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Compensation Age Theory (CAT): Effect of Chronological Age on Individuals with Intellectual Disability

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ABSTRACT

The main goal of this article is to discuss a new concept, the “Compensation Age Theory (CAT)”, for individuals with intellectual disability (ID). The CAT is a holistic framework comprised of four dimensions: (a) the state of the art of the CAT; (b) the theoretical resources which are at the core of the CAT; (c) a series of empirical studies performed by the author and other scholars which support the assumptions of the CAT; (d) cognitive educational intervention programs for individuals at all levels of ID throughout the lifespan, which are anchored in this theory. The CAT framework supports the view that all human beings, even people with ID, are capable of change. Despite the limitations imposed by age or severity of disability, the concept "self-actualization" can be expanded to include people with ID who, under appropriate environmental conditions and with continuous systematic intervention, can be brought to a level of functioning previously absent from their behavioral repertoire.

**Compensation Age Theory (CAT): Effect of Chronological Age
on Individuals with Intellectual Disability**

The main goal of the present article is to discuss a new concept, the “Compensation Age Theory (CAT)” for individuals with intellectual disability (ID). The CAT is a holistic framework comprised of four dimensions: (a) the state of the art of the CAT; (b) the theoretical resources which are at the core of the CAT; (c) a series of empirical studies performed by the author and other scholars which support the assumptions of the CAT; (d) cognitive educational intervention programs for individuals at all levels of ID throughout the lifespan, which are anchored in this theory.

CAT - State of the Art

When considering cognitive education or cognitive intervention programs for individuals with ID, it is assumed that the weight of the mental age (MA) or the basic cognitive level is the crucial factor for determining their cognitive ability. The CAT postulates that the weight of the chronological age (CA) is similar to that of the MA, and that CA plays an important role in determining the cognitive ability of individuals with ID beyond their MA. The CAT claims that in later years, there is compensation for the developmental delays experienced by individuals with ID in their early years. Furthermore, the cognitive ability of adults with ID can be modified at a critical period which was considered to be non-modifiable, even at an advanced age. Our argument is that years of schooling, greater maturity and cumulative life experience help them acquire skills that were previously absent from their behavioral repertoire.

The CAT emphasizes the effect of CA on the cognitive ability of individuals with ID. Cognition is a wide concept which involves several terms including cognitive skills,

cognitive thinking, cognitive strategies, self-regulation skills and metacognitive processes (Hessles & Hessels-Schlatter, 2013; Feuerstein & Falik, 2010; Haywood, 2013; Vygotsky, 1978). Ashman and Conway (1997) defined cognition as a sequence of mental capacities such as "storing, retrieving, storing, transforming and manipulation of information" (p. 41). Feuerstein and Falik (2010) added other skills, such as "organization, processing, understanding generalization, transferring and transformation".

There are several reasons for emphasizing cognition by the CAT in individuals with ID.

(a) In line with the Structural Cognitive Modifiability Theory (Feuerstein & Rand, 1974; Feuerstein, 2003), the CAT claims that individuals with ID can benefit not only from exposure to concrete information and from sensory-based experiences, but also from programs designed to ameliorate impaired cognitive functions and to enhance abstract thinking (Lifshitz & Rand, 1999).

(b) In line with the *Normalization* (Wolfensberger, 2002) and *Quality of Life* (Schalock, 1996) principles, the CAT is guided by the vision that all individuals with disabilities will be valued members of their community and society. Individuals with ID at all levels should have meaningful participation in all aspects of life as stated in the UN Convention on the Rights of Persons with Disabilities (2006): "Persons with disabilities continue to face barriers in their participation as equal members of society and violations of their human rights in all parts of the world" (p. 4). Our purpose as a society is to "promote their participation in the civil, political, economic, social and cultural spheres with equal opportunities" (p. 4). Participation in the above activities requires manipulation of the above-mentioned cognitive skills and strategies.

(c) We live in a digital age and are surrounded by computers and other technological instruments such as smartphones and ipads which influence fundamental

areas of everyday life (Shamir, 2013). These instruments are also accessible to individuals with ID. Coping with the rapidly changing technological world, demands activation of the above cognitive skills. (d) Accelerated progress in brain and neuro-psychological science indicates a reciprocal relation between brain and cognitive modifiability. As will be shown below, fMRI experiments indicate neural plasticity of the brain as a result of a cognitive-stimulating environment even among individuals with ID (Head, Lott, Patterson, Doran & Haier, 2007).

CAT-Theoretical background

One of the intriguing questions in the professional literature that deals with individuals with ID is: how do intelligence and cognitive functioning develop and decline throughout their lifespan? Three possible models of intelligence or cognitive trajectories in individuals with ID compared to the general population have been proposed over the years (Fisher & Zeaman, 1970, and others): the *Impaired Trajectory*, the *Parallel Trajectory* and the *Compensation Trajectory*. These models are based on traditional theories of intelligence in the general population (Wechsler, 1955; Kauffman, 2001), according to which there is an increase in intellectual functioning up to the age of 20, and that the increase in intelligence (the general intelligence score without a distinction between crystallized and fluid measures) is linear (development). This is followed by an asymptote (stability), and a decline from around the age of 60. The three models of cognitive trajectories among individuals with ID differ in three dimensions: (a) the age at which intelligence reaches its peak; (b) the length of the stability or asymptote period; (c) the age of the onset of decline. The three possible trajectories of intelligence and cognitive growth and decline in individuals with ID are presented in figure 1.

