

Adults with intellectual disability are accessible to change beyond the limitation of age - from vision to empirical findings

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Abstract

The Structural Cognitive Modifiability theory and the active modifying approach were developed by Reuven Feuerstein and his colleagues in the mid-1970s (Feuerstein and Rand, 1974). The basic assumption underlying these theories is that, by nature, the human organism is a system open to its environment and accessible to change, even in the presence of three formidable obstacles usually believed to prevent change, to wit, (a) age, (b) aetiology, (c) severity of limitation. The goal of this article is to show the evolution of Feuerstein's theory from vision to empirical findings in a population of adults with intellectual disability (ID). The article will present his thesis, the empirical findings which support it, the theoretical outcomes and the educational implementations of his theories in the field.

Keywords

adults with intellectual disability, cognitive modifiability, compensation age theory, cognitive educational programs

The Structural cognitive modifiability (SCM) and the Active modifying approach were developed by Reuven Feuerstein and his colleagues in the mid-1970s (Feuerstein and Rand, 1974; Feuerstein, Rand, Hoffman and Miller, 1980). The basic assumption underlying these theories is that, by nature, the human organism is a system open to its environment and accessible to change, even in the presence of three formidable obstacles usually believed to prevent change, to wit, (a) age, (b) aetiology, (c) severity of limitation (Feuerstein, Rand & Hoffman, 1979; Feuerstein & Rand, 1974; Feuerstein, Rand, Hoffman & Miller, 1980; Feuerstein, Rand & Rynders, 1988).

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In the 1970s, the prevailing attitude toward the possibility of change reflected the passive acceptance approach. The concept of cognitive modifiability in a population with intellectual disability (ID) of varied aetiology, including even the lower levels, and especially in adulthood and old age, was regarded as visionary.

It took 20 years for these claims to receive scientific recognition. Currently, Feuerstein's notions are supported not only by behavioural studies, but even by neurological and brain science (Lebeer, 2014). The goal of this article is to show the evolution of Feuerstein's theory from vision to empirical findings in a population of ID. The uniqueness of his theories lies in their not having remained in the academic ivory tower, but rather, have been implemented in the field. We will show the outcomes of Feuerstein's theories among adults with ID at advanced ages, even at lower levels of ID. The Structural Cognitive Modifiability (SCM) and the Mediated Learning Experience (MLE) theory served as the inspiration and scientific basis of the Compensation Age Theory that we developed two years ago (Lifshitz – Vahav, 2011). They also serve as a scientific and humanistic basis for four intervention programs designed for diverse populations with ID throughout the life cycle: children, adolescents, adults and even adults with ID and Alzheimer's disease.

Cognitive and intelligence trajectories in a population of ID

For more than 30 years, scientists have been preoccupied with several intriguing questions regarding cognitive change with increasing age. Does intelligence or cognitive functioning decline with increasing age among adults with Down syndrome, and if so when? Is the trajectory of cognitive decline accelerated or parallel to that of the general population? Can the cognitive functioning of adults with ID with and without Down syndrome be modified at an advanced age?

Fisher & Zeaman (1970) proposed three possible models of intelligence or cognitive trajectories in individuals with ID compared to the general population: 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 general intellectual functioning increases linearly up to the age of 20 (without

a distinction between crystallized and fluid measures). This development is followed by 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.

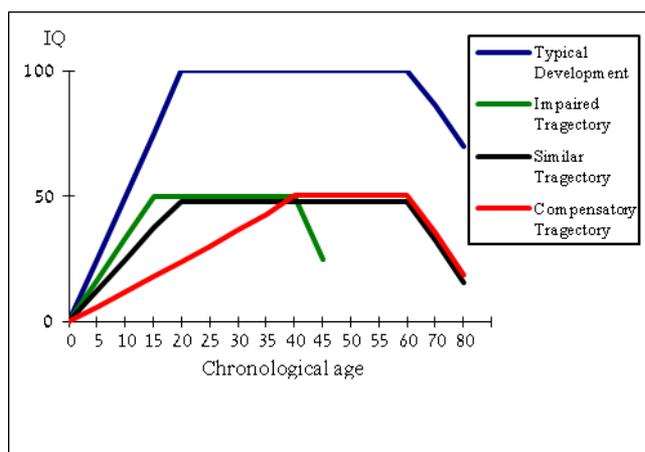


Figure 1. Intelligence and cognitive growth and decline in individuals with ID: Three possible trajectories in individuals with ID compared to the general population.

