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Effect of an exercise and dietary intervention on the cognitive function on obese older women

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Introduction

- Risk of cognitive decline and disease are higher in minorities [1].
- Physical activity and healthy dietary patterns have been linked to the prevention of cognitive decline in older adults [2,3].
- Positive associations between obesity and cognitive dysfunction have been reported [4].
- Mind-body exercises positively effect cognitive and memory function [5].
- There have been similar studies on cognitive function but there are no significant data on the effect of Tai Chi, resistance training, and a dietary intervention on cognitive function [6,7].

Purpose

The Purpose of this study was to examine the effect of a combined Tai Chi, resistance training, and dietary intervention on cognitive function in older obese women.

Hypothesis

It is hypothesized that a combined Tai Chi, resistance training and dietary intervention will show positive effects on cognitive function in older obese women.

Study Design

A non-randomized experimental design with baseline testing prior to the intervention and post-testing at the conclusion of the 12-week intervention. The study took place at St. Martin de Porres Senior Center in Providence, Rhode Island.

Study approved by the Institutional Review Board of the University of Rhode Island (#HU1213-08)

Participants

- Women (n=27) aged 50 – 80 years
- Obese (body mass index ≥ 30 kg/m²)
- Not engaged in a regular exercise program prior to the start of the intervention
- No significant pulmonary, cardiovascular, metabolic, musculoskeletal, or cognitive disorders
- Medication stable



Measurements

- RBANS tests were used to measure participants' cognitive functions at baseline and post intervention.
- RBANS was always administered by a licensed Speech Language Pathologist.
- Other pre and post intervention measures were: height, weight, body mass index (kg/m²), and education.



Intervention

- The EXD group (n=16; 5 dropouts) engaged in three 45 min Tai Chi sessions and two 45min trainings sessions respectively per week.
- A registered dietitian conducted the behaviorally based diet sessions for 45 min once a week.
- The CON group (n=9; 1 missing data) was asked to maintain a normal lifestyle.



Statistical Analysis

- Statistical analysis was performed using SAS statistical software. Significance was set at $p < 0.05$.
- Normality was assessed using Shapiro-Wilk test.
- No outliers were identified using the 3 standard deviations above or below the mean.
- Fisher's Exact tests were used to analyzed education level and race/ethnicity.
- Unpaired t-tests were used for between-group baseline values.
- Paired t-test for within group values.
- To compare between group data, analysis of covariance using the changed score adjusted for baseline values.

Results

Table 1: Baseline Characteristics of the Intervention (EXD) and Control (CON) Groups

Characteristics:	EXD Group (n=16)	CON Group (n=9)	p-value
Age ¹	66.0 (7.6)	66.2 (8.0)	0.945
Education ²			0.136
High School or Less (n)	9	5	
Associates or Some College (n)	6	1	
Bachelors or Higher (n)	1	3	
Weight (kg) ¹	99.8 (3.3)	90.8 (4.4)	0.110
Height (cm) ¹	158.7 (1.5)	158.9 (2.0)	0.934
Body Mass Index (kg/m ²) ¹	39.5 (1.1)	35.7 (1.4)	0.045
Race/Ethnicity ²			0.260
Non-White (n)	12	9	
White (n)	4	0	

Continuous data are expressed as mean (standard deviation).

Categorical data are expressed as the number of individuals.

¹Data analyzed using an unpaired t-test, ²Data analyzed using Fisher's Exact Test

Table 2: Changes in RBANS Scores between Intervention (EXD) and Control (CON) Groups Post Intervention.

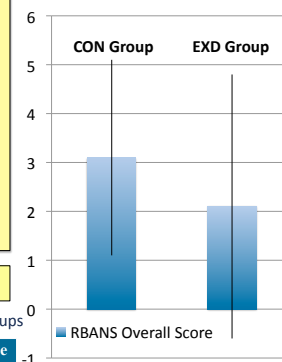
RBANS Categories	EXD Group (n=16)	CON Group (n=9)	p-value
RBANS Overall Score	3.1 (2.0)	2.1 (2.7)	0.995
Immediate Memory	4.1 (2.8)	12.7 (3.7)	0.078
List Learning	2.0 (0.8)	3.0 (1.1)	0.475
Story Memory	1.8 (0.7)	3.3 (0.9)	0.204
Visuospatial/ Constructional	8.9 (3.5)	-3.9 (4.6)	0.038
Figure Copy	1.1 (0.5)	-0.4 (0.6)	0.081
Line Orientation	2.1 (0.1)	-0.1 (1.1)	0.147
Language	-0.7 (3.3)	-0.2 (4.4)	0.918
Picture Naming	-0.2 (0.3)	0.1 (0.4)	0.507
Semantic Fluency	0.9 (1.4)	-1.2 (1.9)	0.394
Attention	-4.0 (2.1)	3.5 (2.9)	0.047
Digit Span	-0.9 (0.6)	-0.9 (0.9)	0.934
Coding	0.6 (1.5)	-0.2 (2.0)	0.754
Delayed Memory	4.6 (2.7)	4.2 (3.6)	0.944
List Recall	0.5 (0.4)	-0.2 (0.5)	0.270
List Recognition	0.5 (0.2)	0.5 (0.3)	0.968
Story Recall	2.0 (0.5)	0.8 (0.6)	0.117
Figure Recall	2.0 (0.8)	-0.4 (1.0)	0.074

There was a difference found in the Visuospatial and Attention categories ($p < 0.05$).

Data are expressed as means (standard deviation).

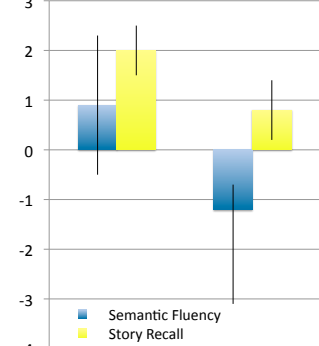
Data analyzed using analysis of covariance using the change score adjusted for baseline values.

Figure 1: Total RBANS Average Score Change Between EXD and CON Groups



Data analyzed using analysis of covariance using the change score adjusted for baseline values. Error bars set to 3 standard deviations above and below the mean. Note that this data are not statistically significant ($p = 0.995$).

Figure 2: RBANS Subcategory Changes (Semantic Fluency and Story Recall) Between EXD and CON Groups



Data analyzed using analysis of covariance using the change score adjusted for baseline values. Error bars set to 3 standard deviations above and below the mean. Note: this data is not statistically significant: Semantic Fluency ($p = 0.394$) & Story Recall ($p = 0.117$)

Discussion and Conclusion

- There were no significant RBANS score changes between the EXD and CON Groups.
- Results show positive and negative results in different RBANS categories and subcategories.
- Strengths of the study were the target population, which include a strong minority population, the combined interventions effects and the presence of a CON group
- This is the first study to report the combined cognitive effects of a 12-week Tai Chi resistance training, and a dietary intervention in older obese women.
- Limitations of this study were the non-randomized design, small sample size, and the study's main focus was on the anthropometric and blood pressure changes.
- The RBANS Subcategory "Story Recall" and "Semantic Fluency" are highlighted because scores from both have been shown to be lower in individuals with Parkinson's disease [8].

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Personal Purpose for the Honors Project

I was involved fully involved with the intervention from the beginning to end and I wanted to use part of the data to learn how to create a formal poster presentation. My goal was to achieve a full understanding of the research process. I will be presenting a poster of the same topic at the American College of Sports Medicine Annual meeting in May 2015.

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