STUDIA UBB PSYCHOL.-PAED., LXI, 1, 2016, p. 5 - 14
(RECOMMENDED CITATION)

DEVELOPMENT OF MOVEMENT ABILITIES

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ABSTRACT. This article reviews concepts related to the development of movement capabilities in general, and persons with intellectual disabilities in particular. Beyond Piaget's theory of evolution and the theory that deals with sensory integration, a burden to illustrate them, the article will introduce some Studies Pertaining to the Connection between Intelligence and Physical Activity among individuals with intellectual disabilities.

Key words: *Intellectual disability, physical activity, Piaget, sensory integration*

ZUSAMMENFASSUNG. In diesem Artikel werden Konzepte im Zusammenhang mit der Entwicklung von Bewegungsmöglichkeiten im Allgemeinen und bei Menschen mit geistiger Behinderung im Besonderen analysiert. Jenseits von Piaget Evolutionstheorie und die Theorie, die sich mit sensorischen Integration beschäftigt, eine Last diese darzustellen, wird der Artikel einige Studien im Zusammenhang mit der Verbindung zwischen Intelligenz und körperliche Aktivität bei Personen mit geistiger Behinderung vorstellen.

Schlüsselwörter: *Geistige Behinderung, körperliche Aktivität, Piaget, sensorische Integration*

Sport and Physical Activity: Definition and Characteristics

In the context of recreation sport connotes moving, pushing or pulling activities that distract people from the burdens of daily life. In the context of rehabilitation, the connection between sport and Physical disability is important as it serves as a bridge beyond the physical limitations with which disabled individuals must grapple in their lives. Nonetheless, the term "sport" has many definitions depending on the culture and history. (Hutzler, 2012).

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In the United States the term is used for constructive exercise, and later handicapped sports (Strafford, 1939). Special physical education (Leitschuh, 2005), adapted physical education (Vinik, 2005) and adapted physical activity (Raid, 2003; Schule & Huber 2004).

The term "physical fitness" was defined as general functioning affecting a broad gamut of motor functions (Singer, 1984). The World Health Organization determines physical fitness to be the ability to perform certain muscular activities in a satisfactory manner, with two major relevant facets: (1) health - the activity should reduce risk of illness and (2) function - the activity should improve select functions such as coordination, balance, explosive power, speed, and so forth (Almosani, 2007).

Movement, physical activity and sport are especially important for the individuals with physical disabilities in general, and individuals with intellectual disabilities in particular, since these activities do not involve prior theoretical knowledge, but rather allow the disabled individuals to display their motor abilities and thus enable maximal self-realization (Hotzler, 2004).

Individuals with intellectual disabilities are often characterized as having motor difficulties expressed in their physical skills. These difficulties are liable to influence such additional areas as cognitive, social and emotional functioning or be influenced by them.

Therefore work on motor skills serves both as a therapeutic and rehabilitative tool for each area of functioning. Hemayattala & Movahedi's research study showed that the development of independent motor or mental skills among individuals with intellectual disabilities, was insufficient. Hemayattala & Movahedi's believe The two skills need to be developed in tandem, where the development of one aspect helps the improvement of the other (Hemayattala & Movahedi, 2010).

One of the suggested ways for individuals with intellectual disabilities to become active, is to be involved in more physical activities (Hotlzer, 2004). Research studies conducted in the 1980s and 1990s have demonstrated this connection between physical activity and quality of life among individuals with intellectual disabilities (Cratty, 1984; Gorman et al, 1990). Almosani, et. al. also noted that involvement in physical activity contributes to the well-being of individuals with intellectual disabilities (Almosani, 2005).

Physical activity for the purpose of improving coping strategies, challenge or self-fulfilment in a person with an individual with disabilities, is a means leading to achievements in other domains such as a feeling of self-empowerment, which in turn leads to a wish to integrate into society and self-acceptance and even the wish to change the environment despite the disability.

Development of motor-movement domain is of crucial importance in establishing the person's independence of a disabled individual living within a community. In cases of motor movement limitations, a developmental delay is caused in the psycho-motor and social realm, detrimentally affecting the individual's ability to engage in personal interactions with the surroundings (Reiter, 2002; Hotzler, 2004; Almosani, 2007).

