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PILOT STUDY OF EXECUTIVE FUNCTIONS IN ELDERLY ADULTS IN CARE HOMES

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Abstract

This current study aims to show, through a qualitative and quantitative study, that psychomotor stimulation through body percussion using the BAPNE Method can not only improve the skills and abilities of elderly adults and their emotional abilities and behaviours, but it can also improve their cognitive ability. We have based this investigation on a research protocol involving a total of N=48 subjects divided between an experimental group and a control group of care homes of similar characteristics in Seville belonging to the Vitalia Foundation. The intervention was completed using a neuromotricity programme by means of the BAPNE Method. Proven activities which were adapted to the aim of the investigation were used with the experimental group for 12 weeks, on Mondays and Fridays, with each session lasting a maximum of 60 minutes. However, the control group carried on with its usual activities and routines and did not experience any change to their cognitive development. The evaluation tools used were the FCRST Test to assess verbal memory and the P Test to measure phonological fluency. Following analysis of the results obtained, we can conclude that in the post-test phase of the experimental group there are significant results in terms of the assessed variables in terms of improvement of their executive functions and cognitive abilities.

Keywords: BAPNE, body percussion, executive functions, care home, elderly adult, prevention.

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1. Introduction

The subject of cognitive rehabilitation in elderly adults has become the focus of various studies which have looked into types of activities that could improve cognitive function. Many such studies have featured expressive activities, such as music (Gregory, 2002).

Authors involved with the BAPNE Methodology have stated that corporal percussion exercises are used at the base of the physical person, but also to give cognitive and emotional aspects. The execution of repetitive movements, along with the singing, stimulate a variety of brain – related brain – related cognitive functions, such as the plan and/or the Athens (Tripovic, Marchese, Carratelli, & Romero Naranjo, 2004). In addition, there is talk of significant improvements in tasks that require cognitive effort, either in aspects such as memorization and efficiency in the processing of information (Pons-Terrés, Romero-Naranjo, Carretero-Martínez, & Crespo, 2004).

This present study is part of a wider ranging study in which we have used a battery of questionnaires and tests in order to assess the executive functions: planning, working memory, concentration, inhibition, sequencing, impulse control and attention, as well as socioemotional and behavioural aspects amongst elderly adults. The tests used in this investigation were: FCSRT, DÍGITOS, ORIENTATION (taken from the Barcelona test), A TEST, RITMO, PRAXIAS, GNOSIAS, SRT, TMT, P TEST, ANIMALES, FAB, HADS, EUROQUOL, MMSE. In this instance, due to the nature of this conference and the brevity of this article, we will only present findings relating to improvement in verbal memory and phonological fluency which were measured using two tests, both validated in Spain: FCSRT and P TEST.

As our sample for this investigation consisted of just 48 subjects, we set out in this initial article to carry out just a pilot study. In order to obtain more significant results, we will carry out follow-up studies to increase the number of subjects in both control and experimental groups.

2. Problem Statement

Do elderly adults participating in a method of cognitive stimulation using the BAPNE Method within the care home in which they live improve their executive functions and phonological fluency significantly compared to elderly adults who do not participate?

3. Research Questions

Having used academic meta-search engines to research the issue (Web of Science, Eric, Rilm, Scopus, Dialnet, JSTOR), we can confirm that the subject of cognitive rehabilitation in elderly adults has been the focus of several studies which have looked into types of activities which can improve cognitive functions in adults at this stage of their life. Use of music as an alternative method of rehabilitation for executive functions has been proven, and contrasts with techniques using pencil/paper and computerised rehabilitation which are habitually used in neuropsychological rehabilitation (François, Grau-Sánchez, Duarte, & Rodriguez-Fornells, 2015; Romero-Naranjo, 2014; Särkämö, Tervaniemi, & Laitinen, 2014). The potential of music has also been demonstrated in terms of improvements brought about in general

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neuropsychiatric symptoms and cognitive functions in elderly adults with severe cognitive deterioration (Hsu, Flowerdew, Parker, Fachner, & Odell-Miller, 2015).

However, what is needed is a greater number of systematic studies which include music teaching specialists in their research teams and which include quantitative results as to the effects of practising body percussion as a cognitive stimulation tool in elderly adults. For this reason, we have used the BAPNE Method which includes a series of articles and research pieces which are based on neuropsychology and which show experimentally by means of validated tests the possible cognitive stimulation which can be brought about (Romero-Naranjo, 2014).

4. Purpose of the Study

This pilot study aims to show that via a programme of cognitive and psychomotor stimulation through practice of body percussion using the BAPNE Method, not only can elderly adults improve their emotional and behavioural aspects, but also their cognitive ability. This is a crucial factor in carrying out effective prevention and rehabilitation in elderly adults within care homes.