Until the 1980s, there was a myth of accelerated cognitive decline among adults with ID (White, 1969) that was expressed in the *Accelerated Trajectory*. This model predicted that individuals with ID would exhibit restrictions in developing intelligence before their 20s. Intelligence would reach its peak between the ages 10-15. Thereafter, they would exhibit asymptote, with a very early age onset of accelerated decline in their mid-thirties or forties. From a theoretical point of view, the accelerated trajectory is anchored in the model of 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 that of “neural reserve”, which represents the capacity to perform tasks or cope with increasing task difficul-

ty. 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). In light of the above, it would not be surprising if the intelligence in a population with ID would peak earlier and exhibit accelerated cognitive decline. 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.

As time passed, the accelerated trajectory yielded to the *Parallel Trajectory*. This model predicts that intelligence and cognitive development in individuals with ID is similar to that of the general population: it peaks in the twenties, after which there is an asymptote and an onset of decline around age 60. Recent studies have questioned the applicability of the CR theory to individuals with ID (Oliver, Crayton, Holland, Hall, and Bradbury 1998). If by definition, people with ID have reduced CR compared with their peers with TD, 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, 2012; Zigman et al., 2004) found an equivalent or even lower risk of dementia among adults with ID with nonspecific aetiology (NSID). Based on the lower age of 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. Facon (2008) supported this parallelism by showing that adults with and without ID, aged 20 to 54 years, demonstrate a similar evolution of crystallized and fluid intelligence with increasing age. Devenny, et al. (1992) reported similar trends in short and long-term verbal memory and visual-spatial organization among adults with ID with and without DS, aged 50+, compared to the general population.

Our review of the literature indicated that neither of the above models was correct. Recent studies point to cognitive stability at older ages even among adults with Down syndrome. Chicoine and McGuire (1997) reported on an 83-year-old woman with mosaic DS with “no physical deterioration, memory and skill loss, with relatively good health all her life” (p. 477). Krinsky et al. (2008) reported successful aging in a 70-year-old man with DS with-

out decline in episodic memory or daily living skills. Based on such studies, as well as my own research (presented later), it seemed to me that a third cognitive trajectory model - was needed.

The model which we came to call the *Compensation Trajectory* model (CT): 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 than that of the general population. Intelligence and cognitive functioning of adults with ID may continue to grow even until their fifties; there will be stability between the ages of 50 to 60 and above, after which they will show a decline. 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.

Empirical findings

In the 80s and 90s, we were the first to address aging phenomena in a population with ID in Israel. Lifshitz (2001) examined aging phenomena of people with intellectual disability (ID) aged 40 -70 (CA = 50.61; $SD = 8.08$) living in various types of community residences (hostel, apartment). Lifshitz & Merriker (2003; 2004) compared adults with ID living in community residences, compared to adults with ID living with their families. In these studies we used the " short version of the Greater Rochester Area Health Status Survey (Janicki & Davidson, 1999), which examines whether deterioration occurs over the years in four cognitive dimensions: speech, comprehension, reading and writing (on 1-4 scale). The findings in the three studies indicate deterioration in health and morbidity, but no decline was found in the four cognitive domains. These findings led us to examine not only the static situation, that is, whether an age-related drop in cognitive skills exists, but also the possibility of altering the cognitive ability of adults with ID even at advanced age. Following are examples of these studies.