The goals of physical education programs for individuals with disabilities as detailed in the educational curriculum focus on the realization of each individual's physical and motor potential and are identical to those of the regular education programs, with only certain adjustments as per the physiological-motor, social and emotional aspects. In other words, the skills are the same for both regular educational programs and those designed for individuals with disabilities. The only differences lie in the teaching methods for each according to the pupils' capabilities (Physical Education Curriculum 14, 1981).

The command of everyday activities, from the most rudimentary depends on the acquisition of basic motor skills which are usually acquired in early childhood naturally in a supportive stimulating environment. In the following years, the child acquires skills via teaching and learning. In any case, motor skills, innate or acquired, depend on motor, comprehension and sensory abilities. The conclusion is that a lack of or delay in the acquisition of motor skills can be the cause of the child's social isolation, feeling of both emotional and social failure, due to low self-esteem brought about by the child's inability to attain the development norm. A variation of motor training along with cognitive training would be the right combination for children with intellectual disabilities (Geron, 1996; Hotzler, 2004; Hemayattalab & Movahedi, 2010).

The importance of being involved in physical activity as described above clearly demonstrates the many advantages gained by people with intellectual disabilities.

Two theories which underlying the development of movement will now be presented.

Piaget's Cognitive Development Theory

Piaget engaged mainly in examining the theoretical and empirical development of intellectual constructs. The basic premise behind Piaget's theory is that of behavioral development from a lesser to more advanced stage, which must be meticulously compared (Plibel, 1970, Geron 1996). One of his research domains focused on investigating the structure of developing intelligence with a distinction between contents and performance. Regarding the **content**, Piaget

refers to raw, unexplained behavior data, such as the child's ability to estimate distance by observation, and the like. However, regarding **performance**, Piaget refers to characteristics of intelligent behavior, which is an active process wherein new things are assimilated into old ones and vice versa. This process is the same for all ages. In between content and performance, Piaget places the essence of intellectual performance. **Structure**, as opposed to the content and performance, changes with age. Different structural characteristics have been described in different time periods in relation to the different development levels: they were primarily defined in verbal intuitive terms, and after years, of the structures were defined in terms of logical algebra and the theory of balance (Plibel, 1970).

Piaget's cognitive development theory, maintains the child is active in the learning process, collects information and processes it. The child becomes acquainted with the environment and makes the transition to abstract symbolic acquaintance. According to Plibel (1970), child development is a direct continuation of biological development.

Society's role in the learning process is secondary, and development occurs at fixed and universal stages, because every person is a biological organism operating in an environment with the same physical laws (Elam, 2000). Piaget refers mainly to the qualitative characteristics of the development. The range of structures which change in the course of development is divided into stages, whereby qualitative similarities and differences between them are used as conceptual landmarks for the purpose of understanding the development process. The theory does not explain development as a process occurring only via quantitative improvement in memory and information processing, but rather as a process consisting qualitatively different stages (Plibel, 1970). Below are the four stages of development underpinning Piaget's theory.

In the first stage from birth until the age of two, Piaget observed that the child’s intelligence develops through his motor interactions with his environment. During this "sensorimotor" stage, the child’s reactions are initially merely reflexive and only gradually become more voluntarily reactive and intentionally responsive. Thus, at this stage the child’s intelligence can be characterized by his motor interactions with his environment. As yet he is incapable of forming mental representations of objects that are outside his immediate view. Eventually the child holds the concept of the object, or an internal representation, in his or her mind and will continue to search for it even when it is out of his view. Eventually the child holds the concept of the object in his mind and will continue to search for it even when it is out of his view. This is in essence the beginning of the development of thought process whereby the child develops the ability to imagine and relate to an object in his thoughts. When

confronted by a difficulty, he or she can cope with the problem in his head, by thinking about it and can anticipate results and choose his or her actions accordingly, rather than acting by trial and error tactics. This progress leads to the second stage of cognitive development.

The second stage is called the "pre-operational" stage, characterized by children between the ages of 2 and 7, acquire language. Since this age range is rather large, Piaget subdivided it into two sub-stages: (1) "Pre-conceptual" stage up to the age of 4, is characterized by the inability to classify, egocentrism animism and transductive thinking. (2) The intuitive thought sub-stage when children, aged 4 to 7, subjective impressions ignoring logic, centrism, conservation and irreversibility.

The third stage from age 7 until the age of 12, is called the "Concrete operational" stage and is characterized by the appropriate use of logic and reaching logical conclusions. This stage is also characterized by decentering, reversibility, conservation and classification capabilities and the development of transductive thinking.

