UNIVERSITATEA "BABEŞ - BOLYAI"
CLUJ-NAPOCA
Faculty of Psychology and Education

DOCTORAL THESIS SUMMARY

THE EFFECT OF PHYSICAL EDUCATION LESSONS IN ELEMENTARY SCHOOL, ON PHYSICAL SELF EFFICACY OF CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER

Doctoral student:

Sigalit Dassa-Shlomov

Scientific supervisor:

Prof. Dr. Vasile Preda

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INTRODUCTION

Key words: self-efficacy; developmental coordination disorder;

This study dealt with children suffering from a developmental coordination disorder (DCD) and their sense of self efficacy.
This study made an attempt to examine the influence of physical education lessons of a regular curriculum, at a regular school, upon the sense of self-efficacy amongst children exhibiting motor difficulties in various motor skills, compared to the physical intervention program conducted by the experimenter.
The examination of this topic arose as a result of feeling that the needs of children with difficulties in acquiring motor skills are not being met within the framework of physical education lessons in elementary schools.

In physical education classes in the standard educational framework, children with and without DCD exercise together. Most children in a regular class do not exhibit motor difficulties. The minority, those with the DCD, without having an alternative, exercise according to the regime suited only for children without difficulties. According to experts in the matter, children with DCD must receive an appropriate intervention for their difficulties as early as possible. The most popular intervention today includes special physical strategies, through which they acquire and master different motor skills and abilities. In the educational curriculum of physical education classes in Israel, the needs of children with DCD are not being met at all in regular physical education classes. Solutions more suitable for them are being administered by privately sought professionals such as occupational therapists, sports therapists and physiotherapists.

1. DEVELOPMENTAL COORDINATION DISORDER CHILDREN (DCD): CHARACTERISTICS AND ASSOCIATED DIFFICULTIES

Some children lack the motor competence necessary to cope with the demands of everyday living. According to the *Diagnostic and Statistical Manual of Mental Disorder, DSM-IV* (American Psychiatric Association, APA, 1994), these children are diagnosed as having a developmental coordination disorder (DCD).

A few years ago, these children were known also as a clumsy. Clumsiness is defined as a delay in motor development, a lack of age adequate motor skills, with an absence of clear neurological impairment (Geuze & Borger, 1993). Some researchers describe these children as having a motor learning difficulty, (MLD), that is, they fail to make progress in physical education classes (Hands & Larkin, 2001).
Some of the children with these motor problems may previously have been diagnosed as having minimal brain dysfunction, or motor impairment (Henderson & Hall, 1982), or as having sensory integration dysfunction (Ayers, 1972).
Today there is an agreement regarding the definition of DCD. According to the DSM-IV: "children with DCD are characterized by a poor performance in daily activities that require motor coordination, caused not by the child's age or intellect, or caused by a known neurological disorder (e.g. cerebral palsy), and which interferes with academic achievement or activities of daily living" (Rostoft & Sigmundsson, 2004).

1.1 DCD CHARACTERISTICS

Children with DCD are significantly less likely than their peers to be physically active (Hands & Larkin, 2001). There is an agreement about the DCD characteristics. At school, the child with DCD may be seen to have one or more of the following difficulties or characteristics: an awkward gait, slow to learn how to hope, run or jump, slow movement up and down the stairs, and inability to tie shoe laces and button shirts. Such children may also be slow to learn how to throw and catch balls, and generally be considered clumsy in either or both fine or gross motor skills. The Child with DCD has a tendency to drop things, to stumble and bump into other children and classroom furniture. Often the child's handwriting is poor as are his drawing skills and manipulation of jigsaw pieces, constructional toys and models. Children with DCD demonstrate a wide range of difficulties, both in the degree of severity and in the nature of their difficulties.
As the research progresses, it becomes clear that children with DCD do not form a homogeneous group. Their difficulties are not always seen across all motor skills, and the variation within the so-called DCD grouping is clear (Wright, 1997). In addition, DCD children show also difficulties with academic achievements.

Piaget accorded sensorimotor skills a central role in children's early cognitive development. According to Piaget's development theory, motor skills contribute to the infant's active exploration of the environment, and it is through such actions that infants construct their knowledge of the world.