Lifshitz & Rand (1999) found improvement in a verbal abstraction test as well as in orientation in time and space among young adults with ID (CA 20-35); middle-aged (36-50); and older adults (CA 50-70) with IQ 40-70. Note, that among the older adults was one 70-year-old, followed by a 65- and a 62-year-old. 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 a divergence effect in logical and predictive thinking two months later (Time 4). The MANOVA's in the follow-up evaluation (Time 5) showed a drop in cognitive functioning relative to Time 4, but participants maintained their achievement in relation to Time 3, a finding that indicates a durability effect. In a follow-up study that was conducted three years later among 21 participants, Lifshitz and Tzuriel (2004) found durability effect. This finding supports Feuerstein's claim that a change obtained after mediated learning experience is structural. Figure 2 presents the cognitive achievements of 21 participants in the three types of thinking at the five time points.

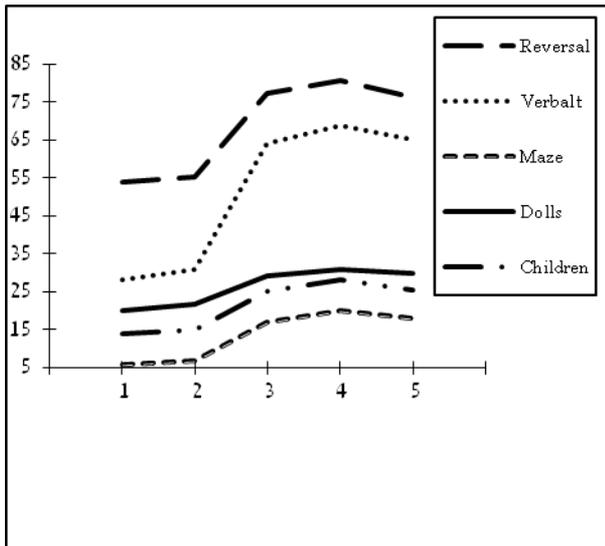


Figure 2. Instrumental enrichment: Results of the five tests in five time periods

Feuerstein and Rand (1974) averred that one of the characteristics of structural change is that the alterations that occur in an individual's behavioural repertoire do not disappear over time; rather, they are significantly evident for a long period. As time passes, functions that were attained improve and become more efficient. This is achieved through the inherent traits of the structure; that is, the tendency toward self-regulation, which leads to self-perpetuating behaviour requiring less investment of energy, which in turn ensures that this behaviour will occupy a relatively high position in an individual's hierarchy of behaviours (Feuerstein, Rand & Rynnders, 1988).

Lifshitz, Tzuriel, Tzemach & Weiss (2010) examined the effect of teaching using a dynamic assessment (DA) procedure on 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 used. 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, presented in Figure 3, indicate that the adults gained more from teaching in the DA procedure than the adolescents.

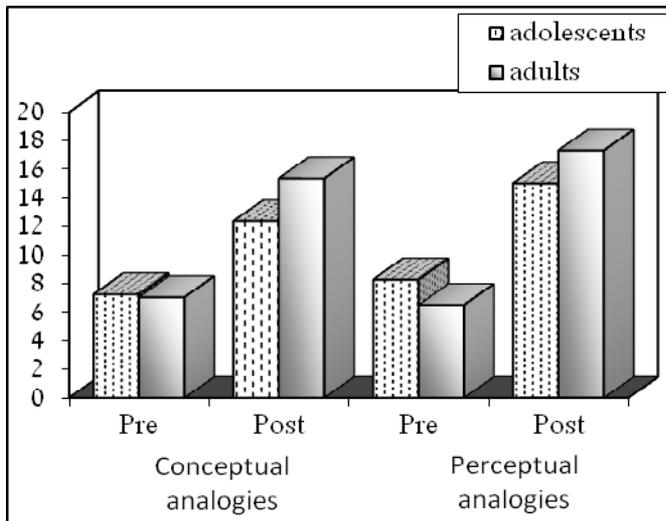


Figure 3. Analogical reasoning: Improvement from pre to post teaching phase: Differences between adolescents and adults with ID

Lifshitz & Katz (2009) examined: (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.