In the fourth stage of development, known as "formal operational" stage, from age 12 and on when cognitive development reaches its peak. This stage is characterized by abandoning egocentric thinking, abstract thinking, hypothetical-deductive reasoning, understanding connections between variables and reflective thinking.

The progression of stages is consecutive but the pace of progression is different for each individual. There are cultural as well as interpersonal differences during each stage. The stimuli to which each individual is exposed in his or her environment encourage development and enable the transition from one developmental stage to the next (Plibel, 1970, Geron, 1996).

Piaget was a pioneer in his claim that movement precedes cognitive development and is a necessary element in the foundation of cognitive development (Piaget, 1972). From infancy and up to the beginning of speech at 1½ - 2 years, cognitive development is based on sensory and motor skills and from both these skills, the name of the stage is derived – "sensorimotor" stage. In the beginning of this stage, the infant interacts with his or her surroundings via various stimuli in it (this is the sensory part) and also by moving his or her muscles to interact with the surroundings (this is the motor part) (Piaget & Inhelder, 1976).

It would seem then that Piaget places primary importance on the reaction of the child’s physical movements to environmental stimuli and considers it crucial in the initial stage of cognitive development. Moreover, a similar form of movement can be found with adults when they first encounter stimuli of any sort. It seems that thinking through movement is a recurrent

process. Adults who encounter an unfamiliar mechanism normally respond by pressing, pushing, or pulling in an effort to discover what will happen next. They will then repeat whatever action brought interesting results.

Physical education teachers and sports coordinators in any educational setting, who are familiar with Piaget's school of thought, believe that a direct connection exists between intelligence and motor ability. With this understanding and attitude, many teaching programs were designed replete with physical activities, all with the goal of improving intellectual achievements (Geron, 1996).

Cratty challenged this Piaget's approach claiming that movement exercise can indeed be a positive factor in improving intellectual activity but only if the activities themselves contain some cognitive component, such as thought, choice, or planning, problem solving during the sports activity (Cratty, 1972). Moreover, other critics of Piaget in the past two decades dismiss Piaget's premise that children's thinking processes differ inherently from those of adults. The critics claim that concepts and terms appear in children earlier, especially before the age of 7 (Waxrnan, 1991), and individual differences in intellectual ability together with influences by learning and environment play a role in changing the age limits set in Piaget's developmental stages (Goebel & Harris, 1980).

According to Piaget, each stage of the child's development provides a partial explanation for the following stages. This can be seen very clearly in the first "sensorimotor" stage, which precedes language acquisition and symbols. Nonetheless, during this stage the child builds the sub-constructs which will come to fore in the subsequent conceptual and intellectual stage. In other words, some form of intelligence exists prior to language acquisition, and aspires to achieve results rather than truths through active problem solving via action such as getting a hidden object. Lacking linguistic or symbol function, the constructs are based on physical movements and are created by the coordination of sensory actions without any thought processes (Piaget & Inhelder, 1976).

Sensory Integration Theory

The Sensory Integration approach was introduced in the 1960s by Jean Ayres and combines psychological and medical concepts and the reorganization of the sensory input into the brain so that it can be utilized in day-to-day actions (Dunn, 2008; Ayres, 1972).

Sensory Integration means the ability to sense, understand and organize sensory impressions gleamed by the person's physical body and his or her environment and then transform and conceptualize all the information and in this manner, define one's reality (Ayres, 1972; Isbell, 2011; Bundy et al,

2002). The essence of sensory integration is order: classification and placement of the information received from various sources and the successful integration of them all into a complete coherent brain function guiding the body effectively in its surroundings (Anderson & Emmons, 2008; Bar Shalita et al, 2008). The process is neurological, where the brain's role is to choose, expand, delay, compare input to previous knowledge stored in the memory and then to connect the sensory information in a flexible ever changing way. The brain performs this function of processing the sensory information and these actions are retained for a long period (Ayres, 1972, 1991; Dunn, 2008).