Motor skills, specifically visual motor skills, are related to cognitive achievements and can serve to successfully identify children at risk for academic underachievement (Hee-Seung & Meisels, 2006). According to Delecato (1966), Cratty (1979) and Soleimani (1994), students with considerable success in perceptual-motor development showed a good academic development, and Levin (1987) found that writing mistakes in children were due to a lack of fine motor coordination, poor motor–visual evaluation and perception disorder.

1.2 SOCIAL AND BEHAVIOR CHARACTERISTICS OF DCD CHILDREN

According to Henderson (1992), a group of children experiencing difficulties in the motor domain, also have additionally side effects connected with social and emotional variables such as self concept. Some reports found that children who were described by their teachers as clumsy were often considered as withdrawn, submissive, and self –conscious.

The perceived awkwardness of children with DCD, as seen in their play and sports behavior, may lead to rejection by their classmates. Children with DCD lack self-confidence, possibly due to the difficulties they experienced with socially important skills. This in turn prevents their involvement in play and sports. The children further isolate themselves to avoid overt rejection (Wright, 1997). Some children with DCD may attempt to cover up their difficulties by exhibiting disruptive behaviors in class. The child plays 'the clown' in order to avoid an evaluation of their motor skills. Losse et al. (1991) found that children with DCD were often bullied, had poor attention span and were more disorganized in class in comparison to their peers. Losse et al. (1991) found that the children with DCD had more behavioral problems than other children. Henderson et al. (1989) showed that children with movement difficulties were unrealistic in the way they set goals for themselves, had lower self-esteem and were less inclined to accept responsibility for what might happen to them.

The children in Henderson study were seen to frequently set goals for themselves without regard for the feedback given to them. This could be because goal setting behavior is a reflection of past experience which in the case of the children with DCD is a series of failure. Long –term failure is particularly pervasive in this regard. The children then set themselves unrealistically high goals. A possible explanation for this is that if one sets an impossibly high standard of achievement then success is unlikely and the impact of failing is reduced (Henderson, 1989).
As for self concept, children with movement difficulties generally exhibit lower self esteem than their well coordinated peers, and the differences is more pronounced when referring to negative descriptions of themselves, rather than a positive ones. With positive statement such as "I am cheerful" or "I am obedient at home" the clumsy children did not differ significantly from the well coordinated children (Wright, 1997).

Children with DCD are also less likely to enjoy physical activity (Cairney and al., 2007). They found that differences in body fat, cardio-respiratory fitness and perceived adequacy toward physical activity account for more than two-thirds of the difference in enjoyment of physical activity between children with DCD and their peers. Children with DCD are more likely to have above normal weight for their age, to be less physical fit and to perceive themselves as less adequate with regard to their physical abilities than children without DCD.
Cairny and el. (2007) claim that perceived adequacy toward physical activity accounts for the greatest proportion of the effect of DCD on enjoyment. This finding reinforces the notion that DCD affects not only physical abilities, but also leads to negative self-attributions. Such attributions, in turn, influence the experience, and perceptions of physically active pursuits such as physical education class. Children with DCD find physical education class less enjoyable than other children because they are well aware of their inadequacies with regard to physical activities. Physical education class is simply a place where their physical limitations are most visible and where the opportunity to conceal their motor coordination problems is greatly reduced, leaving them open to potential teasing and ridicule. Poor fitness and excess weight, while problematic, are perhaps of lesser importance, in part, because many of their peers also share these characteristics (Cairney at el., 2005).