5. Research Methods

This study was conducted in the province of Seville (Spain). The experimental group was from the San Sebastián care home in Los Palacios y Villafranca (Seville); the control group was from the Kansas City care home, also located in the province of Seville. Both homes are part of the Vitalia Foundation.

5.1. Participants and context

The study was conducted using a t sample of n=48 participants. The experimental group n=24 contained 11 men and 13 women, all of Spanish origin. The control group was a similar sample: n=24, consisting of 11 men and 13 women, all of Spanish origin. The socioeconomic and sociocultural characteristics of the individuals under study were varied. We met participants with an average cultural level and who were middle class and others who could not read and write and who were working class.

The selection criteria for inclusion in the study were the level of cognitive deterioration of the participants. Participants were selected who showed only light deterioration, even if their motor levels confined them to a wheel chair.

The exclusion criteria were based on the presence of any pathology which could negatively affect their involvement in this programme of cognitive rehabilitation with music, as well as any severe motor deficiencies which inhibited an elderly person from leaving his or her room.

5.2. Measurements

In order to verify whether the BAPNE Method significantly influences executive functions and phonological fluency, the FCRST test and the P test were used. The two of these tests are validated in Spain.

5.3. Process

The experimental group undertook an intervention with the BAPNE method, whereas the control group received traditional cognitive stimulation. The activities which were carried out are published in the

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two manuals in the teaching programme (Body Percussion – Programación didáctica vol. 1 & 2), and the manuals on the foundation of the BAPNE® Method (Body Percussion - Método Bapne® Vol. 1- 5).

5.4. Design and data analysis

This study was designed to be a quasi-experimental inter-subject method. In the analysis of both tools (FCSRT and P Test), a design of t- Student comparing the mean averages across independent samples was used with a sufficient number of samples allowing the central limit theorem to be applied.

As a result of the quasi-experimental nature of this study, the groups used were selected by the prevention and rehabilitation team alongside the BAPNE trainer within two care homes in the province of Seville. The design of the investigation consisted of two groups. Firstly, an experimental group (San Sebastián in Los Palacios y Villafranca) with whom the BAPNE Method was used in twice weekly sessions, each 60 minutes in length, in their normal weekly activity schedules. Secondly, there was a control group, (Kansas City, Seville) who continued with their traditional activity programme. The pre-test for both groups took place in February whilst the post-test was in June. The software package IBM SPSS 24 for Mac was used to analyse the results and obtain the difference between the two groups.

6. Findings

So as to analyse the data, the t-Student test was used to compare mean averages for independent samples, and a level of statistical significance of 0.05 was used. The statistical software used was IBM SPSS v.24 for Mac. The graphs and tables have been made using Microsoft Excel for Mac for greater visual impact.

FCSRT TEST:

The results obtained when calculating the difference in mean averages between the two independent groups (experimental group and control group) show that in the pre-test phase, there is no statistically significant evidence of difference between the two groups. However, in the post-test phase, there are statistically significant differences in the variables of total free recall (RLT, p=0.002) where the difference between the mean averages was 5.958; total facilitated recall (RFT, p=0.045); total recall (RT, p=0.006); total deferred recall (RDT, p=0.005) and in the variable of total free deferred recall (RDLT, p=0.001) which showed a difference in mean averages of 3.5.

Table 01. FCSRT postest statistical differences among experimental and control group

		Levene's Test for Equality of Variances		**t-test for Equality of Means**				**Group statistics**			
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Diffe**	**Group**	**N**	**Mean**	**SD**
POST RLT	Equal variances assumed	1.314	0.258	3.294	46	0.002	5.958	Experimental	24	39.08	5.492
	Equal variances not assumed			3.294	43.654	0.002	5.958	Control	24	33.13	6.955
	Equal variances assumed	2.239	0.141	-2.065	46	0.045	-2.917	Experimental	24	8.13	3.938

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POST RFT	Equal variances not assumed			-2.065	40.915	0.045	-2.917	Control	24	11.04	5.691
POST RT	Equal variances assumed	10.088	0.003	2.895	46	0.006	2.958	Experimental	24	47.21	2.346
	Equal variances not assumed			2.895	34.929	0.006	2.958	Control	24	44.25	4.426
POST RDT	Equal variances assumed	34.237	0	3.039	46	0.004	2	Experimental	24	13.08	3.127
	Equal variances not assumed			3.039	26.393	0.005	2	Control	24	9.58	3.977
POST RDLT	Equal variances assumed	5.723	0.021	3.392	46	0.001	3.5	Experimental	24	15.75	0.847
	Equal variances not assumed			3.392	43.53	0.001	3.5	Control	24	13.75	3.11