Sensory integration already begins in the uterus and continues to develop for many years. For the most part, development takes place through investigation of the surroundings and through adaptive behavior when body responds to stimuli. The brain processes the information and then sends instructions for a response appropriate to the stimulus. The level and quality of processing are different in each individual according to his or her physiological makeup and previous experiences with the environment (Ayres, 1980; Anderson & Emmons, 2008). The sensory systems are: the **tactile system** (touch) which is the first to develop (Ayres, 1991). **Sensory organs**, located in the various skin layers, translate sensations into electric pulses along the nerves towards the spinal cord and from there to various parts of the brain. Practically speaking, the largest area of sensory cortex is found in the hands, feet and face and stomach. **The vestibular system** (balance - equilibrium) has the most significant influence over other sensory systems and daily functions. It serves as a unifying system in the brain to coordinate incoming data from other systems. Additionally, it directs the nervous system as to where the person stands relative to the center of gravity in order to maintain equilibrium and constitutes an important construct in regulating and stabilizing body positions. The **proprioceptive system** - internal data regarding all types of movement felt or received from within the body. This system assists in negotiating and regulating the interaction between the body and the environment via voluntary and involuntary movements.

These three systems must operate efficiently together; otherwise there may be difficulties in each stage of adaptive behavior: assimilation of stimuli, processing information and difficulty generating an appropriate reaction. Sensory dysfunction could appear as an awareness or sensory processing disorder (Ayres, 1972, Levian-Elul & Carmon, 2008; Cohn et al, 2000).

Sensory Integration Dysfunction is liable to affect certain areas of child development, such as emotional, social and motor development. Therefore, a child with this dysfunction may face numerous difficulties in school. The motor and social and emotional demands made on the child are often the cause of frustration and feelings of failure because sensory integration is a must in every situation in which he is expected to master something new (Anderson & Emmons, 2008).

In 1950, a sensory-motor approach was developed based on three principles: **motor output** depends on sensory input, **activating a motor reaction** must follow a normative developmental sequence, and **stimuli** intended to treat a certain sensory function that will affect other functions. This approach, introduced by Rode (1950), an occupational and physical therapist, formed the basis for a substantial portion of Sensory Integration theory further developed by Ayres in 1972. The emphasis in this theory is placed on successful low level integration of the nervous system before proceeding to any cognitive approach, such as observing a demonstration or listening to instructions.

Development is spiral and the whole of each system is built upon the healthy function of the underlying system in closest proximity to it (Ayres, 1991). It becomes clear and undeniable that Sensory Integration Theory is important role as grounds for this research. Similar to Piaget's theory, the integrative element relies on previous stages of development (Plibel, 1970), the individual's integrative functioning is based on previous development stages. However, according to this theory integration is mandatory, albeit from low order in the early stages, to up through the integration that leads to significant cognitive abilities.

From this, we may conclude that the condition which underlies all cognitive development is sensory integration, acquired prior to cognitive ability. Moreover, physical activity requires complex integrative abilities. In so far as one is more involved in physical activities on a higher level, the necessary abilities are more complex. One must understand the rules of the particular sport; there must be a level of coordination among body parts, and perfect coordination between the brain and the parts of the body participating in the sport activity. Furthermore, there be a recognition and understanding of anatomy, bodily functions and processes in order to apply strategy and tactics for improving performance. This demonstrates the importance of this theory for achieving complex motor abilities best developed in an integrative fashion.

Treatment according to the sensory integration approach is based on two types of integration: (1) the first type is inner-sensory and it deals with improved functioning within a single sensory system. For example, visual exercises improve inner sensory integration of a person's visual system; (2) the second type of integration is inter-sensory and pertains to improving the functioning among a number of sensory systems in order to allow independent or directed movement of body parts, to reduce disorders of tactile integration and to diminish reflexive action or alternately to learn how to cope with reflexes and use them to progress in the movement task, and demonstrate control over the body 's motor actions (Levian-Elul & Carmon, 2008).

This study addresses the issue physical activity among the individuals with intellectual disabilities. Following is a literature review of pertinent research and describe the relevant measures that were tested among individuals with intellectual disabilities.

In conclusion, most of the people with intellectual disability have also motor difficulties. As the intellectual disability is more severe, the motor disabilities are more significant. Therefore, physical activity for every level of intellectual disability is important and necessary to improve their physical ability.

Also, this literature review shows that people with intellectual disability cannot go through the stages of normal development as described by Piaget (1972). As the stage get more complex, people with intellectual disability find it more difficult to reach the cognitive applications therefore remain at an earlier stage.

As for the sensory integration for people with intellectual disabilities, it is very complex. Beyond the physical difficulties as described above, the integration they need to do in order to perform simple movements or complex movements, reduce their overall ability in performing motor activity.

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