The use of «Peak & Neuronation» digital applications for the inclusion of older adults

A case study at USALBI

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***Abstract*—Given the physiological and cognitive degeneration associated with aging, it is important to promote initiatives that prevent situations that may increase dementia among the elderly. The objective of the research was to investigate whether the use of Peak & Neuronation digital applications can contribute to the active aging of the elderly, with respect to the cognitive training they provide. The group of 18 students from the Computer Science discipline of the University of Albacetetrense (USALBI), aged 56-80, was involved. The applied methodology was qualitative: the case study; non-participating observation; surveys by questionnaire; semi-structured interviews. The analysis of the data was collected in 12 practical sessions of utilization of the APPs demonstrated to be an added value and that should be referenced as digital tools within the framework of the cognitive training of the elderly.**

Keywords—elderly adults; digital applications (Apps), inclusion; ICT.

I. ICT, OLDER ADULTS AND INCLUSION

In the current context, digital technologies have a great impact on society, creating new forms of learning, dissemination of knowledge and, especially, on the inclusion of older populations in the information society. In this sense, the technologies allow the elderly to use digital applications (APPs) that aim to provide increased well-being, self-esteem and a more successful active aging. Given the physiological and cognitive degeneration associated with aging, it is important to promote initiatives that prevent situations that may increase dementia among the elderly. The cognitive training APPs, in this particular case, the Peak and Neuronation APPs are digital applications that aim to increase / increase cognitive valences such as memory; the language; mental agility; reasoning; the velocity; flexibility; coordination; the attention; the focus; the concentration; the perception; problem solving; mental calculations; emotion and will power, thus enabling the elderly to actively age in order to promote their inclusion in the current technological/digital society.

The development of Information and Communication Technologies (ICT) has been growing, being part of the day-to-day life of today's society. In the view of [1], the phenomenon of population growth of the elderly population which has taken place will therefore increase demand for learning through the use of ICTs as a way of providing healthy aging and increasing independence. In this context, it is necessary to promote actions that included the older citizens in the digital society, since this population is considered as infoexcluída. To combat this info-exclusion, technologies have a preponderant role so that we can give positive responses at all levels. According to the opinion of [2] the elderly when acquiring computer skills reaches a new perspective of their life, regarding interpersonal and intergenerational relations, reducing isolation and can transform itself as a catalyst capable of awakening new interests involving the psychic and mental part, providing a reinforcement of self-esteem and autonomy in order to provide a more complete inclusion.

In the present digital society, the digital inclusion contributes to the increase of the quality of life of the elderly person through the ICT where the diversity of digital devices is highlighted, being possible to emphasize the design of its interfaces and its greater portability. A concrete example is the use of tablets that can provide and facilitate greater and easier inclusion of the elderly in the virtual world.

Within this context, and according to [3] and [4], ICT can play a key role in supporting the elderly by allowing them to lead a more independent life with access to many resources. In this digital environment, older citizens have the conditions that allow them to select and search information on the Web, process data, acquire knowledge and, more importantly, transmit it, making it a means to improve their quality of life by sharing and by establishing new social networks and new friends [5].

II. DIGITAL APPLICATIONS: CHARACTERIZATION AND USE AS A COGNITIVE TRAINING TOOL

At present, there are numerous digital applications (APPs)

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available in digital equipment stores, in IOS, Android and Windows formats. According to [6], the application of a cognitive training through a device is able to promote positive results when compared to the conventional way and that this is an interesting resource for cognitive stimulation and promotes the socialization of the elderly. In this sense, studies on cognitive training demonstrate that the elderly have the capacity to acquire and retain new information [7].

The digital applications used in this investigation were the Neuronation APPs (Figure 1) and Peak (Figure 2), these APPs are aimed at increasing / increasing cognitive valences such as memory; the language; mental agility; reasoning; the velocity; flexibility; coordination; the attention; the focus; the concentration; the perception; problem solving; mental calculations; the emotion and the strength of will. The APPs used in the study are multiplatform that contains games / activities in Portuguese language that test cognitive valences of memorization, speed of task execution, concentration, problem solving, language and emotion and are available in different operating system formats (Android, IOS and Windows).

Fig. 1. Logotipe of the APP «Neuronation».

Fig. 2. Logotipe of the APP «PEAK».

