

# INTELLECTUAL AND DEVELOPMENTAL DISABILITIES: MOVEMENT AND BODY CONCEPT – A NEUROPSYCHOLOGICAL APPROACH

## DEFICIÊNCIAS INTELECTUAIS E DE DESENVOLVIMENTO: CONCEITO DE CORPO E MOVIMENTO - UMA ABORDAGEM NEUROPSICOLÓGICA

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Abstract: People with intellectual disabilities often have to cope with movement and body awareness disorders. Special educators' assess movement and body awareness in order to determine the level and quality of movement performance, body conception, as well as the lateralization of movement and body. Movement and dance therapy are new rehabilitation methods and treatment to aid with these disorders. This article discusses the differences between the concepts of movement, body schema, body image, and body awareness in order to highlight the importance of these concepts in the physical and mental development of the child, and adulthood. The article pays special attention to the impact of the Covid 19 pandemic on movement and body awareness therapy and rehabilitation methods.

Keywords: Movement. Body schema. Physical activity. Dance and movement therapy. Covid 19.

Resumo: Pessoas com deficiência intelectual frequentemente precisam lidar com distúrbios de movimento e consciência corporal. Os educadores especiais avaliam o movimento e a consciência corporal para determinar o nível e a qualidade do desempenho do movimento, a concepção corporal, bem como a lateralização do movimento e do corpo. A terapia de movimento e dança são novos métodos de reabilitação e tratamento para ajudar com esses distúrbios. Este artigo discute as diferenças entre os conceitos de movimento, esquema corporal, imagem corporal e consciência corporal, a fim de evidenciar a importância desses conceitos no desenvolvimento físico e mental da criança e na vida adulta. O artigo dá atenção especial ao impacto da pandemia de Covid 19 nos métodos de reabilitação e terapia de consciência corporal e de movimento.

Palavras-chave: Movimento. Esquema corporal. Atividade física. Dança e terapia do movimento. Covid 19.

## **I. Introduction**

### **1.1. Movement, body schema and body awareness**

Several taxonomies and discussions determine the basis of the concept of the body schema. In this paper, we will limit the examples to that of dyad and triad taxonomy (De Vignemont, 2009).

The dyad taxonomy (Gallagher, 2005) makes a distinction between body schema and body image. According to this taxonomy, the body schema is a sensorimotor representation of the body that controls and directs the action, while body image includes all other representations of the body that are not related to action, i.e., perceptual, conceptual, and affective (De Vignemont, 2009). The dyad taxonomy is supported by several dissociations, such as deafferentation, i.e. body schema disorder and “numb-sense” defined as a disorder of body image (Paillard, 1999).

The triad taxonomy (Schwoebel & Coslett, 2005), on the one hand, recognizes the concept of body schema as sensorimotor representations of the body based on afferent and efferent information, while, on the other hand, it rejects the concept of body image precisely because of the heterogeneity of this concept. Consequently, the concept of body image is divided into two distinctive representations, the visuo-spatial body map and the semantic representation of the body. From this point of view, at the visuo-spatial level, body image provides a structural description of the interrelationships between body parts supported primarily by visual information. At the semantic level, body image is primarily conceptual and linguistic. It refers to the functional representation of individual body parts and the categorical connection between them. The triad taxonomy is supported by a dissociation between apraxia (a disorder of the body schema), autotopagnosia (a disorder of structural description, at the visuo-spatial level), and specific body aphasia (a disorder at the semantic level) (De Vignemont, 2009).

The opinions of the authors also differ on the question of the distinctive characteristics of the body schema and body image. Most authors rely on three basic criteria: awareness (conscious and unconscious), dynamics (short-term and long-term), and functionality (action and perception) (De Vignemont, 2009; Paillard, 1999; Schwoebel & Coslett, 2005). Different

authors use different criteria when defining these constructs. Thus, for example, Head and Holmes (Head & Holmes, 1911) consider the criterion of dynamics as the most important, Paillard (Paillard, 1999) emphasizes the importance of functionality, while Gallagher (Gallagher, 1986) combines the criteria of awareness and functionality (De Vignemont, 2009).