1.3 MOTOR INTEVRNTION PROGRAMS FOR DCD CHILDREN

Sugden and Dunsford (2007), have divided current intervention approaches into two general categories: "general abilities" and "normative functional".
The general abilities approach (or process-oriented approach), has focused on underlying processes that inhibit the acquisition of daily life skills. In relation to motor skills this approach focuses mainly on sensory processing with the aim of addressing underlying sensory functions and thereby having a positive impact across a range of tasks. For instance, if a child is struggling with bike riding the therapist may focuses on the underlying sensory systems such as balance and kinesthetic perception and processes such as planning and sequencing skills.
These approaches start out from the assumption that there the child is deficient, deficiency which is not related only to the performance of the task but rather involves psychological process that are necessary for the task to be successfully performed. These processes include sensory function, memory, attention, planning, and formulation of motor programs. The sensory integrative (SI) approach is associated mainly with the sensory integrative therapy method (Ayers, 1972; Fisher et al., 1991) and kinesthetic training (Laszlo & Bairstow, 1983). According to this approach, the development of cognition, language, academic, and motor skills depend on sensory integrative ability. Children with sensory –motor problem are believed to be inadequately oriented to their physical environment and need help in making adaptive responses to improve the brain processes and to organize sensory input. Provision of proprioceptive, tactile and vestibular stimulation requires activities that consist of full body movements and training in specific perceptual and motor skills.

In contrast to the general abilities approach, the normative functional approach (or task–oriented approach), focuses directly on functional skills rather than on underlying processes. This approach was influenced by cognitive and instructional psychology and added a cognitive element to solving everyday movement problem (Bond, 2011).
These approaches, believe that good skill teaching is the route forward, providing the pace is appropriate, and the teaching methods are adapted to suit the child. The task is

taught more directly, without an emphasis on the underlying processes, yet, it is taught in such manner using a variety of practices so that the skill generalization is promoted (Sugden and Wright, 1998).

A number of researchers have proposed problem solving models, for instance Cognitive Orientation to Occupational Performance (CO-OP) (Wilcox & Polatajko, 1993). The CO-OP approach focuses on skill acquisition, cognitive strategy use, generalization and transfer of learning. Simultaneously with the development of CO-OP in Canada, a task oriented training program called "Neuromotot Task Training"(NTT), was developed in the Netherlands. NTT is based on motor control and motor learning principles and takes as well and it takes motor teaching and motivation principles into account.

Whatever the strategy adopted, its aim is to improve the child's everyday functioning. Occasionally, this aim is extended to include other abilities, such as social and emotional development or cognitive development (or both), but the central aim of most intervention programs is the improvement in motor functioning.

2. SELF-EFFICACY DEFINITION

Healthy self-esteem is closely linked with actual and perceived competence. According to the Social Learning Theory, such perceived competence is called 'self-efficacy' (Bandura, 1997). Self-efficacy is the belief that we are capable of doing something and that we can influence events that affect our lives. Bandura suggested that people who have perceptions of high self-efficacy often do better than those who have equal ability but a lower self-efficacy. They are more likely to persue difficult tasks and to use more effective problem-solving strategies. They also have a tendency to set themselves more demanding goals and to focus less on the possible consequences of failure (Bandura, 1997).

2.1 WHAT IS SELF-EFFICACY AND WHY IS IT IMPORTANT?

Self-efficacy is a person's judgment about being able to perform a particular activity. It is a student's "I can" or "I cannot" belief. Unlike self-esteem, which reflects the way

individuals feel about their worth or value, self-efficacy reflects how individuals with high self-efficacy view their ability to perform specific tasks. High self-efficacy in one area may not coincide with high self-efficacy in another area. For instance, an individual with high self-efficacy in snow skiing does necessarily has high self-efficacy in baseball. Self-efficacy is specific to each task or task type. However, having high self-efficacy does not necessarily mean that individuals believe they will be successful. While self-efficacy indicates how strongly individuals believe they have the skills to do well, they may believe other factors will keep them from succeeding (Bandura, 1994).

2.2 SOURCES OF SELF-EFFICACY AND THE CONNECTION TO SPORT

Bandura (1997), theorizes that efficacy beliefs are products of a complex process of self-appraisal and self- persuasion that relies on cognitive processing of diverse sources of efficacy information. He categorized these sources of information as:

- Past performance accomplishments
- Vicarious experiences
- Verbal persuasion
- Physiological states (Feltz& others, 2008).

Sports –specific sources of efficacy

Vealey and colleagues (1998) identified nine sources of sport confidence. These sources that are unique to sports may have important practical applications for enhancing efficacy beliefs of athletes according to various age groups, gender, and ability groups.