Figure 3 shows the variable "Usage Options", where there is a uniformity between the two APPs for all items, even for those that do not have this possibility (change colors, change font size, change size of icons). In view of the fact that they are more PPPs for an older population, it is regretted that these changes can not be made because they would facilitate their use

	APPs / Características funcionalidades	*Neuronation*	*Peak*
Opções de utilização	**Língua Portuguesa**	**X**	**X**
	Tutorial / Função Ajuda	**X**	**X**
	Alterar as cores	-	-
	Alterar tamanho das letras	-	-
	Alterar tamanho dos ícones	-	-
	Custo mensal/anual	**X**	**X**

Fig. 3. Usage options (characteristics and functionalities of the Neuronation and PEAK applications.

Regarding Figure 4, the variables that were detected in the APPs used are presented, trying to group them according to the affinities / similarities to the proposed games / activities. In the variable "Speed of execution of tasks", although all APPs have games / activities related to it, the designations presented are not similar. However, when using the different APPs it can be verified that this variable is actually tested. In the case of the variable "Memorization", there is in all PPAs a game / activity that has the same designation. It can be affirmed that in the APPs investigated there are games / activities that go to the stimulation and training of the variable in question. Once again, the designations are different according to each APP and, as already mentioned, the designation itself, although in Portuguese, is a Brazilian Portuguese. In relation to the variable "Problem Solving" the situation is similar to that described for the previous ones, highlighting a detail regarding the linguistic question according to the denomination of an activity that is called Problem Solving. In the variable «Language», although in other variables the language is also tested, APP Peak is associated with language. Lastly, the variable 'Emotion' is the only one that is objectively referenced by APP Peak. By making use of the two APPs it is felt that the variable 'emotion' underlies several other activities. However, as has already been shown for other variables, the presentation and designation of these games / activities has to do with the design of each APP.

Valências Cognitivas	Características/ funcionalidades	APPs	*Neuronation*	*Peak*
	Rapidez de execução de tarefas	Velocidade	-	-
		Agilidade mental	-	X
		Flexibilidade	X	-
		Coordenação	-	X
	Memorização	Memória	X	X
		Memória visual	-	-
	Concentração	Atenção	-	-
		Foco	-	X
		Concentração	X	-
		Perceção	X	-
		Força de vontade	X	-
	Resolução de Problemas	Solução de problemas	-	-
		Raciocínio	X	X
		Cálculos mentais	X	-
		Linguagem	-	X
		Emoção	-	X

Fig. 4. Summary of the characteristics of the variable «Cognitive Valences».

III. RESEARCH METHODOLOGY

A. Type of research

This research is an empirical study of a qualitative nature, which corresponds to a case study, carried out at the Universidad Albicastrense Senior (USALBI), which intends to answer the following research question: 'What are the opinions of the elderly regarding the application of PPAs Peak & Neuronation in the context of cognitive training? Its main objectives are to understand if the elderly who attend the ICT subjects of USALBI use APPs, namely the Peak & Neuronation APPs and promote their use to increase the aging process of each. Because this study is conducted at a particular institution, USALBI, this research should be considered as a case study.

B. Sampling of research

According to [8], the sample is part or subset of the population data to be investigated. In this sense, after a meeting held with the Director of the Cybercentro that is associated with USALBI, it was understood that 18 elderly people who were attending the Informatics discipline (level III) during the academic year 2015/2016. At the same meeting, taking into account the research objectives and the USALBI school calendar, 12 practical sessions were planned in order to use and evaluate the Peak & Neuronation APPs. The selection of the subjects was done intentionally, since the knowledge of the characteristics of these students proved to be important, and in this particular, the previous meetings with the Director of the Cybercentre in Castelo Branco, where the informatics classes are held, were important for what procedures to follow. The characteristics of the sample, that is, the variables, were studied in order to perceive the reality in which the elderly live. In order to be able to deepen the data collected from the elderly, it was necessary to involve the Director of the Cybercentro, a specialist in ICT and a specialist in the area of Social Gerontology who were submitted to a semi-structured interview.

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C. Research procedures and instruments

In this investigation, semi-structured interviews were conducted with 1 specialist in Social Gerontology and 1 specialist in ICT. For this purpose, a script was elaborated with the concern of the researcher to make the necessary and appropriate adaptations when interviewing the ICT specialist and when interviewing the specialist in Social Gerontology. In view of the fact that the issues are similar, there will always be the possibility of comparing / contrasting opinions, since it is possible that there are differences according to a more technological / digital perspective and a more social gerontology. After transcribing the interviews, the next phase corresponded to the content analysis. As mentioned [8], the content analysis contains a set of techniques that analyze the communications that result from the exchange of information that allow the inference of the topic in focus during the interview. Content analysis requires the categorization of themes, their classification and selection of the most relevant sections of the transcribed interviews.