## 1.2. Movement and body schema

Despite numerous disagreements, both taxonomies agree with the definition of the body schema as a sensorimotor representation of the body, emphasizing the specific relationship between the body schema and action, and with the opinion that without a body schema there can be no action (De Vignemont, 2009). Head and Holmes consider the criterion of dynamics as the most important and define the body schema as a postural model of the body that integrates tactile information received from the body surface with proprioceptive information about the position of body parts in space (Head & Holmes, 1911). Gallagher combines the criteria of consciousness and functionality and defines body image as a complex phenomenon which is determined by at least three aspects: perceptual, cognitive and emotional (Gallagher, 1986). On the other hand, the body schema is determined by environmental experience, it reflects and determines posturality and coordinates the action of the body conditioned by external factors (Gallagher, 1986). By emphasizing the criteria of functionality, the body schema can be defined as the representation of the body in space, through the length of the extremities, their hierarchical structure, and the shape of the body surface and body parts. This concept defined in this way does not reach the level of awareness but is exclusively in charge of organizing movements (Paillard, 1999).

The body schema is spatially determined, modular, adaptable, coherent, intrapersonal, and it is involved in the actualization of movement (haggard & wolpert, 2005). The body schema depicts the position of the body in space and its basic function is to integrate tactile and proprioceptive stimuli coming from different parts of the body and localize that part of the body. Adjustability and adaptability are seen through changes in the body schema itself due to aging or caused by the attachment of foreign objects to the body. With constant changes in the position of the body in space, the postural model of our body changes, supplements, and upgrades. Every movement and position evokes an already recorded sensation in the brain,

complements it and changes it in accordance with the new situation. Based on this plasticity of the body schema, the recognition of the postural position comes immediately after establishing this connection and evoking previous records and schemas (Medina & Coslett, 2010). The body schema must adapt to changes in body position in space, both by gradually upgrading an existing schema and with the rapid changes and switching between a couple of alternative coexisting schemas (Braun, Heinz, Schweizer, Wiech, Birbaumer, & Topka, 2001).

### **1.3. Movement and body awareness**

Body awareness is a conscious visual representation of our body and is not in close relation to the organization and control of movement (Paillard, 1999). Awareness of one's body represents a subjective perception of corporeality, a complex relationship between body schemas, position of the body, and movements in space themselves.

Body awareness represents a conceptualization of the body schema, which is based on the experience and information we receive from our body. This phenomenon can also be viewed as the basis for character formation. A person consciously or unconsciously organizes his behavior based on the experience of his body (Mayer, Kudar, Bretz, & Tihanyi, 2008). There are major individual differences in the degree of attention focused on a particular part of one's body, which represent and/or are caused by differences in character and personality (Fisher, 1986). These inter-individual differences can be partly explained by sociological, psychological, and cultural factors. Individual differences in the perception of sensation from different parts of the body are found, for example left-handed people show greater certainty in the perception of sensation than right-handed people (Fisher, 1986).

## **II. Neuroanatomical aspects of movement, body schema and body awareness**

Multimodal integration of somatosensory stimuli is at the core of the body schema (Head & Holmes, 1911). Cortical representation of the body schema involves the integration of perceptual stimuli of movement, body parts, and the body as a whole, which provide information about the position and movement of the body in space and the correlation of the body and body parts with objects in space through movement (Thurm, Pereira, Fonseca, Cagno

& Gamma, 2011). The cortical areas responsible for the body pattern are the supramarginal and angular gyrus. In addition to these structures, other cortical areas that receive visual, auditory, and motor-vestibular information are associated with the body schema, such as the superior parietal lobe and the temporal lobe, which further projects information toward the premotor areas of the frontal lobe (Pietrini, Castellini, Ricca, Polito, Pupi & Faravelli, 2010). Studies have shown that the complexity of sensorimotor integration follows an anteroposterior hierarchy in the postcentral gyrus. Areas of the postcentral gyrus that are located caudally are related to the perception of interpersonal space and the formation of the body schema (Iwamura, 2003).

