influencing motivation and creativity.

Under this premise, it is possible to establish specific pedagogical strategies, delimiting affective and cognitive approaches during learning. Reyes *et al*. (2015) conducted a study in which it was observed that, by encouraging divergent thinking in activities, they increase the functions of abstract thinking, immediate memory and metaphorical sense.

Some aspects of executive functions and creativity are of interest. The production of ideas is a complex activity that interconnects with various regions of the brain. According to the context, creativity is directed towards different levels, for example, artistic talent, decision making, among other functions.

- *Executive functions*

As a result of the above, the frontal lobes become more important in emerging studies of creative thinking in relation to executive functions. According to Montenegro (2018), executive functions are defined as higher cognitive processes that favor the birth of ideas, mobility and the performance of simple operations, these are aimed at executing tasks with a higher level of complexity (decision making, writing, reading, etc.). These functions forge the tools "intermodal and intertemporal integration", which make it possible to conceive emotions and knowledge from the past to the future in order to find the key to different contexts (Verdejo-García and Bechara, 2010).

Additionally, if there is a higher gray matter index in some brain areas such as the right temporal lobe and left parietal lobe, it increases the percentage of creative cognitive competence (Chen et al., 2016). The activities with the highest ratio of creativity are articulated to the frontal lobe, specifically to the premotor cortex, since there is also a greater volume of gray matter, the latter lobe plays a fundamental role in creative behavior.

Finally, cognitive skills or tasks with a higher level of complexity are essential to ensure the quality and development of learning. Its function is supported by the regulation of behaviors that are not related to teaching; decision making and problem solving in the classroom; the objectives of school teaching; programming of tasks and activities; evaluation of knowledge for professional success.

- *Models of creative thinking*

Dietrich (2019) established four diverse processing models (cognitive, affective, intentional, and automatic), which together construct a graph divided into four areas: Intentional and cognitive; intentional and affective; automatic and cognitive; automatic and affective.

Table 1

Creative contingency table

	Cognitive	**Affective**
Intentional	Scientists and inventors	Writer
Automatic	A person and falling object (force of gravity)	Musicians and artists

Note. Source: Own authorship (2022) based on Dietrich's (2019) creative processing models.

These models of thinking pose different skills or complex cognitive tasks arbitrated by different neural circuits. Based on the above lines, people with the most developed intentional and cognitive areas possess a large amount of knowledge about a specific topic and combine it with their skills and abilities to put it into practice. They are usually professionals in the field of science and research. Next, people with the most developed intentional and affective domains let their professional activity be shaped by their emotions. They may prefer quiet moments for personal introspection or journaling, but they are equally logical and rational, coordinating reflective action with emotional creativity. On the other hand, people with the most developed automatic and cognitive areas tend to experience spontaneous cognitive creativity when they have the knowledge they need to get the job done, but may need some inspiration. This model of creativity can emerge in the most atypical moments, such as conceiving the latest idea for a book while doing household chores or imagining a solution to a problem while driving. This modality is observed in the basal nuclei of the brain (within the encephalon), in the development of cognition and emotion. Finally, people with more developed automatic and affective areas have a deeper emotional domain, although their functions are less structured, this can be reflected in musicians and artists.

This is why Dietrich (2019) hypothesized that these four models of creative thinking involve the dominance of different brain regions. Thus, creative thinking originates from two methods: Intentional and automatic. These lay out a neural roadmap that manages emotional information and cognitive processes.

Agents linked to creativity

Several agents to take into account related to creative thinking can be distinguished (Rodriguez, 2011; Mora, 2016):

Agent 1: The dream as inspiration.

Brain disinhibition has favored artistic production with its revelations (Bogousslavsky, 2002; Stickgold and Walker, 2005). Rest is a source of creative ideas (Dietrich, 2004).

Agent 2: Interhemispheric connectivity favoring the creative process.

There are different patterns according to sex according to (Razumnikova, 2004).

Agent 3º: Dichotomy between intelligence, giftedness, high abilities and creative talent.

High abilities and giftedness are related to creative talent (the latter to a greater extent in the figurative field). However, there is no correlation between intelligence and creativity (Rodriguez, 2021).

Agent 4º: Innovation and curiosity.

Innovation needs memory in terms of knowledge of previously raised solutions (Mora, 2016). A path that is influenced by emotions, curiosity in the face of the challenge posed and the abilities and actions to create.

Agent 5º: Frontal lobe dysfunction and creative block.

Depression is associated with this area and irregular functioning, linked to lack of motivation and cognitive flexibility (Rodriguez, 2011). Likewise, according to Flaherty (2004), lack of ideas can also lead to an incorrect functioning of the frontal lobe.

Some activities to develop creativity

According to neuroscience, anxiety is linked to creative inaction and, sometimes, to depression, leading to changes in frontal lobe functioning (Cannistraro and Rauch, 2003). Regarding creativity, the brain area indicated can be stimulated with creative tasks according to electromagnetic studies conducted by Carlsson, Wendt and Risberg in 2000. Following Ramón y Cajal (2013): "Every man can be, if he sets his mind to it, a sculptor of his own brain", so some activities are proposed in pursuit of such an end:

Activity 1. A dialogue with the canvas *Anxiety* (Munch, 1894).