The sources are: Mastery; demonstration of ability; physical and mental preparation; physical self-presentation; social support; coaches' leadership; vicarious experience; environmental comfort; and situational favorableness. These sources are relates to Bandura's theory. Mastery and demonstration of ability are considered to be reflective of performance accomplishments; physical and mental preparation is tied to physiological and emotional state; social support is similar to verbal persuasion; and vicarious experience is the same.

2.3 THE RESEARCH PROCEDURE AND A RATIONALE FOR A NEW INTERVENTION PROGRAME CONTRIBUTING TO SELF-EFFICACY OF DCD CHILDREN

The aim of the present intervention program presented in this study is to empower the sense of self-efficacy among DCD children. The program exposes the child also to strategies and exercising in order to learn and execute new motor skills. This study examined whether the regular physical education lessons in the regular school contribute to DCD children in improving their physical skills, in comparison with the new intervention program. Moreover, the study examined the influence of the program on self-efficacy of DCD children.

In this study 162 children aged 7-9 studying in 1st, 2nd and 3rd grades at a regular school in central Israel were first examined by using a test designated to locate motor difficulties and to estimate their level of sense of physical self-efficacy. The M-ABC test, (**The Movement Assessment Battery for Children – 2-(M-ABC-2) Author:** Sheila Henderson, David Sugden, Anna Barnett, 1992) and, the Self-Efficacy Questioner: The **Physical Self-Efficacy Scale for Children** (PSSC) **Autho**r: Colella Dario, Morano Milena, Bortoli Laura and Robazza Claudio, 2008.

According to the M-ABC-2 test 35 children with motor difficulties were located. These children were randomly divided into 2 groups. 19 children were included in the intervention group and the remaining 16 children served as a control group. The 19 children who participated in the intervention group continued to participate in the regular gymnastic lessons at school as well. The remaining 16 children in the control group participated only in the regular gymnastic lessons at school.

The 19 children belonging to the intervention group were randomly divided by the experimenter into 6 groups. Each group participated in a special training program of 10 meetings, once a week. Upon the termination of the program, the children were reexamined by means of the motor achievement test and the self-efficacy test.

The DCD children who participate in the intervention group, exercised in- order to improve their motor skills. A few physical skill approaches have been selected: the process-oriented approach and the task–oriented approach.

The process-oriented approach, include sensory function, memory, attention, planning, and formulation of motor programs. The task-oriented approach focus on

the functional skills that a child is having difficulty with. In-addition, this approach conceptualizes the acquisition of motor skills as a problem-solving exercise, involving the interaction of cognitive, motor and affective components, such as child's motivation, confidence, and interest in improving or learning new motor skills.
This intervention program was also aimed at improving the sense of self-efficacy of the children, and included techniques for confidence enhancement.
The rational to the program lies in Bandura's theory (1997), and Valley et al, research (1998), and Feltz, Short and Sullivan 2008.
According Feltz et al (2008), in sport in order to build children's confidence, the coach should provide success. This insight relies on numerous theories and studies. Bandura (1997) suggests that past successful performance is one of the strongest sources of building confidence. Indeed, studies demonstrate that in general successful experiences reinforce strong self-efficacy and failure tends to lower such feelings. According to Bandura, the child has to experience successful physical experiences in order to empower his self-efficacy beliefs. However, success does not always lead to high confidence. Empowerment of the self confidence is a product of the way in which the individual interpret his success, and the way in which he achieved it. Such interpretations affect self-confidence. In order to achieve high confidence the individual has to interpret his success as something that he earned by himself and by his own efforts.
The techniques which the DCD children were exposed to maid an attempt to empower self-efficacy. The rational behind it is that through strengthening the self-efficacy the DCD child will be motivated to learn new motor skills.
It should be noted that as long as the teacher, therapist or the coach will not believe that he can assist improving the child skills, there will be no improvement. Therefore, as a first condition we should take into account the teacher's self-efficacy and his belief that he is able to help DCD children.
Furthermore, the teacher must be enthusiastic in the learning process. The children must feel his desire, concern, leadership, assertiveness, and persistence. The teacher should inspire a sense of comfortable to the child. In addition, in every meeting the children will be encouraged to practice the skills as many times as they seem fit.
The following are the self-efficacy techniques that have been used in this research:

Technique no.1: Instructional Strategies and Performance Aids

In instructional situation, the instructor must develop not only a person's physical skills (behavioral change) but also the person's confidence in his own ability to perform the skills (cognitive change). Instructional sequence of developmental or modified activities in sports may involve breaking the skill into parts.