Body image is a mental representation of the body that is formed based on an individual's unique experience (Tavares, 2003). The research examining diseases and conditions that are characterized by the disorder of the perception of body image indicates the crucial importance of the prefrontal lobe and limbic system in the process of forming body image (Berlucchi & Aglioti, 2010). The results of the study conducted on a sample of people with eating disorders indicate an altered experience of body image (Miyake et al., 2010). The authors of this research used the neuroimaging technique in the study of cerebral activation and noticed that subjects with eating disorders have increased activity in the prefrontal lobe and amygdala (Miyake et al., 2010). In another study, in addition to increased activation of the prefrontal lobe, the authors observed abnormal activation in the cingulate cortex (Pietrini et al., 2010). Uher and Treasure indicate altered activation of the hypothalamus, putamen, pituitary gland, and frontotemporal circulation in individuals with an eating disorder, ranging from hypo to hyperactivation depending on the specific disorder (Uher & Treasure, 2005). Downing and associates point to the influence of visual perception, specifically located in the lateral part of the occipitotemporal cortex of the right hemisphere (Downing, Jiang, Shuman, & Kanwisher, 2001). This area functions as a specialized neural system of visual perception of the human body related to the position of the body in space, as well as the position of the body relative to other objects in space (Downing, Jiang, Shuman, & Kanwisher, 2001).

Authors researching lateralization conclude that lesions in the right posterior region of the parietal lobe are responsible for the altered body schema, and therefore the organization of the body schema is considered a right-lateralized function (Luria, 1976).

### **III. Disorders of body schema and body awareness**

Lesions of certain cortical structures, primarily the posterior region of the parietal lobe, can lead to an altered experience of body schema and body awareness. Certain parts of the premotor, motor and frontal cortex (cerebral cortex) are defined as the areas responsible for motor activity and movement of individuals (Berlucchi & Aglioti, 1997). Depending on the region affected, changes in movement, body schema, and body awareness are attributed to disorders of a specific cognitive domain (Berlucchi & Aglioti, 1997).

Disorders of the body schema are classified according to functional deficits, and there are seven categories of deficits established (Haggard & Wolpert, 2005):

#### **3.1. Pathologies of sensory input**

The most representative example of sensory input pathology is a state of deafferentation caused by reduced or absent sensory input (Gallagher & Cole, 1995). Reduction or loss of sensory input is usually caused by interruptions in peripheral sensory fibers. A case is described in which the subject is unable to perform any movement unless accompanied by visual representation (Gallagher & Cole, 1995). Haggard and Wolpert point out the importance of proprioceptive and tactile inputs within the body schema in this case. Comparing this with the case of deafferentation in a blind person, it was shown that a blind person could establish sensorimotor control despite the lack of visual representation. Based on these facts, the authors conclude that updating proprioceptive information acquired simultaneously with movement is essentially an automatic process (Haggard & Wolpert, 2005).

#### **3.2. Pathologies of bodily spatial organization**

Studies conducted on a sample of people with focal lesions show that the structures responsible for the localization of stimuli on the body surface are separate from those in charge of processing tactile forms (Paillard, 1999). This leads to two possible situations: a person can perceive a tactile stimulus, but without the possibility of localizing the stimulus or he can locate a tactile stimulus, but cannot describe it (Paillard, 1999).

In people with somatosensory lesions, there are evident changes in the spatial organization of the body. Spatial distortions of body size or the size of body parts can occur as a consequence of a specific psychiatric or neurological condition and are classified as macrosomatognosia and macrosomatognosia, depending on whether the size of the body or body part is underestimated or overestimated. Macrosomatognosia is a general underestimation of the body as a whole, and is more often associated with body image than with the body schema (Leker, Carney, & River, 1996). In contrast, macrosomatognosia may be related to a specific part of the body and therefore reflects a distortion of the basic neural representation of the body (Haggard & Wolpert, 2005).

### **3.3. Pathologies of segmentation**

Autotopagnosia, as a disorder of the body schema, mainly occurs in persons with lesions of the left parietal lobe. In this disorder, the impossibility of localization of body parts, both on one's own and on the body of another person, is noticed, which indicates the existence of a deficit of the body schema at a higher cognitive level, not only on the primary sensorimotor representation. Knowledge of the categories of body parts in persons with autotopagnosia is preserved, but recognizing and determining the position of these elements within the spatial organization of the body as a whole is not possible (Kinsbourne & Warrington, 1962). Finger agnosia, like autotopagnosia, is associated with lesions of the left parietal lobe, more specifically, the angular gyrus. Primary deficiency of this area is associated with the inability to differentiate the fingers (Kinsbourne & Warrington, 1962). Since this disorder can occur unrelated to autotopagnosia, some authors suggest the introduction of the concept of "finger schema", which certainly affects the quality of the performed movement (Haggard & Wolpert, 2005).