- Analysis of the portraits and the environment.
- Question and analysis: does it convey tranquility or nervousness?
- Identify and express a basic emotion conveyed to you by the painting in accordance with Aguado (2018): "Fear, joy, sadness, anger, disgust, curiosity, admiration, surprise, guilt, and security."
- Respect and empathy are enhanced.

Activity 2. Recreational mathematics: We draw points and/or straight lines.

- Reflective activity on a sheet of paper.
- Question and analysis. Placed 4 or 5 dots on the paper, is it possible to draw straight lines without lifting the pencil from the paper and passing through each and every dot?
- Imagination, curiosity, the desire to excel and creativity are correlated.

Activity 3. Creative competence: Imaginative environments.

- The magic of thinking and creating with objects.
- Question and analysis: what can we do with a stick? can anything be invented or researched thanks to the sticks?
- To encourage creativity, examples can be shown from the discovery of the center of gravity with the fingers, the discovery of the fulcrum to lift an object or reproduction of the experience of Eratosthenes, with the demonstration that the Earth is round thanks to the shadow of two sticks (it can be exemplified with a cardboard representing the world and two toothpicks). See: Ministry of Science, Innovation and Universities. [FECYT ciencia] (2012). *One thousand schoolchildren measure the Earth like Eratosthenes* [Video]. Youtube. &lthttps://www.youtube.com/watch?v=S56r8lDHqDk> or by reproducing the following experiment in which collaboration is needed with other people in another country who have carried out the same experience and under the same conditions: IES Itaca. [itacaies] (2015). Project: Eratosthenes. Autumn Equinox. Searching for solar noon [Video]. Youtube. &lthttps://www.youtube.com/watch?v=b3XYjwGQOQ8>.

Activity 4: Design of a creative routine activity.

- Creativity and thinking routines.

- Question and analysis. We focus on a daily activity or action. is there an alternative way to be realized? which is the most effective? which is the most efficient? is one of the ways to be realized both the most effective and the most efficient?

Creative potential is associated with various stimuli. Tasks and activities are the drivers of creativity. Creating contexts as a method of expression is key to stimulating creative thinking. Experimenting, manipulating and inquiring with resources allows them to develop their skills. From this approach, experiential learning is very practical to turn the classroom into a "laboratory" where creative stimulation strategies can be promoted as a vehicle for the teaching-learning process.

Discussion and conclusions

The creative process is defined as the creative capacity as opposed to innovation which focuses on the action of creating. Two notions or "paths" that intertwine and become evident in the face of a challenge and/or problem. This process can be observed either from the perspective of the information, distinguishing four phases (preparation, incubation, illumination and verification) or from the perspective of the subjects involved, with three phases (association-integration, elaboration and communication). One of today's challenges is to avoid relegating the process only to the expression of cognitive constructs that define creative processes the expression of cognitive constructs that define creative processes.

Creativity arises when there is a need, this process involves an initial phase of fixing and searching for information. It could be called a "product" of a consistent search and the context. This information can be associated with images and feelings in order to reach an idea. Creative people need to take risks and find novelties. Higher cognitive functions are located in the prefrontal cortex, where the neural bases are located. The frontal lobes apparently occupy an important place in the axis of creativity. The generation of creative ideas occurs between the frontal and temporal lobes. The frontal lobes are becoming more important in emerging studies of creative thinking in relation to executive functions. An exchange of information occurs during the creative action in different areas of the brain. The interrelation between the different areas of both hemispheres, which constitutes a distinctive element in the course of the creative processes.

Throughout the creative process, the interrelationship between the temporal and frontal lobes of the brain is essential. Dopamine and noradrenaline as neurotransmitters that favor tasks related to motivation and creativity. While it is true that individual elements and social contexts that interfere must be taken into account in order to value this faculty. From another point of view, it is also interesting to note the different research that interconnects intelligence with creativity.

Brain regions become key pieces to understand the neurophysiology of the brain in the creative dimension. It seems that creativity is not only in specific areas of the brain, but in the whole brain as a whole. Its functionality is supported by the various developmental contexts. A new teaching neuromethodology to learn about students' brains is neuroimaging. Thus, it is of interest to infer in possible studies supported by neuroimaging techniques to investigate the relationships established between cognitive

processing and brain creativity, as well as to establish these neuromethodologies in their development. Neuroimaging can contribute to the early seeds of learning.

New horizons are opening up through neuroscience, with various neuromethodologies such as neuroimaging for the study of the brain and other capacities such as creativity. It can be inferred in future research that will delve deeper into the cognitive process, showing the connections and effects on information processing in the brain. These future advances may fuel knowledge and curiosity about the nature of the brain and behavior in relation to creativity. In the words of Francisco Mora (2017): "Without curiosity there is no attention and no knowledge."

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