Figure 1

We will present the three models, with emphasis on the third model which comprises the basis for the CAT theory.

The "*Impaired Trajectory*" (IT) model is anchored in the Cognitive Reserve (CR) Theory (Katzman, 1993), which posits that normally occurring individual differences in the way people process tasks might provide a differential reserve against brain pathology or age-related changes. A sub-concept of the CR theory is the "neural reserve", which represents the capacity to perform tasks or cope with increasing task difficulty. Individual differences may result from innate characteristics (e.g., intelligence), or may be modulated by life events such as educational or occupational experiences or leisure activities (Scarmeas & Stern, 2003; Wilson & Bennett, 2005). A higher neural reserve might be expressed in the form of brain networks that are either more efficient or have a greater capacity to handle increased demand. Individuals with ID possess less CR than their peers without ID, by definition (Zigman et al., 2004). They have lower intelligence and slower task processing. They do not achieve higher educational levels or occupational statuses, and tend to participate in fewer intellectually stimulating leisure activities. The IT model predicts that individuals with ID will exhibit restriction in developing intelligence before their 20's. Thereafter, they will exhibit stability. Their lower CR exposes them to an accelerated and steeper decline which will be manifested in their mid-thirties or forties.

The *Parallel Trajectory* (PT) model was proposed following recent studies that questioned the applicability of the CR theory to individuals with ID (Oliver, Crayton, Holland, Hall, and Bradbury 1998). If people with ID have reduced CR compared with their peers with TD, by definition, then these persons would be expected to be at greater risk for dementia of the Alzheimer type (DAT) with increasing age than the general population (Snowdon, Greiner, & Markesbery, 2000). However, several studies (Merrick, 2010; Zigman et al., 2004) found an equivalent or even lower risk of dementia among adults with ID with a nonspecific etiology (NSID). Based on the lower age for onset of DAT among individuals with ID, the above authors reached the conclusion that factors that determine intelligence may have little or no direct relationship to risk for dementia in individuals with NSID. On the contrary, studies indicate similar trends of cognitive change among adults with ID and adults with typical development (TD).

Facon (2008) supported the similar trajectory model using WAIS-R results of adults with and without ID aged 20 to 54 years. Hierarchical regression analyses among the two groups showed similar evolution of scores with increasing age for verbal and performance scales. Devenny, Hill, Patxot, Silverman, and Wisniewski (1992) reported similar trends of change compared to the general population among adults with ID with and without Down syndrome (DS) aged 50+ in short and long-term verbal memory and visual-spatial organization. Based on the above, the PT model predicts that intelligence and cognitive development among individuals with ID are similar to those of the general population in terms of the peak age and the onset and rate of decline. The difference between the two groups lies in the baseline IQ level, which in individuals with ID is two standard deviations below the norm of the general population.

The *Compensation Trajectory* (CT) model, which is at the core of the current study, postulates that while intelligence in the general population grows linearly up to the age of 20, individuals with ID will be compensated in later years due to the developmental delays they experience in their early years (Fisher & Zeaman, 1970).

The proposed CAT theory distinguishes between the period of cognitive growth and the period of cognitive stability and decline. It predicts that the duration of the growth period among individuals with ID may be longer compared to the general population, and may continue until their late 40's. Intelligence and cognitive functioning in this population will therefore reach their peak at the age of forty to fifty. The theory also predicts that similarly to the general population, intelligences among individuals with ID will exhibit stability between the ages of 50 to 60, and will show a decline after age 60. Thus, individuals with ID will exhibit a different pattern of cognitive growth than individuals with TD, but will show a parallel pattern of cognitive stability and decline.

The CAT is anchored in several theoretical resources: the Structural Cognitive Modifiability (SCM) theory and the Active Modifying (AM) approach (Feuerstein & Rand, 1974; Feuerstein, 2003; Feuerstein & Falik, 2010). The basic assumption underlying this theory is that the human organism is, by nature, a system open to its environment and accessible to change, even in the presence of three formidable obstacles usually believed to prevent change: (a) age; (b) etiology; (c) severity of limitation (Feuerstein, 2003).

Theoreticians such as Bloom (1964) and Piaget (1970) argued that the age of an individual is a crucial factor for the success of environmental intervention. In their opinion, the critical time to carry out an intervention aimed at correcting cognitive

deficiencies is at a young age, and the sooner the intervention the better the results. The SCM theory does not dispute the importance of starting intervention programs at an early age. However, it rejects the assumption that there is a critical time for initiating such an intervention. This position is buttressed by Gunzburg (1968) and Luftig (1987), who argued that maturation and life experience of adults with ID help them learn and acquire new cognitive skills that were previously absent from their behavioral repertoire.