### **3.4. Pathologies of extent**

"Phantom limb" is a phenomenon that often occurs in people with an amputated body part(s). This is not an uncommon occurrence, since it takes time to reorganize the deafferented region of the cortex. A person feels for a certain period that he can move the amputated part of

the body. Some authors believe that this feeling depends on efferent signals that normally update the body schema (Wolpert, Ghahramani, & Jordan, 1995). Although the efferent signal is sufficient to cause a sensation of phantom limb movement, there is no sensory feedback. Over time, the body schema adapts and the system becomes aware of the inefficiency of efferent signals.

### **3.5. Pathology of updating**

Harry et al. (1998) report a patient with cognitive abnormalities in the corpus callosum where subarachnoid hemorrhage led to a stroke located in the frontal lobe of the right hemisphere. The greatest damage was noted in the anterior supplementary motor cortex of the right hemisphere. The patient had a feeling of an extra limb, an extra left hand in the position of the left hand. Since the assessment of body position is based on the integration of motor stimulus and sensory feedback, the unsuccessful integration of sensory and motor information causes the feeling of an additional limb. In a dormant state, these sources of information match. However, when in motion, there is a discrepancy between sensory and motor information. In this situation, the coherence of the body schema is lost, the perception of body shape is changed in order to adapt to sensory and motor information, that is, the discrepancy between them is reduced, and a feeling of an extra limb occurs (Haggard & Wolpert, 2005).

In an opposite situation, a part of the body seems to have disappeared. The part of the body that is dormant and out of sight fades from consciousness. This case has been described in a patient with a cyst on the left parietal lobe. The patient loses the sense of presence and position of the right extremities for a few seconds if he does not see them. There is also the absence of tactile stimuli and a feeling of heaviness in the extremities. The authors note that automatic movements are preserved, and difficulties are observed in reaching movements (Wolpert, Goodbody, & Husain, 1998).

### **3.6. Pathologies of bodily coherence**

Anosognosia often occurs in patients with damage to the right hemisphere that has led to paralysis of the extremities on the left side of the body. In these situations, the motor system

does not register a discrepancy between real and predicted states, and people with anosognosia believe that the body schema is coherent (Frith, Blakemore, & Wolpert, 2000). Otherwise, somatoparaphrenia may occur. The person is aware of the abnormal sensorimotor status of the limb, but the attitude towards that part of the body is also abnormal. A person can be convinced that that part of the body belongs to another person (Bisiach, Rusconi, & Vallar, 1991). Given this belief, the coherence of the body schema in an individual with somatoparaphrenia is preserved, despite the obvious deficit.

### **3.7. Pathologies of interpersonal body representation**

Studies indicate that the body schema is used interpersonally, to represent one's own body, as well as the bodies of others. Botini et al. (2002) report tactile neglect at the interpersonal level of body representation in a patient with hemianesthesia. The patient believes that her left arm belongs to her cousin, and ignores the tactile stimulus when she is asked to react to the touch on her left arm. However, when she is asked to respond to a touch on her cousin's left arm, she responds to a tactile stimulus. This example shows a strong link between primary somatosensory maps and the cognitive level of body representation, in which an individual's own body experience can alter primary tactile data processing.

In some cases, lesions of the left parietal lobe may be accompanied by heterotopagnosia, which is another example of the pathology of interpersonal representation of the body. In one such case, in which the respondent was asked to show the examiner's nose, the respondent showed his own nose each time. This suggests that localization within the body map is preserved, but body representation is projected onto one's own body (Degos & Bachoud-Levi, 1998).

### **3.8. Mirror neurons**

In the last decade, scientists have focused a great deal of attention on research of the prefrontal cortex, and the reason for that is the discovery of mirror neurons, primarily found in monkeys. Mirror neurons are cells that respond to specific actions directed towards a specific goal. The reaction of "mirror" neurons is noted both when a certain action is performed, but

also when observing another person performing the same activity (Rizzolatti, Fadiga, Gallese, & Fogassi, 1996).