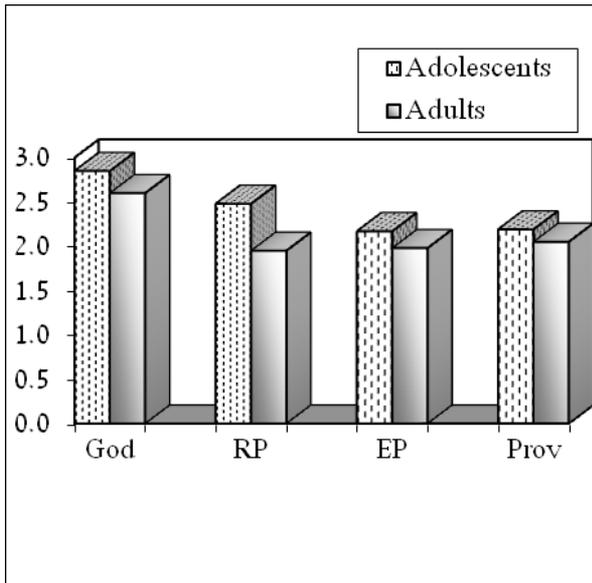


Figure 4. Religious cognitive concept: Differences between adolescents and adults with ID

The scores of prayer efficacy and providence of God were significantly higher among the adults than the adolescents. The adults also exhibited more mature motives for being religious (dependence, security, God as an anchor) than the adolescents (belonging to a religious community, expecting fulfilment of 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.

An additional study was conducted among adults with severe and profound ID (Lifshitz, Klein, & Fridel, 2010). The goal was to examine the effects of a year-long Mediation Intervention for Sensitizing Caregivers (MISC; Klein, 1992) on the quality of interactions between rehabilitation day centre paraprofessionals and their adult consumers with severe ID. Another goal was to examine the effect of the intervention on the consumers' cognition, autonomy, and behavioural functioning

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

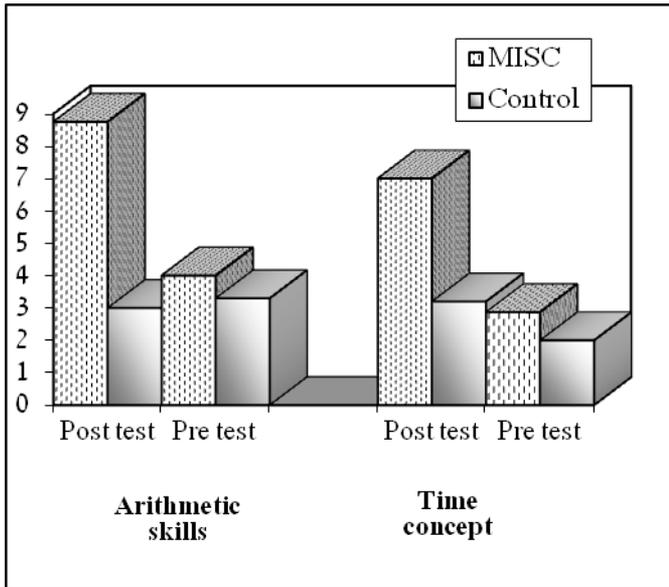


Figure 5. MISC intervention: Differences between the experimental and control groups in arithmetic and time concepts

All these studies indicate that environmental intervention can alter the cognitive ability of adults with ID even at advanced age, and even in severe and profound ID.

The compensation age theory

Based on the empirical findings, WE formulated the *Compensation Age Theory* (CAT). What is the essence of this theory? 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 is comprised of four statements: (a) Chronological age plays an important role in determining the cognitive ability of individuals with ID, beyond their mental age. Contrary to prior assumptions (Cuppos, 2013), the direction of influence is positive. (b) Intelli-

gence and cognitive performance of individuals with ID might continue to grow till their late 50s; (c) Adults with ID can be modified even at an advanced age; (d) Maturity and cumulative life experience help adults with ID acquire cognitive skills that were previously absent from their behavioural repertoire.