The Cognitive Reserve Theory (CRT) (Stern et al., 2005) is also at the foundation of the CAT, as is its sub-concept, neural compensation. This concept relates to a situation in which the physiological effects of aging or brain pathology cause the alteration of a brain network, resulting in a network that would not normally be used by unaffected individuals but in a different way, or additional brain areas might be recruited. Stern et al. hypothesized that the altered network is used to compensate for the inability to utilize the healthy brain's responses to increased task difficulty. The ability of the compromised brain to express or optimize compensatory networks may also vary as a function of CR.

One might argue that individuals with ID are exposed to lower CR due to their lower level of intelligence, fewer opportunities for cognitive education and cognitive leisure activities. Based on the lower rate of dementia among the population with ID compared to the general population (Zigman et al., 2004), our argument is that CR in individuals with ID should be examined within the population with ID itself, and not compared to the general population. There are individual differences within the population with ID in task processing, according to the intelligence level and life events such as occupational and leisure experience. However, as will be shown, individuals with

ID can acquire cognitive skills efficiently in their adulthood and even at an advanced age. This statement includes all levels of ID: mild/moderate as well as severe/profound.

Developing cognitive skills during young adulthood, in midlife, is part of the agenda of the CAT. It is anchored in the *Cognitive Activity Theory* (Wilson & Bennet, 2005). This theory postulates that there is an association between participation in cognitive activities during midlife, and a reduced risk of cognitive decline leading to Alzheimer disease (Stern et al., 2005; Wilson & Bennett, 2005; Wilson, Barnes, & Bennett, 2007). Based on the *Cognitive Reserve Theory* (Stern et al., 2005), the authors suggest that cognitively active persons experience more cognitive decline before reaching the cognitive impairment levels commensurate with dementia, compared with less cognitively active adults.

This association between cognitive activity and reduced risk of Alzheimer disease has been confirmed in several studies (Scarmeas, Levy, Tang, Manly, & Stern, 2001; Winocur, Palmer, Dawson, Binns, Bridges, & Stuss, 2007). In one study (Wilson & Bennett, 2005), healthy older Catholic clergy members rated how frequently they participated in several cognitively stimulating activities at the beginning of the study. After five years, persons reporting frequent participation in cognitively stimulating activities had only half the risk of developing Alzheimer disease compared with those reporting infrequent cognitive activity. The authors suggest that education affects the risk of cognitive impairment and dementia by somehow enhancing the brain's capacity to tolerate Alzheimer disease pathology.

One might argue that cognitive activities include a high level of abstract thinking which are beyond the capacity of individuals with ID. However, according to Wilson and Bennett (2005), even activities that involve a basic level of information processing can be fruitful. In fact, all kinds of leisure activities, such as listening to the radio, watching TV, reading, writing, playing games, fishing, leisure creations, involve cognitive stimulation.

Thus, activating cognitive interventions among adults with ID at all levels of ID might be a protective factor against accelerated deterioration.

CAT-Empirical findings

Our claim about a compensation age and our concentration on adulthood and even advance age is based on empirical findings. The first assertion about the influence of CA on the cognitive ability of individuals with ID was presented by Facon and his colleagues. Facon and Facon-Bollengier (1997) examined the effect of CA on the crystallized intelligence level of children and adolescents (aged 6-18) with ID. Participants were tested on both the Peabody Pictures Vocabulary test (Dunne & Dunne, 1981) and the French version of the Columbia Mental Maturity Scale. Stepwise regression showed that 28% of the PPVT in the above sample was accounted for by CA. In another study (with the same ages), Facon and Facon-Bollengier (1999) showed that the fluid intelligence factor and CA explain an important fraction of the crystallized intelligence factor variance (43% and 21%, respectively) of individuals with ID. According to Facon and his colleagues, this finding supports the hypothesis that CA-related experiences exert a significant effect on the crystallized component of intelligence in people with ID. The authors claim that long life experience may aid people with ID to succeed better in some cognitive tasks and partly determines their MA. Thus, when subjects are matched by MA, as is usually done to separate the influence of CA and MA on target tasks, there is a de facto attenuation of the contribution of the CA.

The role of CA on the cognitive ability of individuals with ID is also expressed by the criteria of matching between individuals with ID and with TD in memory studies. When individuals with ID and TD were matched according to CA, individuals with TD

outperformed those with ID, a finding which is self-explanatory (Turner, Hale, & Borkowski, 1996; Cherry, Njardvik, & Dawson, 2000). However, when matching was based on MA, the performance of individuals with ID was equal to their controls. In this case the individuals with ID are older than their TD peers and this affords them an advantage compared to their controls (Carlin, Soraci, Dennis, Chechile & Loiselle, 2001; Perrig & Perrig, 1995, and others). Carlesimo, Marotta and Vicari (1997) stated that longer exposure to linguistic and academic experiences of adolescents with ID may explain their more efficient use of semantic strategies than their TD peers with the same MA. While those studies focus on younger ages (children/adolescents), a series of studies conducted by the author of the current study implies the influence of CA on the cognitive ability of adolescents and adults with ID. These studies are presented henceforth in brief:

Study 1 (Lifshitz & Tzuriel, 2004) was performed with the goal of examining the influence of a cognitive intervention program on cognitive achievements of adults with ID and the duration of this influence. The original sample (Lifshitz & Rand, 1999) included 71 adults with ID in three age groups: young adults with ID (CA 20-35); middle-age (36-50); older adults (CA 50-70) with IQ 40-70. The follow-up study conducted three years later included 21 adults (CA 30-59) who participated in the original study.