Technique no. 2: providing feedback

It is often difficult for a person to evaluate his or her own progress and therefore a credible and expert observer can play an influential role in developing confidence beliefs. Bandura (1997) considers most communication–based confidence–building strategies as "verbal persuasion". To be effective, the persuasive information must be believable. During the early phases of skill acquisition, progress feedback (information regarding the individual's progress) should be given. For example one should give feedback on the positive aspects of the performance, but also mention mistakes, provide instructional feedback of how the learner can improve with respect to the mistakes made, and encourage the learner to continue his efforts.

Technique no. 3: Modeling

Bandura (1997) considers modeling as one of the most powerful means of transmitting values, attitudes and patterns of thoughts and behaviors. Four conditions are necessary for effective modeling – attention, retention, production, and motivation. When learning a new skill the learner learns how to execute a particular technique better by observing a proficient model. However, Bandura notes that it is easier for people to persuade themselves of their physical abilities if they see people whom they see as similar to themselves, perform difficult physical tasks, than if they observe those with superior ability.

Technique no. 4: Imagery

Another way for a learner to experience performance success and thereby build self – efficacy is through mental imagery. Imagery has been referred to by a number of names: visualization, mental rehearsal and mental practice. Imagery should involve all the senses (seeing, feeling, touching, hearing, and tasting). Bandura uses the term

"cognitive enactment". His suggestions includes cognitive images like plans and strategies, motor images like movements and the subsequent kinesthetic sensations, and emotive images i.e. affective emotions like stress and anxiety, as well as muscle tension. In the present study this technique was used when the child was asked to imagine himself performing a specific sports skill successfully.

Technique no. 5: Goal setting

When teaching a student to set goals for himself we should explain that goal should be:

1. Specific rather than general. A general goal would be "I would like to be a better basket ball player". A more specific goal would be: "I would like to improve my dribbling skills, by practicing for an extra 15 minutes three days a week.
2. Measurable. A criterion (expressed numerically) for measuring the progress toward reaching the goal should be set.
3. Action oriented. Goals should refer to something that needs to be done.
4. Realistic. Goals should be possible to achieve with hard work. A goal should be something that the performer is able to do and will want to work hard toward because attaining the goal will give him or her great satisfaction.
5. Time bound. A specific time frame should be set for each goal.

Technique no. 6: Controlling disruptive negative thinking

According to Bandura (1997) when people are able to control their own thinking, they are less burdened by negative thoughts. In sports, negative thinking is often referred to as a form of negative self-talk. Self-talk is defined as a dialogue in which an individual interprets feelings and perceptions, regulates, and gives himself instructions and reinforcements.

Sport psychologists suggest cognitive thought control strategies which include thought stopping and modifying negative thoughts to positive ones. For example, a statement "I'll never be able to put this ball into the basket" could be reformulated to something like: "I have a good throwing technique. I can put the ball into the basket". Changing negative thoughts to positive ones is not always effective if the learner believes the negative thoughts. For this reason some psychologist suggests to challenge these thoughts. For example, if the learner is not successful in putting the

ball into the basket, he or she may say something like: "it happens to all beginners, its natural, and if I follow the instruction and my routine my performance will get better. The key is to make the self-talk instructional and motivational rather than judgmental, negative, and doubtful.

Technique no. 7: Attribution

Attributions are the reasons people give for their successes and failure.
According to Bandura (1997), the trainer or therapist, should tell the learner that past failure were due to insufficient effort rather than a lack of ability. The rationale is that this can help foster a more resilient sense of confidence because a lack of effort can be rectified more easily than lack of ability.

Technique no. 8: Self-talking

The student's verbal repetition of the teacher's instructions. For example, the child learns to perform multiple consecutive hopscotch style hops; one hop on two legs, the next hop on one leg, along a certain route. The child practices the hops while reciting the mnemonic "one-two, one-two" and so on.

Technique no. 9: performance show

The student performs the learned skill in front of the children and explains his/her way of performing the skill. In his explanation he also presents a solution to the problems he encountered in performing the skill.

