# The Use of Reading Processers – Phonological, Orthographic, Semantic and Context among Children and Adolescents with Intellectually Disabled With Reference to Their Chronological Age and Mental Age

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# Abstract

The main objectives of the current study were to examine the extent of the use of reading processors among children and young adolescents with Intellectual Disability (ID), in relation to their chronological age (CA) and mental age (MA). Another goal was to examine the extent of the use of the interactive compensatory mechanism in the process of reading, among the same population.

There are several approaches which explain the process of reading, all based on different models. Herein are some of these approaches:

The Bottom-Up Model (Resnik & Weaver, 1979). According to this model, the reading acquisition process begins from the parts to the whole, from deciphering the cornerstones to the production of meaning.

The Top-Down Model (Goodman, 1967). According to this model, the reading acquisition process begins from the whole to the parts, from meanings based on vocabulary, basic concepts and the worldly knowledge of the reader, to the deciphering of the cornerstones.

The interactive model (Rumelhart, 1977). According to this model, reading includes both a perceptive process and a contextual one, thus, it can be noted that the interactive model incorporates both of the abovementioned models.

The processors model (Adams, 1991; Weaver, 1994). This model is derived from the interactive model. According to the processors model, the reading process includes four main processors: the phonological processor, the orthographic processor, the sematic processor and the contextual processor. Each of these processors provides another component in making reading more effective, automatic and fluent (Tov-Lee, 2002

Studies dealing with acquiring reading abilities among individuals with ID, relate mostly to approaches of teaching reading and their effectivity, where some of the studies support the global approach based on the orthographic processor (Farrell & Elkins, 1994; Channell, Loveall & Conners, 2013), and others support the analytical-phonetic approach based on the phonological processor (Cupples & Iacono, 2002;

Cohen Wolf, Heller, Alberto & Fredrick, 2008; Barker, Sevick, Morris & Romski, 2013.

There are few studies dealing with the use of reading processors among population with ID. However, while these studies address the use of one processor or another on its own, they do not examine the use of reading processors as a whole.

The contribution of the Chronological age to cognitive development among population with ID is manifested in the "compensatory age" theory developed by Lifshitz-Vahav (2011). Based on the cognitive-structural modifiability theory developed by Feuerstein (1974 ; 2003) . According to this theory, the delayed development among individuals with ID in their early years is compensated for at a later years. Thus, it is possible that underdeveloped abilities in early stages will become more developed in later stages. As defined by Feuerstein (1974), the ability to change is possible beyond three obstacles which may prevent such change: etiology, the severity of the disability and the age.

In light of the above said, the operative objectives of the current study are:

- Examining the connection between the CA of the subjects and the extent in which they use the different processors.

- Examining the connection between the MA of the subjects and the extent in which they use the different processors.

- Examining whether and how the interactive compensatory mechanism is being used, in relation with the CA and MA.

Our study comprised of 40 participants with ID, divided into two age groups: young adolescents (N = 20) between the ages 10-14, and mature adolescents (N = 20) between the ages 16-21. The disability level of the participants ranged between mild ID (IQ=55-70) and moderate ID (IQ=40-54), according to the traditional definition of ID (Grossman, 1983). The participants were selected from both sexes randomly.

Five tools were used: the PPVT test to examine the participants' mental age, a test out of the set 'Maakav' (2003), To examine the use of the phonological processor, as well as three tests taken from the dissertation of Brown (2010) in order to examine the use of the other processors.

We shall present the objectives of the research, the hypothesis and the results herein:

The primary objective of the study was to examine the connection between the participants' CA and their extent of use of the different processors. We hypothesized that the lower the participants' CA is, the higher the use of the phonological processor will be, seeing as it is a more basic processor, whereas, as the participants' MA progresses, the higher processors will be used more extensively: the orthographical, semantic and contextual processors.

The results of the study indicated that while the young participants (10-14) indeed used the phonological processor to the highest extent, the adolescent participants (16-21) preferred the use of the semantic processor. In addition, it was found that the higher the CA is, the extent of use of the phonological processor decreases. In light of these findings, it seems that as the CA progresses, the ability for using higher reading processors develops, while the use and dependency of the basic phonological processor decreases.

The explanation is based on the literature dealing with the acquisition of reading in general and specifically on using reading processors and the hierarchy between them. According to various researches (Hanaor, 2003; Talmore 2007), developmentally, at the beginning of the reading process, the cognitive and language processes are not mature enough to enable one to lean on a visual or a semantic vocabulary, or on a control ability or the use of context. Therefore, the young reader must lean on the rules of graphic-phonemic deciphering and phonological decoding alone. As the age progresses, along with basing the atomization of the deciphering, the broadening of the global vocabulary and the language and cognitive maturity, the reader can decrease the exclusive leaning on the deciphering and turn the majority of the resources to constructing meaning while expressing a controlling ability and use of context.

The secondary objective of the study was to examine the connection between the participants' MA and their extent of using the different processors.

We hypothesized that the lower the participants' MA is, the higher the use of the phonological processor will be, whereas as the participants' MA progresses, the

higher processors will be used more extensively: orthographic, semantic and contextual.

In reference to the contextual processor, the results of the study indicate a difference between the participants with the lower MA and the ones with a higher MA. The subjects with the higher MA used context more in comparison with the ones with the lower MA. In addition, a significant positive relation was found between the MA and the extent of use of the contextual processor. The higher the MA was, the more the contextual processor was used.

Regarding the semantic processor, it was found that the extent of using this processor was the highest among the lower MA group as well as among the higher MA group.

The meaning of these findings indicate that a reader of any cognitive level, be it low or high, strives to produce significant information by reading. However, the higher the MA is, the better ability the reader possesses to use more sophisticated methods in order to produce meanings, for instance, using the contextual processor. This processor provides a tool through which one can quickly and efficiently decipher new words or longer words according to their context into the general content of the text and thus preserve the continuity of the reading and produce meaning from what is being read.

The third objective of the study was to examine whether and how there is use of the interactive compensatory mechanism in reference to the CA and MA. We hypothesized that the higher the CA and/or MA is, the participants will present an improved thinking flexibility as well as a better ability of using the interactive compensatory mechanism and will select the proper processor to use in order to overcome difficult reading conditions.

The results of the study indicate that both CA groups and both MA groups use the interactive compensatory mechanism. The differences between the groups are expressed in the following: A. selecting the processors – usually, the selection of the phonological processor is more common among participants with a lower CA and MA, compared to participants with a higher CA and MA who presented greater use of higher processors. B. matching the correct processor – as the CA and MA progresses,

the selection of the correct processor which will compensate for the difficulty in reading is more educated and serves the reader more efficiently in producing meaning and understanding what is being read.

A significant positive relation was found between the MA and the use of the contextual processor. By definition, reading incorporates an integral search for meaning. This search advances as the age and cognitive level increases. During this process, the readers make use of all of the reading processors and whenever they encounter a difficulty in reading, they select the processer which will ease them in overcoming the difficulty.