The central means of intervention were four tools from the Instrumental Enrichment Program (Feuerstein, Rand, Hoffman, & Miller, 1980): comparison, categorization, time and space relations. The effects of the intervention were examined with reference to three types of thinking (Glanz, 1989): logical thinking (Reversal Test and Test of Verbal Abstraction), predictive thinking (Maze Tests) and insightful thinking

(Postures Test and Children Test). The battery was administered five times: twice before the intervention spaced two months apart, twice afterwards spaced two months apart, and a follow-up three years later.

MANOVA's and contrast between the four time points in the original study yielded significant improvement from Time 2 to 3, and two months later (Time 4), a divergency effect in logical and predictive thinking. The MANOVA's in the follow-up evaluation (Time 5) showed a drop in the cognitive functioning relative to Time 4, but participants maintained their achievement in relation to Time 3, a finding which indicates a durability effect. Figure 2 presents the cognitive achievements of 21 participants in three types of thinking in the five time points.

The findings show significant changes among all investigated age groups (30-57), including adults with ID with and without Down syndrome, without any differences due to age. The results indicate that it is possible to alter the level of cognitive functioning of adults with ID even at an advanced age.

Study 2 (Lifshitz, Tzuriel, Weiss, & Tzemach, 2010) was performed in order to map the difficulties and cognitive processes in solving analogical problems among adolescents (age 13- 21) and adults (age 25-66) with ID (IQ 40-70). The *Conceptual and Perceptual Analogical Modifiability* test (Tzuriel & Galinka, 2000) was administered using a dynamic assessment procedure.

Figure 3 presents the improvements from pre to post-teaching tests between adolescents and adults. Repeated measures MANOVA's and post-hoc tests did not reveal significant differences between the two age groups in the pre-teaching stage. In the post-teaching stage, the adult group scored significantly higher ($p < .05$) than the adolescent

group ($M=15.09$ and $M=8.28$, respectively). The findings indicate that the adults gained more from teaching in the DA procedure than the adolescents.

Study 3 (Lifshitz & Katz, 2009) was performed in order to examine: (a) the level of understanding of Jewish cognitive concepts among Jewish adolescents and adults with ID (IQ 40-70); (b) the psychological emotional motives of the participants for being religious. The participants included adolescents (age 13-21) and adults (age 30-60) with ID. The cognitive component included four factors: Concept of God, Heavenly recompense - reward and punishment, Divine providence - the sense of the presence of God in everyday life, efficacy of prayer.

The scores of prayer efficacy and providence of God were significantly higher among the adults than the adolescents (Figure 4). The adults also exhibited more mature motives for being religious (dependence, security, God as an anchor) than the adolescents (belonging to a religious community, expect to fulfill personal wishes). Regression analysis indicated that among the adolescents, MA contributed to the explained variance of the cognitive components, while among the adults, CA contributed to the explained variance of the cognitive component.

Study 4 (Lifshitz, Klein, & Fridel, 2010) was carried out in order to examine the effects of a year-long Mediation Intervention for Sensitizing Caregivers (MISC; Klein, 1992) on the quality of interactions between rehabilitation day center paraprofessionals and their adult consumers with severe ID. Another goal was to examine the effect of the intervention on the consumers' cognition, autonomy, and behavioral functioning

The objective of the MISC (Lifshitz & Kein, 2007) is to help caregivers and direct staff relate to their dependents in a way that will enhance their cognitive, autonomous,

and behavioral functioning. It is not content-specific, but may serve as a tool for teaching “literacy of interaction” in daily activities such as vocational, domestic, and leisure skills. Paraprofessional staff members in rehabilitation centers and their consumers with severe and profound ID were divided into an experimental and a control group. The paraprofessionals in the experimental group participated in a workshop on the MISC and then activated the MISC intervention in the rehabilitation center for one year.

Following the intervention, more mediation of choice making, cognitive expansion, and encouraging with explanation were observed among the paraprofessionals in the experimental group than in the control group. Consumers with ID in the MISC group improved their arithmetic skills, temporal concepts, and sequential memory of two digits (Figure 5). The findings indicate that appropriate environmental conditions and continuous systematic intervention may enable adults with severe and profound ID to invent new skills, which were previously absent from their behavioral repertoire.