Technique no. 10: practicing skill while searching after solutions

The purpose of this technique is to encourage the child to find solutions to problems that came up during the activity.

3. OBJECTIVE

The literature that deals with children with DCD emphasizes and examines the optimal ways to promote abilities of children with the motor difficulties. So far, the literature has not provided an opinion regarding the self-efficacy of the child with DCD.

The idea of using self efficacy theory as an attitude which can promotes DCD children achievements, derived from physical training theories in elite sport area. The sense of physical efficacy acts as a powerful therapeutic critical tool for the promotion of achievements of athletes. Trainers use different techniques with which they impact the thought and decision-making processes among their athletes. It has been found that elite athletes with high self-efficacy also show high achievements in their field.

This study will try to bridge the gap between the existing knowledge regarding the advancement of children with DCD, that is the current techniques for motor improvement and training, and new knowledge, that is, self-efficacy as a tool that can be beneficial and constructive.

Self-efficacy as a new piece of knowledge presented in this research work, can affect the achievements of the child with motor difficulties. It may also act as a foundation for building confidence in obtaining motor skills.

This work focuses on the issue of the advisability of including special techniques in the regular physical education lessons in school for the benefit of children with DCD. Two perspectives will be presented, the self-efficacy perspective theory and, the motor ability.

No doubt, one of the most important goals of physical education lessons is to contribute to the physical health of the child and the second: to make sure that they will be an active grown-up later in life. However, children with motor difficulties who study in regular schools must be taken into consideration. It was found that these children experience challenged in their motor and athletic abilities. Consequently, they may exhibit social difficulties, and hardships that are expressed by a low sense of self-efficacy. Such feelings may lead to avoidance of any physical activity whatsoever.

This study addressed the following questions:

1. Does physical education lessons in the regular curriculum at school have an impact on DCD children's beliefs about their capabilities to succeed in motor skills?
2. Does the special intervention program have an impact on DCD children as of their judgments of personal capability?
3. Is there any difference between the regular physical education in the school's curriculum and the intervention program concerning the motor abilities of DCD children? Does one of them show better impact improvement of their physical abilities?

Up to this point, the question of whether the children's self-efficacy can be used as a foundation for developing their motor abilities has not been discussed. The literature mentions two main approaches for developing the motor abilities among children with DCD. One is Ayer's process oriented approach and the second approach emphasizes the development of motor abilities that form a basis for athletic abilities and games, such as dribbling, hitting balls, throwing, catching and the like.

To promote the self-efficacy of children with difficulties, and to design an appropriate intervention plan, this study relies on Bandura's self-efficacy theory. Bandura defines self-efficacy as follows: "Self-efficacy is a person's judgment about being able to perform a particular activity"(Bandura. 1997).

Bandura's cornerstone is that people have cognitive processes such as memory, imagination, and judgment, and can subsequently create mental representations of their environment – to recall past events, analyze the present and predict future outcomes. Hence, people can influence their environment (e.g. pick a specific environment, influence people and/or influence and develop their abilities). According to Bandura (1997), social context influences a person's behavior. We all have expectations for possible outcomes of our behaviors, based on past behavior or the behavior and actions of others. Bandura outlines the term "self-regulation" as the ability of a person to learn from his interactions with the environment, as well as his ability to reinforce himself and modify his behavior in accordance with the goals he set for himself. An important factor that influences a person's behavior is **his sense of self-efficacy**, meaning the belief of the individual in his abilities of coping with a task.

If so, the **conceptual framework** at the core of this research presents the motor physical view, beside the psychological-self-efficacy view, as contributing to the advancement of children with motor difficulties. Together, these two aspects form a complete conceptual framework, which helps to understand and promote children with difficulties. The psychological viewpoint, self-efficacy, presented in this work, has not been examined in regard to children with DCD and in the present study it serves as a complementary approach the therapeutic techniques offered to these children.

On the one hand, DCD children need to practice a range of approaches, methods and motor strategies. As is said, "walk the walk, not just talk the talk", meaning that repeated practice is necessary to attain expertise.