In terms of research instruments, non-participant observation was also used, this observation was made during the ICT classes with the practical application of Peak & Neuronation APPs. This observation was made between May, June and July of 2016. During the classes of Computer

Science, working in the facilities of the Cybercentro, it was possible to hold practical sessions with Peak and Neuronation APPs, which were chosen by the elderly that make up the sample of the study, after a presentation session of four APPs: Peak, Neuronation, Fit Brains Trainer and Lunosity.

In the present investigation, questionnaire surveys were conducted in order to deepen the data collection and to know the opinions of the sample. The inquiries were previously validated through the "judges method", with the collaboration of experts in ICT and Social Gerontology. A pre-questionnaire was created for the study sample, which, after the validation process by the "judges method", the suggested corrections were made that culminated in the questionnaire that was applied to the elderly. The questionnaire is organized into three groups of questions: Group A - Identification of participants and frequency in USALBI; Group B - Information and communication technologies and active aging; Group C - Evaluation of PPPs. In this questionnaire, the questions presented were of three types, focusing on more directive issues where the elderly would have to indicate response options, questions associated with a Likert scale according to five levels, associated with several affirmations, and finally questions of open character. It is important to note, in the particular case of the use of the Likert scale, that the five-level definition presupposes that levels one and two will have a 'negative' appreciation, level three will have an 'in' appreciation, and levels four and five correspond to a 'positive' assessment.

In this investigation, the triangulation of data consisted of a first phase of comparing the data collected through the questionnaire surveys and the analysis of the observation tables collected in the practical sessions with the students that were involved. In a second phase, in the content analysis of the interviews and, in a third phase, in the conclusions that will take into account all the data collected through the participation of all the research participants: students from USALBI who attended subjects of Informatics, specialist in ICT and specialist in Social Gerontology.

IV. MAIN FINDINGS OF THE INVESTIGATION

A The evolution of ICT in society has triggered a reflection of its usefulness and the potential of digital applications in cognitive training of populations, in this case in particular of the elderly. In this context, the main objective was to find out if elderly people who attend the IT disciplines of USALBI use APPs, namely the Peak & Neuronation APPs and promote their use to increase the aging process of each. In order to achieve this objective, 12 sessions of Peak and Neuronation APPs were carried out, with the realization of the games / activities available from each APP. In addition, from these practical sessions, questionnaire surveys were also applied to the elderly, field notes were recorded and semi-structured interviews were conducted with a specialist in ICT and a specialist in Social Gerontology in order to perform a triangulation of data that contributed to a more reliable and sustained analysis.

At the end of the practical sessions of utilization of the PPPs, it can be affirmed that this was very positive because of the elderly people's reasoning, with respect to the results of the obtained scores, observed an increasing of the same ones that indicates better levels of performance. Making an inference from this observation leads one to conclude that the use of these APPs was improving the performance of their cognitive training in the different valences of the games / activities associated with the capacities: of the 'memory', the 'rationale', the 'language' , 'mental agility', 'perception', 'focus' and 'emotion'. At the same time, it is possible to affirm that PPPs are / can be a true form of fitness, to prevent degenerative diseases at the cognitive level and that training, associated with different proposed activities, provides the elderly with training moments that are considered very useful for your sanity. According to the analysis of the questionnaire surveys, it may be mentioned that, in the opinion of the elderly, PPPs contribute to the improvement of the capacities of the cognitive valences under study, attributing the highest scores on the Likert scale (levels 4 and 5), both with regard to the cognitive capa- bilities as with respect to the intuition of the APPs used. It is stated that the data collected do not allow conclusions to be drawn to advise the use of one or another JPA for a particular purpose. This means that it is important for the elderly to use as many APPs as possible for cognitive training in order to be able to gauge if there is one that may be more specialized in one or another valence.

In order to triangulate the data obtained, it is possible to affirm that the opinions presented by the specialists, as theoretical expectations, came to be confirmed in practice since the data collected at the level of the field notes and from the given answers in the questionnaires, the APPs used would give the elderly a feeling that there was an overall improvement in the scope of the cognitive domain, and also their willingness to continue using them..

The results of the research conducted at USALBI allow us to state, in general terms, that the objectives of this case study have been fulfilled, and it can be verified that the elderly people who attend USALBI feel that the APPs give it a greater digital inclusion and that they promote conditions of improvement in cognitive valences. de melhoria nas valências de carácter cognitivo.

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