The idea of a compensation mechanism with increasing age in individuals with ID is also supported by genetic and brain studies conducted among adults with DS. It is known that adults with DS develop Alzheimer disease pathology progressively with age (Janicki & Dalton, 2000; Oliver et al., 1998), but clinical signs of dementia are delayed by at least 10 years after the first signs of disease. Furthermore, studies have reported a subset of adults with DS who do not exhibit dementia at any age (Devenny et al., 1992; Zigman, Schupf, Devenny, Mizejeski, Ryan, Urv, Schubert and Silverman, 2004). While virtually all DS subjects older than 40 have a significant neuropathology of dementia, there is a lack of concordance between the typical age of onset for dementia in this etiology (Mesulam, 1999). Head et al. (2007) suggested that compensatory events may be

of particular relevance for the DS group. Their claim is based on fMRI and PET observations on individuals with DS which indicated compensatory increases in the metabolic rate in vulnerable brain regions in DS prior to the development of dementia. Head et al. (2007) suggested that genes which are overexpressed in DS (APP, DSCAM, MNB/DYRK1A, RCAN1) produce proteins critical for neuron and synapse growth, development and maintenance and provide further evidence for the activation of plasticity mechanisms in this etiology. These genes may lead to developmental cognitive deficits, but paradoxically, with aging may participate in molecular cascades supporting neuronal compensation. Based on work in rodent models and in a canine model of human brain aging, Head et al. suggested that use of behavioral enrichment (including physical exercise) may have a significant impact on healthy brain aging in DS. These same interventions may promote pathways and molecular cascades involving genes overexpressed in DS that may enhance compensatory mechanisms.

CAT: Educational Implications –four programs of cognitive education for individuals with ID

The fourth dimension of the CAT framework is its operative implications for cognitive educational programs. We constructed four cognitive educational intervention programs for individuals at all levels of ID: (a) Empowerment program: Academic enrichment for adults with mild/moderate ID; (b) ABC: Enriching cognition and literacy, affect and behavior skills during daily life activities for school-age students with severe/profound ID; (c) ABC: Enriching cognition and literacy affect and behavior skills during daily life activities for adults with severe/profound ID; (d) ABC: Enriching

cognitive and literacy affect and behavior skills during daily life activities for elderly persons with ID and Alzheimer disease.

(a) *Empowerment program: Academic enrichment for adults with mild/moderate ID:* This program is designed for adults with moderate and mild ID with/without DS. The program combines humanistic and scientific goals. It emerges from the UN convention for persons with disabilities: "*Parties shall ensure an inclusive education system at all levels and lifelong learning directed to: The full development of human potential, sense of dignity and self-worth, their talent creativity as well as their mental and physical abilities*" (UN, 2006, p. 20). The empowerment program puts these rights into action. In this program, the students attend the School of Education, Bar-Ilan University (during the academic year) once a week for six academic hours. The courses taught are psychology, sociology, self-advocacy, library and computers and are adapted to the level of the students. The lecturers are students in the Intellectual Disabilities track of the Master's Degree program at the School of Education. Teaching in the project is part of the practicum in the track.

Another group of students with ID are included during the academic year in a BA research seminar on Lifelong Learning of Individuals with Disability, together with regular students. One goal of this special seminar is to teach students with ID to conduct research about themselves. Reciprocal learning takes place between regular students and students with ID. Together they study issues related to self-advocacy. The task of the students with ID is to interview three friends with ID about self-concept, self-efficacy, hope and optimism using questionnaires. The typical students perform the statistical analysis. The two groups analyze the results and draw conclusions together.

The educational objectives of these programs are to acquire knowledge on academic subjects that might be relevant to this population, develop strategies for learning, access the university's libraries, conduct small research projects and use the computer lab. The social objectives are to expose students with ID to students with TD in class and during breaks, expand the friendship circle of students with ID, empower and strengthen their self-image, confidence, and quality of life, and construct positive attitudes towards individuals with disability among the regular students.

(b) ABC: Enriching cognition and literacy affect and behavior skills during daily life activities for school-age students with severe/profound ID (Lifshitz-Vahav, Tal, Nissim, & Nissim, in press): This program was developed by us as a request from the Special Education Division of the Israeli Ministry of Education and serves as the new Israeli national curriculum for students with severe/profound ID. The essence of this program (published earlier as the MISC approach, Klein, 1992; Lifshitz & Klein, 2007; Lifshitz, Klein, & Fridel, 2010) is introducing cognition, literacy and autonomy during daily life activities to school-age students with severe and profound ID. The program includes three components: behavioral component (mediation of adaptive behavior skills), cognition (mediation of cognition and literacy), affect (mediation of autonomy). Mediation of these components is conveyed by the mediators (teachers, paraprofessionals and direct caregivers) through their interaction with their students with ID not only in the formal lessons but during meal time, domestic skills, sport class, art, occupational therapy, vocational preparation, etc.

There is a myth among teachers, paraprofessionals and even parents that literacy and cognitive skills are beyond the ability of individuals with severe and profound ID.

