



International Journal of Aging Research (ISSN:2637-3742)



Effectiveness of the “Kwido-Mementia” computerized cognitive stimulation programme in older adults

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ABSTRACT

Despite the importance of cognitive stimulation to counteract the cognitive decline associated with age, there is contradictory evidence about the benefits of cognitive training programs that are carried out through new technologies, and little evidence about those programs conducted at home. This research examines the effectiveness of a computerized cognitive stimulation program in adults 65 years old and over who are users of a home care service. The sample consisted of 43 participants (88% women) and an average age of 81.4 years. A quasi-experimental research design with a control group was carried out, where the experimental group completed a 15-session training (Kwido-Mementia). The results showed that the training program improves cognitive functions; both visuospatial memory capacity and perceptual reasoning skills. The computerized cognitive training proves to be an effective tool, not only to prevent deterioration, but also to improve the cognitive abilities of people 65 years old and over. The work contributes to clarify, in part, the existing controversy in the literature regarding the usefulness of cognitive training programs based on new technologies and provides positive evidence, contrary to what other studies indicate regarding the programs carried out at home.

Keywords: cognitive stimulation; computerized; older adults; home care

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How to cite this article:

Álvarez-Lombardía, I., Migueles, M., Aritzeta, A., Acedo-Gil, K. Effectiveness of the “Kwido-Mementia” computerized cognitive stimulation programme in older adults. International Journal of Aging Research, 2018, 1:14

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1. Introduction

Ageing is related to the decline in different cognitive functions, such as the decrease in the speed of information processing, the deficit in working memory or the alteration of aspects of executive functions (Thomas, Dave and Bonura, 2010). According to the Scaffolding Theory of Ageing and Cognition (STAC), the cognitive functioning of the elderly is the result of the interaction of different variables. On the one hand, the structural and functional changes that occur in the brain with age, and on the other, a compensatory process, called scaffolding, that counteracts the negative effects of these neurobiological changes (Park and Reuter-Lorenz, 2009). Cognitive training (Reuter-Lorenz and Park, 2014) influences these two variables, and therefore the cognitive performance of older people, in addition to genetic factors, environmental factors and life experience. A way to conduct cognitive training programs is through new technologies. However, the effectiveness of the technology-based programs is not clear, and to date, research has shown contradictory results (see, Ballesteros, Kraft and Tziraki, 2015 and Simons, et al., 2016). Actual studies associated with cognitive stimulation through technology in older people, show that the interventions are carried out in controlled environments, and that there is little evidence regarding the effectiveness of such initiatives at home. In addition, some researches have showed that initiatives of cognitive training using new technologies at home, without supervision, seem to be ineffective (Lampit, Hallock and Valenzuela, 2014 and Chiu, et al., 2017). The objective of this study was twofold. First, to shed light on the existing contradictory results and to provide empirical evidence to the scarcity of existing studies conducted at home. Secondly, this work aims to examine the effectiveness of a computerized cognitive training on the cognitive functions of adults 65 years old and over who are users of home care service.

2. Method

2.1. Participants

Forty three older adults (age range 70 to 93 years of age) participated in the study. Participants were recruited from the Bureau of Dependency and Home Care Service of the Department of Social Services of the City Council of Bilbao (Spain). Adults older than 65 years without cognitive impairment (score \geq 24 points on the Mini Mental State Examination (MMSE)), were enrolled in the research.

2.2. Measures

An initial screening evaluation was conducted through two tests, to select the older adults participating in the study. These tests were Mini-Mental State Examination (MMSE) of Folstein (1975), in its adapted version to Spanish population by Lobo, et al. (2002) and Montreal Cognitive Assessment (MoCA) of Nasreddine (2004).

During the neuropsychological evaluation phase, all participants completed two evaluation sessions (before and after the training). Each assessment session lasted for 2 hours approximately. They responded to a broad battery of cognitive tasks and psychoaffective tests that examined both their cognitive functioning as their psychoaffective well-being. In the present study only two of them will be underlined: Memory Reproduction Subtest of Complex Figure Copy Test of Rey (1987) and Picture Completion Subtest Wechsler Adults Intelligence Scale (WAIS III) of Wechsler (2001).

During the cognitive training phase, the experimental group completed a cognitive stimulation program using the Kwido-Mementia technological platform. This multi-device platform works with two interfaces. On the one hand, a portal for the professional, where users are registered, cognitive training program is assigned, and the results of the training are monitored in real time. And, on the other hand, a portal for the elderly person, where the access to the cognitive training is located. The

researchers designed the structure of the program, where the following cognitive functions were trained: attention, language, memory, perception and executive functions.

