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LETTER

Reply

Resposta

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Dear Editor,

We have read the comments by Lopes[1] regarding our article "Effect of virtual reality in Parkinson's disease: a prospective observational study", published in *Arquivos de Neuro-Psiquiatria*[2].

These are our responses to the comments by Lopes.

Regarding the statistical analysis, the Student's t-test is used to compare two groups. It is a parametric test, which can be used in two distinct situations: a) when both groups are independent (comparisons between different groups), and b) when both groups are dependent or paired, which was the case in the current study. The same group was compared in two distinctive situations (such distinctive situations entail both paired or dependent groups), for example: before and after the administration of a medication, before and after a training session[3,4]. We point out that the Student's t-test allows comparison of the means of two independent or dependent samples. For small samples, it is necessary that they come from Gaussian populations. Therefore, before using the Student's t-test for paired data, we verified the data normality by means of the proper statistical test. Thus, the tests used before and after the sessions were adequate[3,4,5,6,7].

As for the application of the Spearman's non-parametric correlation, it can be applied in ordinal quantitative and qualitative scales. As the aim for using Spearman's correlation was to correlate the type of game with the applied scales and questionnaire – Dizziness Handicap Inventory, and Berg Balance Scale, in addition to the SF-36 questionnaire; that is, to test if the scores for the type of game were related to the scales and questionnaire – this analysis was adequate, as data did not allow the use of Pearson's Correlation Coefficient. The use of ANOVA or its non-parametric correspondent would be used in a case where the objective was to compare the results of all scales simultaneously, which did not make sense in our scales, due to the different nature of their measurements. Therefore, the applied test was adequate[3-5].

Table 3 in our study showed that there was evolution in game learning. However, as it was formerly evidenced, there was significant correlation between the results of the games and the studied scales[2].

Final scoring for the Dizziness Handicap Inventory and Berg Balance Scale improved after rehabilitation. The SF-36 questionnaire showed a significant change in the functional capacity for the Tightrope Walk and Ski Slalom virtual reality games ($p < 0.05$), as well as in the mental health aspect of the Ski Slalom game ($p < 0.05$). The Dizziness Handicap Inventory and Berg Balance Scale showed significant changes in the Ski Slalom game ($p < 0.05$). There was evidence of clinical improvement in the patients in the final assessment after virtual rehabilitation[2].

In conclusion, it is known that brain functions entail an interaction between genetic processes and development with environmental factors, such as learning. Brain mapping of an adult is subject to steady changes based on the exploration of its sensory pathways. The possibility of brain plasticity opens perspectives to search for solutions to conditions caused by damage and brain impairment associated with several types of accidents and diseases. Whenever an individual grapples to learn new ways of physical or cognitive activity, plasticity is being conducted, and new synapses and new neural circuits will evolve. In balance disorders, the central nervous system has natural compensation mechanisms, central mechanisms of neuroplasticity known as adaptation, habituation and substitution, so that resolution of the sensory conflict occurs[8].

Exercises aim at improved vestibulo-ocular interaction during head movement, expanding its static and dynamic postural stability. Rehabilitation helps re-establish self-confidence, reduces anxiety and improves social interaction and

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body balance, thus virtual reality was the rehabilitation strategy in this study[9].

Four balance games were carried out (Soccer Heading, Table Tilt, Tightrope Walk and Ski Slalom) with strategies involving saccadic, optokinetic stimuli, head movement, static and dynamic balance, motor coordination, eye-foot coordination, circular pelvic movements, knee flexion-extension, ankle-hip movements, back-to-front and side-to-side movements and weight transfer, all aiming at balance disorders and postural instability.

Given the above-mentioned functions, there are several systems contributing to the improvement of flexibility, strength and life perspective, in addition to the reduction of aging-related degenerative effects.

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