Our experience with the ABC (the MISC) intervention among adults with severe and profound ID (Lifshitz et al., 2010) indicates that individuals with severe and profound ID can be modified even at advanced age. Based on the above, we constructed the program for school-age students (age 6-21) with severe and profound ID. Some examples for introducing cognition during daily life activities are presented: alongside the impartation of how to use the spoon or fork, the mediator can talk with the students about the offered foods, the taste, the color (this tomato is red), the shape (round). When eating a cake, the mediator talks about the ingredients, the nutritional components. Word signs of the menu are indicated. In art class, teachers talk about the color, shape, design, texture, verbs and nouns related to the work.

Autonomy is integral part of human rights and affords meaning to life (affect), as stated in the UN convention for persons with disabilities (2006): “Recognizing the importance for persons with disabilities of their individual autonomy and independence, including the freedom to make their own choices” (p. 3). For individuals with severe/profound ID, the principle of making choices should be applied in everyday activities such as beloved foods, choosing their clothes, the occupational and leisure activities. The three components of the ABC, including the strategies and examples, are presented in table 1.

(c) ABC:- Enriching cognition and literacy, affect and behavior skills during daily life activities for adults with severe/profound ID (Lifshitz, et al.,, 2010): This program was designed for adults with severe/profound ID. There have been attempts to improve cognitive, choice-making, and adaptive behavior skills of adults with severe and profound ID. However, these studies taught participants in separate classes or on an

individual basis (1:1 ratio between mediator and trainee). These studies focused on specific skills: improving metacognition by a computer-assisted program (Moreno & Saldana, 2005), receptive communication abilities (Casella, 2004), choosing the leisure activity (Browder, Cooper, & Lim, 1998), etc., and lacked a holistic approach to combine all these skills together in everyday natural settings. Our program advocates the ABC, a holistic and broader approach to concurrently improving the cognition and literacy, behavior and affect of individuals with severe ID through daily life activities via their ongoing and varied interactions with their paraprofessional staff. This program was adapted for life situations of adults and was implemented for one year in two vocational centers. The findings indicate, as mentioned above, that before the interaction, the direct staff in the control group continued to emphasize only the use of basic skills for immediate performance, without attempting to expand on their meaning by giving basic information such as color, size, or number of products. For example, during vocational work, consumers were instructed to pack 10 spoons in plastic bags and were provided with a box containing 10 slots to aid them in counting the spoons. Staff members guided them in inserting the spoons in the slots. In the experimental group, the paraprofessionals counted aloud with consumers and then provided them with opportunities to count alone, but staff in the control group did not. Following the intervention, more mediation of autonomy (choice making) was observed in the experimental group. Through their interactions they succeeded in improving math skills and time orientation.

(d) ABC: Enriching literacy, affect and behavior skills during daily life activities of persons with ID and AD (Lifshitz & Klein, 2011): One of the serious problems resulting from the increase in lifespan is a concomitant rise in cases of dementia of the Alzheimer type

(DAT) among adults with/without DS. Estimates of the age-specific prevalence of dementia in adults with DS have varied widely, from under 10% to over 75% (Zigman, Schupf, Sersen, & Silverman, 1996). This association appears to be due to a triplication of the gene for the beta-amyloid precursor protein (β -APP) which is located on the proximal part of the long arm of chromosome 21 (Goldgaber, Lerman, McBride, Saffiotti, & Gajdusek, 1987).

Several studies focused on the stressors and sense of burden of the caregivers (families) or staff caring for elderly persons with ID and AD (McCallion, McCarron, & Force, 2005). Caregivers lack knowledge on how to treat and what can be done with persons with ID who are exposed to Alzheimer disease, and exhibit problems with memory, space and time orientation. The ABC for adults with ID and AD affords a solution to these questions and fills this void. The mediational parameters can be applied through the interaction between caregivers and persons with ID/AD during daily activity: meal and medication time, work sessions and leisure activities. This ABC for adults with ID and AD is based on the integration of *person-centered cultural approaches* which emphasize individual identity and selfhood and the *cognitive rehabilitation approach* (Clare, Wilson, Carter, & Hodges, 2003) which is based on the understanding that despite difficulties with memory and other cognitive functions, people with dementia still have the ability to learn new associations and information, and to adjust their behavior and responses. In line with the CAT and the cognitive rehabilitation approach, the ABC for adults with ID and AD works on mediation of cognition and autonomy during daily life activities in order to improve their functioning in the same areas that they exhibit deficit (for more details see Lifshitz & Klein, 2011).

For example, Jacob (54 years old) is a person with DS who was diagnosed with early-stage Alzheimer disease four years ago. Based on the cognitive rehabilitation theory (Clare et al., 2003), a tailored program with three mediational parameters of the MISC was constructed in order to overcome his weaknesses. The findings indicate that he showed numerous important strengths, including the capacity and motivation for learning new skills. This suggested that he was able to learn new strategies that compensate for his deterioration in short-term memory, orientation in time and space. Jacob was coping with the onset of dementia by facing up to its impact and trying to adapt.