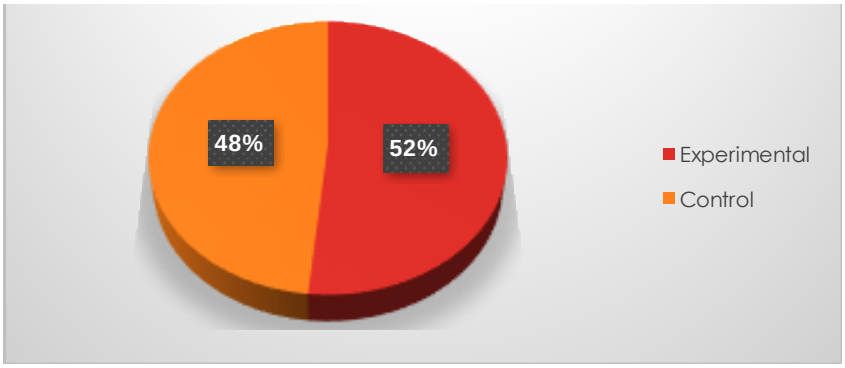

Figure 01. Average in the total count in the postest

P TEST:

In this test of phonological fluency, statistically significant differences were obtained in the number of total words (POST PT, $p<0.001$) between the experimental and the control group. Statistically significant differences were also found in the difference between the post-test and the pre-test in the total number of words when comparing the mean average of this difference between the two groups ($p=0.01$), which was 3.125.

Table 02. Pretest-postest statistical differences in the phonological fluency test among experiemental and control groups

	Levene's Test for Equality of Variances			**t-test for Equality of Means**				**Group statistics**			
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Diffe**	**Group**	**N**	**Mean**	**SD**
PRE PT	Equal variances assumed	0.927	0.341	0.578	46	0.566	0.583	Experimental	24	5.25	3.779
	Equal variances not assumed			0.578	44.717	0.566	0.583	Control	24	4.67	3.185
POST PT	Equal variances assumed	0.693	0.409	4.993	46	0	3.708	Experimental	24	7.25	2.609
	Equal variances not assumed			4.993	45.964	0	3.708	Control	24	3.54	2.536

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PT	Equal variances assumed Equal variances not assumed	0.04	0.843	2.683 2.683	46 45.7	0.01 0.01	3.125 3.125	Experimental Control	24 24	2 -1.13	3.867 4.194

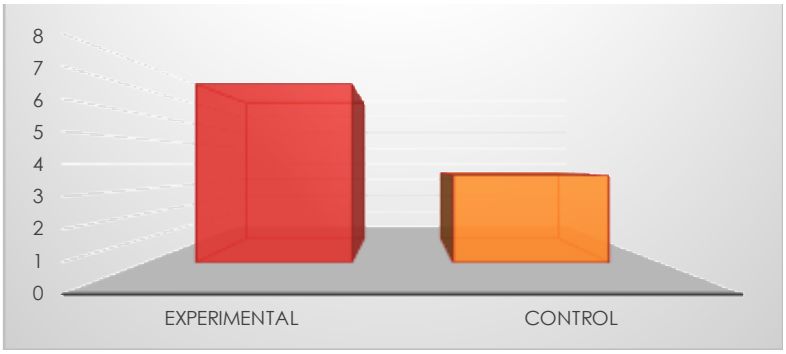

Figure 02. Average total words in the postest

7. Conclusion

Through this study, having considered the results collected, we can confirm that the information obtained in the FCSRT test and the P test in relation to development of verbal memory and phonological fluency is satisfactory. Moreover, it has been posible to confirm that the implementation of the neuromotor programme using the BAPNE® Method for the stimulation of the executive functions is viable in the group studied.

Verbal memory requires attention and codification of information. These are processes which we work on to a great extent when performing practical activities with the BAPNE Method. Phonological fluency, however, requires less common strategies (Perret, 1974) as searching for words by their initial letter is not a common task and involves a greater degree of effort. Furthermore, phonological fluency demands the inhibition of the incorrect response, and thus involves greater cognitive effort.

Following the neuromotor programme carried out using the BAPNE Method with healthy adults suffering from mild cognitive impairment, the aspects related to memory and verbal fluency were analysed. Statistically significant improvements were obtained, thus confirming our initial hypothesis. After analysing the data obtained, we have been able to confirm that there are differences between the experimental and control groups across the pre- and the post-test in all the variables; there was no homogeneity between the groups. Although all the students saw some improvement, the experimental group improved more significantly.

It is important to emphasise that over the course of future investigations it will be crucial to look for similiar control and experimental groups so that the pre-test sample can be homogeneous, thereby avoiding extraneous variables. This programme ran for 12 weeks. It would be beneficial to plan for 12 months in future studies. This would produce more significant and reliable data.

To conclude, this pilot study, which included a sample of 48 participants (24 in the experimental group and 24 in the control group) can serve as a basis for future studies including the BAPNE Method as a rehabilitation tool and to improve executive functions related to memory and phonological fluency. This would prove the potential benefits of BAPNE® Method in elderly adults with regard to the development of the executive functions.

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