

**BAR-ILAN UNIVERSITY**

**Working Memory (Phonological Loop, the Visuo-Spatial Sketchpad and the Central Executive) According to Task Load among Students with ID Participating in Academic Enrichment versus those who are Fully Integrated in Regular Courses**

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## Abstract

The main objective of the proposed study was to examine a working memory profile in its three channels (phonological, visuo-spatial and the central executive mechanism) (Baddeley, 2000, 2007) in three different levels of cognitive load (low, intermediate, and high; Cornoldi & Vecchi, 2003). The study examined differences among students with intellectual disabilities (ID), who study in a customized academic enrichment program ( $N = 25$ ) compared to students with ID who are fully integrated in regular courses ( $N = 10$ ) as part of the OTZMOT project at the School of Education at Bar-Ilan University.

The current study focused on examining students' working memory in its three channels in three levels of cognitive load. Working memory is a temporary storage system, which allows a person to process information and to use it for cognitive tasks such as thinking, understanding, and learning (Baddeley, 2007). According to Baddeley (2003), it is related to other cognitive functions such as learning skills, mathematics, literacy and language comprehension, and cognitive meta-processes. This explains this study's significance since it provides: a. A specific and focused examination of the subject (working memory) and the population (students with ID) as part of the OTZMOT project (at the School of Education at Bar-Ilan University). We focused on a specific measure and a specific population, two groups with defined characteristics (students with ID who study in a customized academic program compared to students with ID who are fully integrated in regular courses). b. A comparison of the working memory channels, the phonological, visuo-spatial, and the central executive mechanism between the two groups in three cognitive levels – low, intermediate and high (Cornoldi & Vecchi, 2003). c. An examination of connections between the measures of intelligence and measures of memory according to the three levels. d. An examination of differences in the working memory channels between the two groups in relation to etiology (students with Down syndrome and those without a specific etiology) (Van der Molen, Van Luit, Jongmans, & Van der Molen, 2007, 2009).

An IQ test was conducted using three sub-tests from the Wechsler test – vocabulary, similarities, and block design (WMS-III, Wechsler, 1997; WAIS-III<sup>HEB</sup>; Wechsler, 2001). The working memory measures were conducted by the Baddeley's (2007) model using three tests in the phonological loop and the visuo-spatial sketchpad, as well as six tests in the central executive mechanism. In each channel, tasks with three levels of control (low, intermediate, and high) were presented (Cornoldi & Vecchi, 2003). The level of control was determined by the level of active processing required to manipulate forward word recall, reverse word recall, selective word recall task, transformation of information and integration of Verbal double task (Lanfranchi et al., 2004, 2009). It was also determined by the Kilberg's (2013) task hierarchy. The students with ID used all of the tests. The following tools were used to test the executive function: Tower of Hanoi (Borys, Spitz, & Dorans, 1982) and Verbal Fluency (McCarthy, 1972).

The findings showed that the main differences between the two groups (students who study in a customized academic enrichment program and students who are fully integrated in regular courses) were found in the **intermediate load level**. Additionally, no differences were found between the two groups in the low load level beyond the channel. Also, no differences were found between the research group at the high load level beyond the channel (except for the matrix test that represents the visuo-spatial channel). In addition, a different hierarchy of tasks was found within each of the cognitive load levels between the students who were fully integrated and those who were studying in a customized academic enrichment program. Positive correlations were found between the memory measures and the intelligence tests, i.e., the higher the students' achievement in the intelligence tests, the higher their achievement in the working memory tests. No differences were found between subjects without etiology and those with Down syndrome.