The system of mirror neurons in monkeys is located in the ventral part of the premotor cortex, more precisely, in the F5 area. Posterior to the F5 area is the F4 area, which also belongs to the ventral part of the premotor cortex, and contains somatotopic maps of the arms, hands, and face (Holmes & Spence, 2006). Many neurons in the ventral part of the premotor cortex respond to somatosensory and visual stimuli. However, the part of space within which visual stimulation acts on these neurons is determined by the position of the hand in space. Examining the ventral part of the premotor cortex, researchers came to three relevant findings. Neurons in the ventral part of the premotor cortex that respond to visual stimuli containing information about peripersonal space continue to respond even when the object is not visible, for example, when the light is turned off and the room is completely dark. If, after that, the object moves silently, the neuron continues to react. This suggests that these neurons encode the presence and position of the object in peripersonal space independent of the sensory modality through which the object is perceived. Second, trimodal visuotactile cells, which possess somatosensory, visual, and auditory receptive fields, have been detected in the ventral section of the premotor cortex. Reactions to the auditory stimulus of most of these cells varied depending on the amplitude and distance of the stimulus. Finally, an experiment with monkeys confirmed that these neurons react to the movement of the false hand, when the monkey's hand is out of sight, despite the fact that the genuine hand is static. These results indicate a feature of multisensory representation of the peripersonal space of the ventral part of the premotor cortex (Holmes & Spence, 2004).

Area F4 in monkeys is equivalent to area BA 44 (Broca's area) in humans. By meta-analysis fMRI BA 44 experts prove that key elements of the executive movement system are activated by execution, preparation for imitation of movement, and observation of activity execution. There is evidence that exposure to this area by transcranial magnetic stimulation (TMS) can have a negative effect on imitation and manual dexterity. These data indicate that mirror neurons probably also exist in humans (Pomeroy et al, 2016).

#### **IV. Movement, body schema and body awareness in people with intellectual disabilities**

The experience of space can be divided into: subjective space (body space), peripersonal (gestural), manipulative, objective, and representative (projective) space (Maćešić-Petrović & Žigić, 2009). Knowing body parts is a basic act of recognition that occurs through the interaction of somatosensory experience and thought. Summarizing somatosensory experiences, the basis for discovering the topography of the body is formed. With the appearance of speech, the child can name certain body parts that he previously experienced on the motor and sensory level, and thus the named body parts become clear concepts on the level of consciousness (Maćešić-Petrović, Ičelić & Jovanović, 1994).

In children with intellectual disabilities (ID) repertoire of physical experience and movement is not only limited but also differs in quality. Depending on the degree of disability, these children show developmental disharmony or delay in the development of speech, movement, motor skills and perceptual abilities (Maćešić-Petrović, 1997). Knowledge of body parts develops simultaneously with the development of movement, kinesthesia, and motor skills, so it is possible that lack of movement, due to disintegration, or delay in movements and motor development, can lead to lack or inadequately formed concepts of body parts (Bojanin & Ćordić, 1997). Naming and recognizing body parts is not possible without conceptual development, formed on the basis of movement and motor skills, which goes hand in hand with the appearance of a symbolic function in the concrete operational stage of cognitive development (Piaget et. al., 1988).

By integrating the recognized, experienced and named, with the decentralization of the thought process, the child discovers the lateralization of the body and space (Maćešić-Petrović et al., 1994). At six or seven years of age, the schema of earlier experiences of the body is renewed and upgraded with the experience of lateralization of the body and movement (Bojanin & Ćordić, 1997). Lateralization of movements of the upper and lower extremities can be divided into: functional, peripersonal and neurological lateralization (Bojanin, 2015). However, in children with ID, sensorimotor forms of behavior are prolonged during development, which means that movement and psychomotor skills, in all their forms, are delayed in development and cannot serve as adequate resources for getting to know the world and oneself in the world (Maćešić-Petrović, 1998).

Children with ID adopt the experience of physical integrity and lateralization on themselves much later compared to their peers from typical population (TP). These children also show difficulties when it comes to determining lateralization of another person. This type of lateralization requires the decentralization of thought processes, and thus operational thinking (Bojanin & Ćordić, 1997). While TP children master operations at the age of 7-8, the sphere of logical judgments, the dimensions of the world and oneself, as well as causal relationships, these operational structures develop slowly and incompletely in children with ID (Gligorović, 2013). Depending on the degree of ID, some children will never reach the operational stage of cognitive development.