2.3. Procedure

All participants were informed of the study protocol, agreed to participate and signed their informed consent. Subsequently, they were randomly assigned to an experimental group ($n = 27$) or to a control group ($n = 16$). The experimental group completed the cognitive training program using the Kwido-Mementia technological platform, at home, independently, through a tablet with internet connection, and with on-line and telephone supervision. The program lasted an average of 10 hours distributed in a pedagogical support session and 15 training sessions, with an approximate duration of 35 minutes each.

3. Results

Non-parametric test analyses were carried out to observed changes in punctuations for the experimental group (after and before the training) and the differences between the experimental and control groups.

Participants of the experimental group showed higher scores both in the Memory Reproduction subtest ($Z = -4.06$, $p < .001$; $r = .553$) and in the Picture Completion ($Z = -3.38$; $p < 0.005$; $r = .461$) after having completed the cognitive training. In addition, it should be mentioned that these differences show a moderate to high effect size.

The differences in the ranges observed in the control group are not statistically significant neither for Memory Reproduction subtest ($Z = -.237$; $p > .05$; $r = .042$) nor for the Picture Completion ($Z = -.103$; $p > 0.05$; $r = .018$). Therefore, it should be mentioned that there have been no changes in these two variables in the control group.

The comparison between the average ranges of the experimental group and the control group in the pretest, showed that there were no statistically significant differences between both

groups or in the Memory Reproduction subtest ($U = 181.50$, $p > 0.05$, $r = .132$), or in the Picture Completion ($U = 151.50$; $p > 0.05$; $r = .249$), the size of the effect being of a low magnitude in both cases. That is, the scores are equal in both variables between both groups before the experimental group completed the cognitive training.

The comparison between the average ranges of the scores in the Memory Reproduction subtest of the experimental group and the control group in the posttest are statistically different ($U = -2.239$, $p < 0.05$, $r = .341$) with an effect size of a moderate magnitude. In this same sense, the comparison between the average ranges of the subtest scores of the Picture Completion presented by the experimental group and the control group after the cognitive training, showed that the experimental group obtained significantly higher scores than the control group, with an effect size of a moderate magnitude ($U = 95$, $p > 0.01$, $r = .466$).

4. Discussion

The objectives of this work were, first, to shed light on the contradictory results existing in relation to the effectiveness of cognitive training programs with a technological base and to provide empirical evidence on the effectiveness of the programs carried out at home. In parallel, this work sought to test the effectiveness of a computerized cognitive training (Kwido-Mementia) conducted at home in people 65 years old and over.

The researchers found that older adults who completed the program (experimental group) improved their cognitive functioning in both their visuospatial memory capacity and in their perceptual reasoning skills. Likewise, it can be concluded that such observed improvements only occur in participants who completed the cognitive training (experimental group) and not in participants who did not completed it (control group).

The results suggest that this computerized cognitive training program, through Kwido-

Mementia technological platform, which allows work skills such as attention memory, language, perception and executive functions, is a useful tool to improve the cognitive skills examined in this report.

In this sense, this research contributes to clarify, in part, the controversy and contradictory results in the literature, supporting those works that defend the usefulness of cognitive stimulation programs based on new technologies for older adults 65 years old and over (Ballesteros, Kraft and Tziraki, 2015 and Simons et al, 2016). In addition, this work demonstrates that such programs can be extremely effective when carried out at home and with minimal supervision online, which would mean a reduction in costs compared to classic training.

It is worth mentioning that, among others, one of the limitations of the present investigation is associated with the size of the sample, which was reduced. This fact invites authors to treat with caution the generalization of the results to the population.

5. Conclusion

To conclude, the authors found that this computerized cognitive training produced positive effects in the cognitive skills examined. Future research should increase the sample and examine in greater detail the changes in other areas of cognitive stimulation that are likely to be influenced by the Kwido-Mementia platform.

Acknowledgements:

This work was partially financed by the programme “Hazitek” from the Infrastructures and Economical Development Department of the “Basque Country Government”, programme supported by the European Regional Development Fund (FEDER).

This work wouldn't be possible without the collaboration of the technological firm “Ideable Solutions” (Developers and owners of the technological platform Kwido-Mementia) and the Social Action Department of the “City

Council of Bilbao”, special thanks to both of them for their help and support.

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