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The Effectiveness of Working Memory Training Using N-Back Program in Improving Fluid Intelligence of University Students

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Summary

The Title of the Study:

The Effectiveness of Working Memory Training Using N-Back Program in Improving Fluid Intelligence of University Students

The aims of the study :

The study aimed to explore :

1. The effectiveness of working memory training using N-Back program in improving fluid intelligence of university students.
2. The effect of the training task type: dual(visual-auditory) ×single(auditory) on improving fluid intelligence of university students.
3. The effect of the training duration (10×20×30 sessions) on improving fluid intelligence of university students.

The Hypotheses of the study :

In light of the study aims and literature review, the following hypotheses were tested:-

1. There are statistically significant differences between means of scores of the two experimental groups: (visual-auditory) and(auditory) and the control one in the third post measurement (after 30 sessions) of fluid intelligence in favor of the two experimental groups.

2. A-There is a statistically significant positive effect of the training duration (10×20×30 sessions) on fluid intelligence scores in favor of the longest duration of training (30 sessions).

B- There is a statistically significant positive effect of the training task type dual task (visual-auditory×–single taskauditory) on fluid intelligence scores of university students in favor of the dual task.

C- There is a statistically significant positive effect of the interaction between the training task type: (visual-auditory) ×(auditory) and the training duration (10×20×30 sessions) on the fluid intelligence scores of university students.

3. A- The follow up test scores of the first experimental group (visual-auditory) varies according to the training duration (10×20×30 sessions).

B- The follow up testscores of the second experimental group (auditory) varies according to the training duration (10×20×30 sessions).

Research Method :-

A-The Approach :

The researcher used the experimental approach.

B- Participants:60 university students of the Faculty of Education were recruited for conducting a pilot study to validate the psychometric characteristics of the working memory tasks, For calibrating the fluid intelligence test and preparing its 5 different forms, **320 volunteer students from the faculty of education were recruited**. As for the main study, **participants were (90) Second year students** at the College of Education , Fayoum university. They were enrolled in the academic year (2013/2014), their mean age was (19.2) mean and (0.4) standard deviation .They were divided into three groups .The first experimental group (N=30) was trained on the dual task of N-Back Program (visual/auditory). The second experimental group (N=30) was trained on the auditory task of N-Back Program, and the control one which wasn't trained on any training programs.

C-Materials :-

The researcher administered the following materials :-

1- **Fluid intelligence Test**: The researcher developed and calibrated a fluid intelligence test out of the following tests: (Raven's Advanced progressive Matrices (2008), Cattell's Culture Fair Test prepared by (Amal Sadek and Foad Abo Hatab,2005) and (Raven's advanced Progressive Matrices (1998) on a common scale using the Rasch model for measuring fluid intelligence.Then five equated forms were prepared according to the calibrated fluid intelligence test to be used in the repeated measures.

2- **Working memory tasks**: The researcher prepared and validated the following tasks:

a- Reading span task

b- Backward digit span task

c- Numbers and letters sequencing task

d- Spatial span task

D- Training Program:

The researcher used the working memory-based N-Back Program, prepared by Jaeggi, Perrig ,Jonides& Buschkuehl(2008)

Statistical Techniques :-

The researcher employed the following techniques:-

1. One Way ANOVA

2. Repeated Measures ANOVA
3. Mixed Models ANOVA

Procedures

1. Reviewing the related literature and previous studies on current topic of the study.
2. Administering the fluid intelligence tests to 320 students for validating and calibrating the fluid intelligence test to prepare five equated forms using WINSTEPS.
3. Administering working memory tasks to 60 students for validating their psychometric characteristics using SPSS.
4. Administering the first form of fluid intelligence test as a pre test and working memory tasks to the two experimental groups and the control one.
5. Administering the training program to the two experimental groups for 10 sessions ,where the first experimental group was trained on the dual task of the program(visual/auditory) and the second experimental group was trained on the single task(auditory).
6. Administering the second form of fluid intelligence test after 10 sessions of the training N−back program.
7. Continuing training the two experimental groups for another 10 sessions.
8. Administering the third form of fluid intelligence test after 20 sessions of the training N−back program.
9. Continuing training the two experimental groups for another 10 sessions.
10. Administering the fourth form of fluid intelligence test after 30 sessions of the training N−back program to the two experimental groups and the control one.
11. Administering the fifth form of fluid intelligence test after three months from the third post measurement for testing the continuity of N−back program effect on fluid intelligence.
12. Data Entry and conducting the statistical analysis..
13. Discussing the results of the study.
14. Suggestions and recommendations.

Results :-

(1) The current study showed the following: There are statistically significant differences between means of scores of the two experimental groups (visual-auditory)×(auditory) and the control one in the post measurement (after 30 sessions) of fluid intelligence in favor of the two experimental groups.

(2) A-There is no statistically significant effect of interaction between the training task type: dual (visual-auditory) ×single (auditory) and the training duration(10×20×30) .

B- There is no statistically significant effect of the training task type dual (visual-auditory) ×single (auditory) on fluid intelligence scores of the two experimental groups.

C- There is a statistically significant effect of the training duration (10×20×30) on the repeated measures of fluid intelligence within every experimental group with a big size effect in favor of the longest duration of training.

(3) A- There are statistically significant differences between the follow up measurement(after 3 months), the first post measurement(10 sessions) and the second post measurement (20 sessions) of fluid intelligence of the first experimental group in favor of the follow up measurement, while there are no statistically significant differences between the third post measurement (30 sessions) and the follow up measurement of fluid intelligence.

B-There are statistically significant differences between the follow up measurement, and the first post measurement (10 sessions) of fluid intelligence of the second experimental group in favor of the follow up measurement, while there are no statistically significant differences between the second post measurement (20 sessions), the third post measurement (30 sessions) and the follow up measurement of fluid intelligence.