The results of research conducted by Simon and Dedrog speak in favor of that. These authors examined the knowledge of body parts and the body awareness in 124 children with ID from 3 to 6 years of age and the same number of TP children equal in gender and age. The results of this research indicate that the group of children with ID has a significantly lower level of knowledge of the body schema, while in the entire sample there are no statistically significant differences in relation to gender (Simons & Dedroog, 2009).

## **V. Assessment of movement and body awareness**

Assessment of the body awareness includes assessment of knowledge of body parts, lateralization of body and space, and recognition and naming of fingers (Gligorović, 2013). The respondent is asked a series of questions and he is given specific commands on the basis of which the subject is assessed whether he knows body parts. Lateralization is assessed in relation to one's own body and the bodies of others. Furthermore, the perception of relations in space is evaluated, which refers to the perception of the relationship of movement, body, and space, the relationship of movement, body, and objects in space, as well as the mutual relations of different objects in space (Bojanin & Ćordić, 1997).

Assessment of knowledge of body parts belongs to a general diagnostics procedure that is utilized by special educators. In order to examine the knowledge of body parts, special educators use The Body Parts Assessment Scale (Gligorović, 2013). The Scale is based on a study of 635 children, aged 3 to 14 years. In addition to the questionnaire, which contains names of the body part divided into four categories (hull parts, parts of hands and fingers, parts

of the head, parts of the foot and toes), the examiner uses an age indicator list. This list contains names of body parts divided according to the age indicators, that is the average age at which these terms are mastered. Using the age indicators list, the examiner estimates whether the respondent knows the body parts expected for age and records assessment results. The plus sign (+) is entered next to the name of the body part that the child knows, the minus sign (-) is entered if the child does not know a certain part of the body. After three consecutive incorrect answers, the examination is concluded (Jovanović, 2014).

The level of knowledge of body parts is assessed by movement and a touch of the named body part, and can be:

- In line with expectations for a certain age;
- Below expectations for a certain age;
- Above expected for a certain age;
- Disharmonious finding, in the case when the answers range from the highest to the lowest results (Jovanović, 2014).

This assessment is compared with other assessed levels of psychomotor development in order to draw a conclusion about the overall development (Bojanin & Ćordić, 1997). The results of the assessment are an important part of planning the treatment, learning, and daily activities of people with intellectual disabilities (Gligorović, 2013).

## **VI. Movement therapy vs. Re-education of psychomotor activity**

Psychomotor reeducation, the newer concept originated from France, has been modified in recent years as movement therapy, and is used in our country and around the world. Movement therapy uses spontaneous basic movement that gradually becomes more complicated in order to encourage the development of a connection between movements, as well as the development of more complex motor activities. At the same time, on the mental level, new cognitive schemas and new forms of cognitive activity are created through the formation of concepts and conceptual network which arises from the basic building blocks incarnated in motion of body parts as well as the body as a whole (Maćešić-Petrović, 2014).

In our earlier work, we proposed a new method of treatment through movement, called the Re-education of psychomotor activity (RPA), or Movement Therapy (MT). This

methodological and conceptual frame implies the use of speech and movement-motor exercise, teamwork and supervision of a physical specialist and child psychiatrist, while the exercises should be led by a special educator and physical rehabilitation specialists. Specific exercises are given to elevate, develop and re-develop movement, motor, perceptive, conceptual and behavioral functioning, as well as learning processes. These exercises imply a certain form of MT, based on the movements of the whole body or parts of the body. They have psychotherapeutic effects and benefit the development of children and youth with intellectual and other developmental disabilities. With a variety of exercises provided by a special educator, this method improves the following performances:

- Reducing movement, motor and emotional impulsivity of the child;
- Reducing distractibility of child's movement activity and attention processes;
- Improving cognitive strategies of the child;
- Improving learning strategies of the child;
- Improving educational and self-educational strategies of the child, teachers and parents (Maćešić-Petrović, Kovačević, Đurić-Zdravković, 2012).