Conclusions

The CAT framework supports the view that all human beings, even people with ID, are capable of change. The CAT model is not just a theoretical framework. It can be implemented in the field of cognitive education among individuals with ID, especially in older ages and among those with severe and profound ID. Individuals with ID can benefit not only from exposure to concrete information and sensory-based experiences, but also from programs designed to ameliorate impaired cognitive functioning. Despite the limitations imposed by age or disabilities, the concept "self-actualization" can be expanded to include individuals with ID at all levels, even at an advanced age.

Limitations and further research

The CAT focuses on the effect of CA on the cognitive ability of individuals with ID. Except for one research (Lifshitz & Katz, 2009), it does not relate to emotional and social aspects. It is recommended to expand research on emotional and social aspects as well. The empirical findings of the CAT were based on behavioral studies. Conducting

brain and neuro-imaging studies will strengthen the CAT from the neurological point of view.

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Table 1:

Three mediational components of the ABC .

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| <p><i>Cognitive component</i></p> <p><u>Cognitive expansion:</u></p> <p>A. Behavior directed toward expanding a participant’s cognitive awareness, beyond what is necessary to satisfy the immediate need that triggered the</p> | <p>Giving meaning to all activities such as work, leisure activities, ADL. Creating a need to search for meaning in the individual’s experience to maintain the attention gained in the focusing process and allowing for the mediating process.</p> <p>Clarifying processes (insight); attributing</p> |
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| <p>interaction.</p> <p>Enhancing literacy through ADL, vocational and leisure activities.</p> | <p>past and future needs to the present situation; critical interpretation; providing general rules, inductive/deductive reasoning; spatial and temporal orientation; providing appropriate strategies for memory and recall.</p> <p>Relating to concepts such as colors, size, shape, numbers, counting and learning a sequence of actions of the vocational tasks, meals, and leisure activities.</p> <p>Giving additional information about work beyond the immediate experience,</p> <p>Using word signs accompanied by pictures in the vocational hall, dining room (menu, food's ingredients), and leisure activities (work tools, actions, materials).</p> <p>Focus in ADL – Feeding: the names of foods, menu, food ingredients should be indicated by word signs accompanied by pictures.</p> <p>Vocational activity: Focusing on the</p> |
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| | <p>object to be packaged, weighed, sorted.</p> <p>10 items relevant to work such as the name of products should be indicated by word signs.</p> <p>Space orientation: The close surroundings: room, shower, toilet, dining room, infirmary, should be indicated by word signs accompanied by pictures.</p> |
| <p><i>Affect component</i></p> <p><i>Mediation of meaning (affecting):</i></p> <p>Enhancing quality of life by providing opportunities for choice making, self-determination, and autonomy (and other values).</p> | <p>Providing choices for decision-making appropriate for all levels of ID including individuals with severe/profound ID during performing ADL skills, vocational, leisure activity.</p> <p>(choosing the type of work, the loved food, the leisure activity)</p> |
| <p><i>Behavioral component</i></p> <p><u>ADL skills</u></p> <p><u>Regulation of behavior in teaching ADL skills</u></p> <p>A. Includes all stages of task analysis</p> | <p>A. Regulation of task analysis (Gold, 1978)</p> <p>- Verbal instruction (“Use the spoon”).</p> <p>Modeling (showing how to bring the spoon to the mouth with verbal instruction).</p> |

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| <p>(Gold, 1978; Luftig, 1987) when performing each task.</p> <p>B. Behavior that models, demonstrates and/or verbally suggests regulation of behavior in relation to specific tasks or any other cognitive process required before overt action is introduced.</p> | <ul style="list-style-type: none"> - Practice (client imitating the moderator) so that the behavior will be assimilated. - Physical assistance (palm, hand, arm of the moderator). <p>B. Mediation of the process of perception (systematic exploration), or elaboration (planning behavior), or expressive behavior (reducing egocentric expressions) and regulating the intensity and speed of behavior.</p> |
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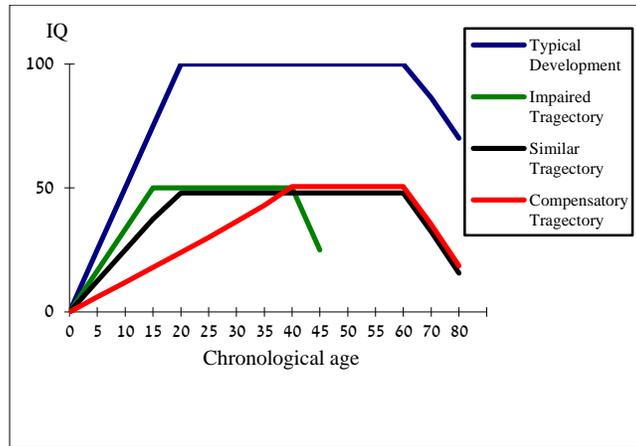


Figure 1: Intelligence and cognitive growth and decline in individuals with ID: Three possible trajectories in individuals with ID compared to the general population.