However, this research suggests that, in addition to what the research literature offers with regard to working with DCD, techniques for the promotion of self-efficacy based on Bandura's theory, should also be taken into account. In addition, psychological techniques that have been previously used to advance and empower athletes may also be useful. The claim is that when a child with difficulties uses techniques to fortify his self-efficacy, in the future he will want to try and practice his motor skills, and will even see an improvement in his motor performances.

3.1 THE RESEARCH HYPOTHESES

1. The physical self-efficacy of children with DCD will improve as a result of their participation in the intervention group, as compared with children with DCD who participate in regular physical education classes in accordance with the regular curriculum.

2. The motor achievements of DCD children will improve following their participation in the intervention group, as compared with DCD children who take part in regular physical education classes at school.

3. At the end of the school year, the physical self-efficacy of non DCD children participating in physical education classes, will not improve in comparison to their sense of efficacy at the beginning of the school year.

4. DCD children who participate in the intervention group and demonstrate an improvement in their self-efficacy will also demonstrate an improvement in their motor achievements.

According to these hypotheses, the intervention program in this research will include techniques designated for the enhancement of children with motor difficulties in the two aforementioned motor approaches, and will additionally utilize techniques to enhance self-efficacy.

This research strives to add to the existing research knowledge in the field of DCD and to test the hypothesis that motor improvement cannot be achieved without a solid foundation of behavior characterized by motivation for learning, that believes is ready to try and learn, visualizes and experiences success.

4. FINDINGS

The results will be dealt according to the hypotheses.

According to hypothesis no. 1: The results showed that children with DCD did not demonstrate a higher sense of physical self-efficacy, in comparison to children with DCD who participated only in the regular physical education lessons. This research cannot point to the superiority of the experimental group on the control group in each of the questionnaire items. Yet, we can state that children who participated in the intervention program estimated their **muscles as stronger**, that is the program contributed to their physical self-efficacy. In this item the experimental group was the only group which demonstrated a difference between the pre-test and the post-test. Yet, according to the results, the children's sense of physical confidence did not increase in general.

However, according the **Physical Self-Efficacy Scale for Children** (PSSC), additional findings were discovered (Findings were discovered in five out of six questions).

- **Findings from the first question**: How do you feel about your running?

a. Differences were found between the **control** and **non DCD** group (P=0.03). The achievements of the **control** group were lower in the beginning than those of the **non DCD** group, and were still lower than the regular's in the post-test.

b. Differences were found between and **experiment** and **non DCD** group (p=0.73). In the pre-test, the achievements of the **experimental** group were lower in comparison with the **non DCD** group. However, in the post-test, the **achievements of the experimental group (DCD children) were similar to the achievements of the non DCD children**. In the post-test, the non DCD group was no different than the experimental group.

- **Findings of the second question**: In the physical education classes what exercises are you usually able to do?

a. There was a **marginal difference found** between the pre- and post-test for each one of the groups tested (p=.034). It seems that all the scores of the students in all the groups were lower before when compared to after.

b. The experiment group showed improvements in its scores on the post when compared with the pre-test. However, as stated, the differences were marginal.

- **Findings of the third question**: How do you feel your muscles?

The experimental group reported weaker muscles when compared to the report of the non DCD (they replied that their muscles are strong). **In the post-test the experiment group reported stronger muscles**. Conversely, the non DCD reported decrease in muscle strength.

However, the experiment group showed improvement in its accomplishments between the pre- and post-tests, which the control group did not.

- **Findings of the fourth question**: In physical education classes, in school and at home, how do you move?

There was a **marginal difference** found (p=0.080), in the scores of the children on the pre-test when compared to the post-test, in all groups

The **experimental** group showed improvement in its scores on the post-test, but no differences were observed between this group and the control group.

- Findings of the **fifth** question: In physical education classes, do you feel secure?

Marginal differences were observed, (p=.050), between the pre- and post-tests, in all groups. However, no differences were observed between the groups.

The data shows a decrease in the sense of security in the post-test, in all groups.