The CAT is conceptually based on complementary theories: those designed for special populations such as Feuerstein's SCM theory, as well as modern gerontological theories such as the Cognitive Reserve Theory, the Cognitive Activity Theory, the Cognitive Rehabilitation Theory and the *lifespan developmental orientation*.

Theoreticians like Bloom (1970) and Piaget (1970) argued that the critical period for intervention to improve cognitive deficiencies occurs at a young age. The SCM theory does not dispute the importance of early intervention, but rejects the idea of critical time for initiating cognitive intervention. This position is supported by recent neurological and brain research. Neuroplasticity is the "ability of the nervous system to respond to intrinsic and extrinsic stimuli by reorganizing its structure, function and connections" (Cramer et al. 2011, p. 1592). The exact mechanism of neuroplasticity related to cognitive aging is still unclear; however, the viewpoint that 'the adult brain is adaptive at any age and has lifelong capacity for change' is on the rise (Mahncke, et al., 2006, p. 12524).

The *lifespan developmental orientation* states that aging is a bipolar period of decline and deterioration on the one hand, but could be a period of growth, development and elevation on the other. The decline in biological potential with age is compensated by the knowledge, wisdom and maturity accumulated by adults throughout the life span. While this approach is accepted for the general population, it has not yet penetrated to populations with ID. The CAT embraces the lifespan orientation and adapts it to populations with ID.

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 a brain network to change, resulting in a network that would not normally be used by unaffected individuals, or would be used in a different way, or in recruitment of additional brain areas. 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 com-

promised brain to express or optimize compensatory networks may also vary as a function of CR.

One might argue that individuals with ID exhibit lower CR due to their lower level of intelligence, and their having 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 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 adulthood and even at an advanced age. This statement includes all levels of ID: mild/moderate as well as severe/profound.

Recently, the idea of reserve, plasticity and compensation has also been supported by innovative research in genetic and brain science. For example, compensatory, sprouting responses or neural reserve in aging have been observed in rodent and canine models of human brain aging.

Head et al. (2007) found that in rats, voluntary running on a wheel leads to the induction of BDNF in the hippocampus, both at the gene expression level and at protein levels. In another study, a group of aged beagles (9-11 years at the start of the study) was provided with a program of behavioural enrichment that included physical exercise, social enrichment, environmental enrichment and cognitive training. Head et al. observed significant improvements in complex learning ability and maintenance of cognitive function over a treatment period of 2.8 years.

It has been documented 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 aetiology (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 of individuals with

DS that 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 over expressed 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 aetiology. 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 the use of behavioural 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 over expressed in DS that may enhance compensatory mechanisms.

Implications of the SCM and CAT on cognitive intervention programs for all levels with ID at all ages

We constructed four cognitive educational intervention programs designed for individuals at all levels of ID at all ages, based on the SCM and CAT. We also based the programs on the second theory developed by Feuerstein: the Mediated Learning Experience (MLE). MLE (Feuerstein, 2003; Feuerstein & Falik, 2010) refers to the way in which stimuli experienced in the environment are transformed by a mediating agent, usually a parent, teacher, instructor other intentioned person in the life of the learner. This mediating agent, guided by intention, culture, and emotional investment, selects, enhances, focuses, and otherwise organizes the world of stimuli for the learner, according to a clear intention and goals for that learner's enhanced and effective functioning. According to Feuerstein (2003), what ultimately determines the realization of an individual's potential, even if it is influenced by genetic factors, is the individual's MLE; i.e., the extent to which he/she was exposed to educational, cultural and social stimuli.

The four programs are presented herewith:

(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 analyse 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.

The next three programs were designed for individuals with severe and profound levels of ID throughout the life cycle: childhood and adolescents, adulthood and old age. For this purpose, we (Lifshitz & Klein, 2007; 2011; Lifshitz, Klein and Cohen, 2010) adopted three mediational parameters which Feuerstein (Feuerstein et al., 1980; Feuerstein, 2003) indicated as crucial for the success of the mediation process: Transcendence, Mediation of Meaning, and regulation of behaviour to the special needs of individuals with severe and profound ID.