Other studies in the area of possible treatment strategies stress similar conclusions (Mervis & John, 2010; Williams & Grossett, 2011; Dew et al., 2012; Einfeld et al., 2012; Reilly, 2012; Sappok et al., 2012). Many studies proposed creative therapies such as movement and dance therapy. A newer concept implies MT as a conceptually based therapeutic approach in the treatment of numerous motor, neuropsychiatric and developmental disorders (Maćešić-Petrović, 2014).

Reeducation of movement and psychomotor activity is a way of re-practicing movement and renewing the child's experiences gained by sensorimotor and psychomotor activity affected by the disharmonious development of psychomotor feedback structures or its functions, which significantly changes the experience of one's own existence in the world. (Bojanin, 2006). RPA is a method of treatment that reveals to the child a clear experience of himself, encourages the development of self-awareness through movement, and experience and awareness of his place in the world, which allows him to gain independence in life, in accordance with his age (Maćešić-Petrović, 2014).

RPA and MT use movement as an elementary, building block of sensorimotor and psychomotor development to get to know and gain new personal experiences about movement, body and others, where activity recapitulates all stages of development during the previous stages. It is very important to remember that the movement is used as it is, as it is conquered and preserved, in order to renew the sensorimotor and psychomotor experience, which is the basis of concepts that the child does not understand enough in the basics, and not to exercise, strengthen, beautify body structures and functions (Bojanin, 1986).

### **6.1. Movement re-education and movement treatment in children with intellectual disabilities**

In the treatment of children with ID, all MT exercises can be applied, with the condition that, based on special educator diagnostics, the exercises are adapted to each child's individual abilities. Which exercises will be applied and with what level of intensity depends on the age of the child and the quality of his neuropsychological and motor development. Movement treatment, so called RPA, consists of exercises that correspond to a certain age, that is, a certain stage of development, and will aim to prevent disharmonious development of psychomotor skills and incomplete development of body awareness, time and space. In the case of a child with developmental disabilities, these exercises will be used in preventing the deepening of existing disorders and encouraging typical development (Bojanin, 1986).

Other authors also emphasize the importance of using movement in the treatment and rehabilitation of various disabilities, such as vision loss - blindness and Asperger's syndrome. This treatment can also be used in the TP through the reorganization and use of movement and dance in various aspects of life (Wasem Walter, L., Simone Harnisch, G., Roberto Borella, D., 2020; González Alba, B., Prados Megías, E., 2021). The importance of the use of various movements, physical activity and dance in the Covid 19 pandemic situation (Lara-Aparicio, Mayorga-Vega, López-Fernández, 2021) is also emphasized.

## **VII. Exercises from the movement therapy group**

The exercises used in MT are divided into two groups: general and specific exercises (Bojanin, 1986).

General exercises are used in the early treatment of children with psychosocial development difficulties, in order to prepare the child for the adoption of specific exercises or they are applied in parallel with specific methods, thus supporting their effectiveness. General exercises affect the personality of the subject as a whole (Bojanin, 1986).

Specific exercises are aimed at stimulating very specific areas. Specific RPA, unlike the general one, affects certain personality traits or abilities (Bojanin, 1986).

This is especially true for children with developmental and intellectual problems, but also in refugees, gerontological practice, neurological disorders, as well as post-traumatic stress syndrome, occupational burnout syndrome, which often occurs in professionals and the general public in the Covid 19 pandemic situation.

The so-called "pandemic burnout" requires a special psychological and motor approach to the current situations of mental and motor isolation which is affecting the population of the entire planet. This specific situation is even more difficult for children, especially children with developmental and ID. In this sense, in the first place, help can refer to a number of creative therapies, among which a significant place belongs to therapy through movement and dance, such as sensori motor integrative therapy, well known as Jean Ayres therapy and occupational therapy.

## **VIII. Conclusion**

Studies indicate the importance of movement in the formation of the body schema, as well as the difficulties faced by people with the body schema disorder. Body awareness develops in accordance with general development and development through movement. Therefore, MT and dance therapy are important factors in the comprehensive treatment of problems in the development of movement, cognition, and intelligence. In the final considerations, assessment techniques and instruments are proposed, which determine further treatment. Timely treatment can prevent the deepening of existing problems and simultaneously encourage

typical psychomotor development. The importance of MT as well as dance in the situation of "pandemic burnout" is also pointed out as a method for overcoming stress and disorders in an isolation situation due to Covid 19.

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