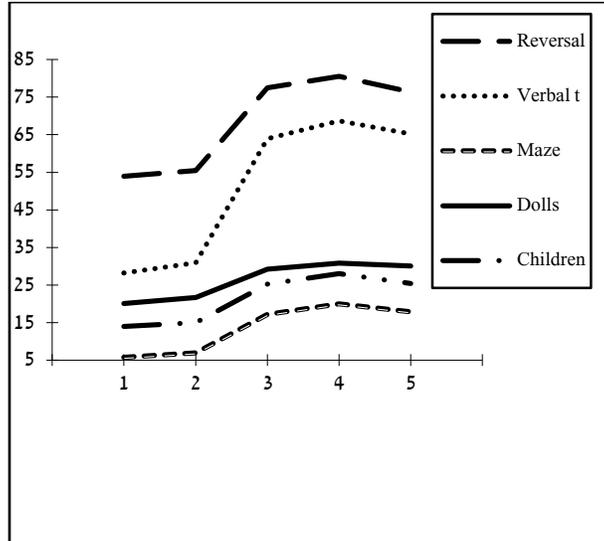


Figure 2: Instrumental enrichment: Results of the five tests in five time periods

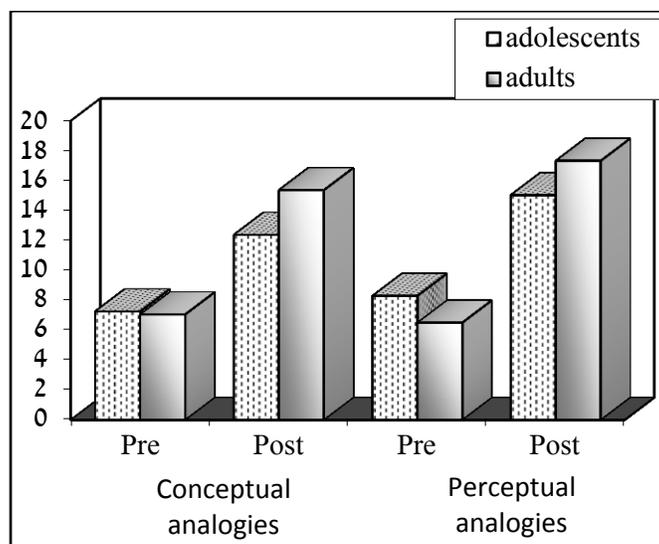


Figure 3: Analogical reasoning: Improvement from pre to post teaching phase:

Differences between adolescents and adults with ID

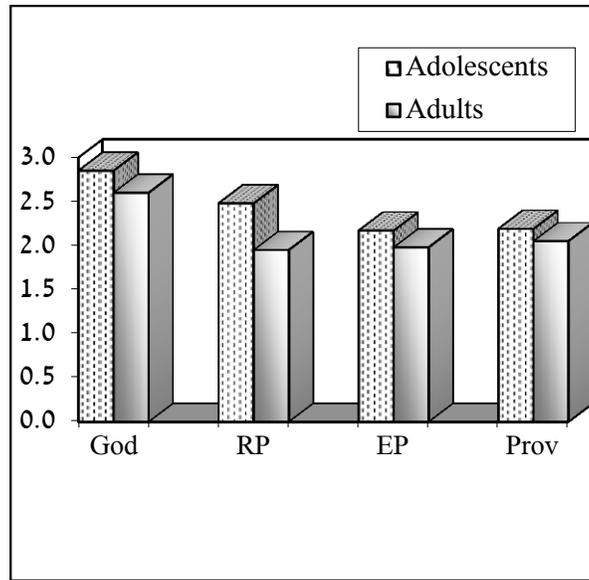


Figure 4: Religious cognitive concept: Differences between adolescents and adults with ID

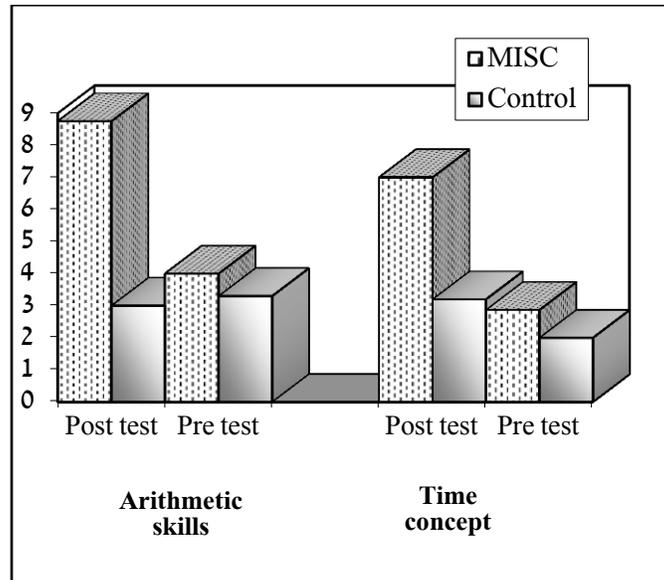


Figure 5: MISC intervention: Differences between the experimental and control groups in arithmetic and time concepts