

EXECUTIVE AND WORKING MEMORY IMPAIRMENT IN YOUNG ADULTS WITH ISOLATED SEVERE HYPERTRIGLYCERIDEMIA: A CROSS-SECTIONAL STUDY

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Introduction and Methodology

The aim of this cross-sectional study was to evaluate the potential relationship between serum triglyceride (TG) levels and cognitive performance in a cohort of young adults.

A total of 47 young adults, including patients with isolated HGT and healthy controls, were enrolled in the present study at the outpatient clinic of the Nutrition Unit, in collaboration with the Institute of Neurology, of the "Magna Graecia" University of Catanzaro. The inclusion criteria were aged 20-55 years and at least one TG measurement. The exclusion criteria were history of brain injury, neurological or psychiatric diseases, familial hypercholesterolemia, diabetes, severe general medical conditions, and hearing or vision deficits. The cohort was stratified into three subgroups subjects' highest recorded fasting serum TG levels: 14 individuals with severe hypertriglyceridemia (HTG) (≥ 500 mg/dL), 16 with moderate HTG (150-500 mg/dL), and 17 normolipidemic subjects included as controls (<150 mg/dL). Participants underwent a broad structured psychometric evaluation, including cognitive functions, psycho-emotional status, eating habits, and quality of life assessment. The publicly available dataset of the 'Leipzig Study for Mind/Body/Emotion Interactions' (LEMON) [1] was used extracting data on biochemical analyses and assessments of cognitive to confront our findings.

Results

Table 1. Neuropsychological Assessment of participants according to highest recorded fasting triglyceride levels

Variables	Controls* (n=17)	Moderate HTG* (n=16)	Severe HTG* (n=14)	p-value	LSD Post-Hoc Analysis
TG (Range, mg/dL)	38-124	163-390	542-1266		
Education (years)	16±2	12±4	13±4	0.001	a vs b 0.001 a vs c 0.007
FAB	15.4±0.8	15.5±1.5	13.9±2.8	0.033	a vs c 0.027 b vs c 0.018
FAP	15.1±0.6	15.9±0.5	13.7±0.5	0.014	b vs c 0.004
TMT-A	27±8	44±33	39±27	0.16	/
TMT-B	71±23	87±43	85±47	0.41	/
DST	57±11	47±11	41±18	0.011	a vs b 0.05 a vs c 0.003
DST*	57±4	50±3	37±4	0.008	a vs b 0.043 a vs c 0.001 b vs c 0.044
FDS	5.9±1.4	5.4±1.5	5.1±1.3	0.29	/
BDS	4.7±1.2	3.8±0.8	3.2±1.5	0.004	a vs b 0.043 a vs c 0.001 b vs c 0.044
BDS*	4.5±0.4	4.0±0.3	3.0±0.4	0.037	a vs c 0.043 a vs b 0.018 b vs c 0.044
Rey's 15 Words Test - Immediate	48.4±7	44.3±9	41.8±11	0.11	a vs c 0.043
Rey's 15 Words Test - Delayed recall	10.6±2.2	9.8±2.8	8.5±2.8	0.25	/
EAT-26	10.2±9	11.9±9	8.8±6	0.55	/
BES	3.0±5	7.5±9	5.8±4	0.14	/
BDI-II	7.1±8	10.8±8	10.7±8	0.36	/
STAI-Y1	55.7±4	47.4±9	45.9±11	0.004	a vs b 0.007 a vs c 0.003
STAI-Y2	54.1±4	50.2±8	44.9±8	0.003	a vs b 0.001 b vs c 0.005
SF-36 Total score	2857±418	2388±664	2374±728	0.046	a vs b 0.032 a vs c 0.033

*Adjusted for education, obesity, energy intake, use of antihypertensive, hypolipidemic, and hypoglycemic drugs. FAB = Frontal assessment battery; FDS = forward digit span; BDS = backward digit span; EAT-26 = Eating Attitude Test; BES = Binge Eating Scale; BDI-II = Beck's Depression Inventory; STAI-Y = State-Trait Anxiety Inventory; SF-36 = Short Form Health Survey 36.

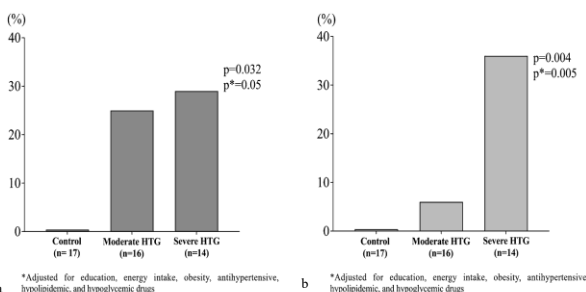


Figure 1. Prevalence of severe executive dysfunction evaluated by a) frontal assessment battery (FAB) and b) backward digit span (BDS) according to highest recorded fasting triglyceride levels

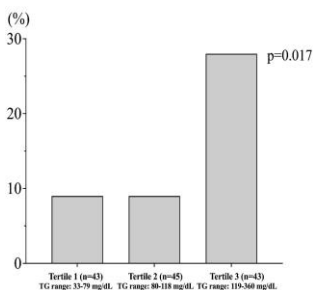


Figure 2 shows the prevalence of severe executive dysfunction, assessed with TMT-A, across tertiles of fasting serum TG levels in the LEMON study. Severe executive dysfunction was observed in 28% of participants in Tertile 3 (highest TG values), compared to 9% in Tertile 2 and Tertile 1 (p = 0.017; Fig. 1).

Patients with severe HTG exhibited significantly reduced performance compared to controls in executive and working memory domains, as measured by the Frontal Assessment Battery (p = 0.03), the Digit Symbol Test (p = 0.01), and the Digit Span Backward (p = 0.004). Severe executive dysfunction was observed in 36% of individuals in the severe HTG group, 6% in the moderate HTG group, and none in the control group (p = 0.004). Moderate to severe working memory dysfunction was identified in 29% of the severe HTG group, 25% of the moderate HTG group, and was absent in the controls (p = 0.032). The population analysed from the LEMON study showed that participants with highest TG values had significantly lower mean scores in test evaluated working memory compared to participants with lower levels of HG.

Discussion and conclusion

These results demonstrated a relationship between elevated TG levels and cognitive impairment, specifically in executive function and working memory, after adjusting for obesity, education, energy intake, and medication use. Similar results were obtained analyzing the LEMON dataset.

Severe isolated HTG in young adults is associated with executive functions impairment, suggesting that monitoring and managing the triglyceride levels could play a role in the prevention of cognitive decline.

Reference:

[1] A. Babayan et al., "A mind-brain-body dataset of MRI, EEG, cognition, emotion and peripheral physiology in young and old adults," Sci Data, vol. 6, no. 1, p. 180308, Feb. 2019.



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