Mediation of meaning: We changed this to providing opportunities autonomy for making choices. Autonomy and choice fulfil a basic human right and enhances the quality of life (Schalock, 1996).

Transcendence (cognitive expansion): We divided transcendence or cognitive expansion according to ID level: (a) Basic cognitive concepts: colour, size and quantity, spatial and temporal orientation (b). Higher levels relating to critical interpretation, clarifying processes, i.e. the meaning of the work, the targeted consumers, and the manufacturing process.

Regulation of behaviour: Our observation of interactions between individuals with ID and their staff led us to base the observation of regulation of behaviour on Gold's (1978) and Luftig's (1987) four stages of task analysis: verbal instruction, modelling, practice and physical assistance when performing ADL tasks. We also related to instructions and rules and correction of maladaptive behaviour.

The acronyms *A (autonomy) B (adaptive behaviour skills) C (cognition)* represent these parameters.

(b) ABC: Enriching cognition and literacy affect and behaviour skills during daily life activities for school-age students with severe/profound ID (Lifshitz-Vahav, Tal, Nissim, & Nissim, in press): We developed this program upon request by the Special Education Division of the Israeli Ministry of Education; it 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. 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 formal lessons, but during meal time, domestic skills, sports 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, Klein & Cohen, 2010) indicates that individuals with severe and profound ID can be modified even at advanced age. Based on the above, we constructed a program for school-age students (age 6-21) with severe and profound ID. Some examples of in-

roducing cognition during daily life activities are presented: along with instruction on how to use a spoon or fork, the mediator can talk with the students about the offered foods, the taste, the colour (this tomato is red), the shape (round). When eating cake, the mediator talks about the ingredients, the nutritional components. Written word signs of the menu items are provided. In art class, teachers talk about the colour, shape, design, texture, verbs and nouns related to the work.

Autonomy is an 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 favourite foods, choosing their clothes, occupational and leisure activities.

(c) ABC:- Enriching cognition and literacy, affect and behaviour 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 behaviour 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 leisure activities (Browder, Cooper, & Lim, 1998), etc., and lacked a holistic approach that would combine all these skills in everyday natural settings. Our program advocates the ABC, a holistic and broader approach to concurrently improve the cognition and literacy, behaviour and affect of individuals with severe ID through daily life activities via ongoing and varied interactions with their paraprofessional staff. This program was adapted to life situations of adults and implemented for one year in two vocational centres. As mentioned above, the findings indicate that even after the intervention, 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 colour, 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, an activity not carried out by staff in the control group. 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 behaviour 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 ID 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 have 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 for persons with ID who have 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. Mediation parameters can be applied through the interaction between caregivers and persons with ID/AD during daily activities: meal and medication time, work sessions and leisure activities. This ABC for adults with ID and AD is based on the integration of *person-centred 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 the deterioration in memory and other cognitive functions, people with dementia still have the ability to learn new skills and new associations, and to adjust their behaviour accordingly. 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 in which 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 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 indicated 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 compensated for his deterioration in short-term memory, and orientation in time and space. Jacob was coping with the onset of dementia by facing up to its impact and trying to adapt.

Conclusions

In line with the SCM and the CAT framework including our empirical studies support the view that all human beings, even people with ID, are capable of change. In this article we indicate the evolution of Feuerstein's work (Feuerstein & Rand, 1974; Feuerstein, Rand, Hoffman & Miller, 1980; Feuerstein, Rand & Rynders, 1988) in a population of ID from vision to reality. Our work shows that individuals with ID, especially at older ages and among those with severe and profound 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 advanced ages.

Further research

Following Feuerstein's direction and the CAT, our studies and interventions focus on the cognitive ability of individuals with ID. It is recommended to expand research on emotional and social aspects and to examine whether it is possible to alter the emotional and social skills of individuals with ID beyond the limitation of age, aetiology and severity of limitation.

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