According to hypothesis no. 2, the motor achievements of children with DCD who participate in the intervention group will improve, in comparison with Children with DCD who participate in the regular physical education lessons at school.
In the framework of the intervention group, children with DCD were exposed to motor techniques designated to improve their performance. The present study intended to find out, among other things, whether as a consequence of the exposure and the special training the children demonstrated improved performance. Did the additional tools these children received, in comparison with children with DCD who participated only in the regular physical education lessons, and who did not get such tools, help them?
This hypothesis was partly confirmed. Differences were found between the **experimental group and the control group**, yet, the differences were found only in some of the skills which the children were tested in. The differences which were found were in the following skills: skipping, throwing an object while moving, underhand throwing, running and kicking a ball, catching a ball with both hands, catching a ball with one hand, hitting the ball while moving, rolling rope, running and kicking the ball while it's in motion.
All the children (100%) in the **experimental group** demonstrated an improvement in their skipping skills as well as in throwing an object while moving, underhand throwing and catching a ball with both hands. A considerable rate of them also succeeded to demonstrate rather good skills in all the other exercises. The experimental group children did not demonstrate an improvement in skills which combined the movement of the child and a changing environment. The improvement was apparent in skills in which the child was moving, yet his environment was stable, or in which the child was motionless and his environment was changing. As aforesaid, when the child was moving and his environment was changing, improvement was not detected.
Hypothesis no. 3., another hypothesis of the present study was related to the sense of physical self-efficacy of the children without DCD. According to the hypothesis, the sense of self-efficacy of these children who participate in physical education lessons, will not improve at the end of the year, in comparison with their sense of physical self-efficacy at the beginning of the year. This hypothesis was included in order to

understand the effect of physical education lessons on the self-efficacy of children who do not have DCD.

The hypothesis assumed that the regular physical education lessons do not emphasize enough and do not strengthen enough the sense of physical self-efficacy and the motivation of the children. The physical education lessons given to these children, in contrast to the lessons of the intervention group children did not include techniques designated for improving and increasing self-efficacy. These children were only exposed to general fitness training and learned the motor skills which were included in the curriculum of the Ministry of Education.

This hypothesis was **fully confirmed**. The examination of the children's answers to each of the items in the questionnaire showed that at the end of the academic year, their self-efficacy was not improved, in comparison to their self-efficacy at the beginning of the year.

According to the **forth hypothesis** children with DCD who participate in the intervention group and who demonstrate an improvement in their sense of self-efficacy, will also demonstrate improvement in their motor achievements. According to this hypothesis, the intervention group children who practiced techniques for increasing their self-efficacy will improve their sense of self-efficacy, and that improvement in turn will affect their motor achievements.

This hypothesis **was not verified**. The experimental group children did not demonstrate an increased sense of self-efficacy as a consequence of participating in the program. Therefore, we are not able to say, unequivocally, that the improvement in their motor skills is due to an enhanced sense of self-efficacy.

The improvement in motor skills may be due to the physical training and the motor techniques which were presented to these children.

5. THE CONTRIBUTION

The contribution of the present study lies in its clarification of the relationship between self-efficacy and motor achievements. The study examines the hypothesis that through enhancement of the sense of self-efficacy, the DCD child will present improvement in his motor skills and competence. The present study wished to demonstrate that these children should be given tools which will motivate them to be active in the physical education lessons at school.

The main claim of the present study is that the physical education lessons at school, in their present format, do not contribute to the sense of physical self-efficacy of these children, in comparison to alternative lessons (the intervention program) which were presented to such children by the experimenter. The intervention program exposed the children with DCD to techniques for the enhancement of their sense of self-efficacy and to motor competence and skills improvement strategies. Accordingly, two secondary claims were presented:

1. Improvement in the sense of self-efficacy will lead to better motor achievements.
2. Due to participation in a special intervention program, Children with DCD will demonstrate improvement in their motor skills.

Regarding the main claim the examination of the children's answers to each of the items in the self efficacy questionnaire showed that at the end of the academic year, their self-efficacy was not improved, in comparison to their self-efficacy at the beginning of the year. In regard to these findings, it can be seen that the self-efficacy of children without motor difficulties does not improve as a consequence of participation in regular physical education lessons. The sense of self-efficacy of these children was high at the beginning of the year, remained the same at the end of the year, and even decreased a little, but didn’t get the very high score.

These findings support the hypothesis of this study that the regular physical education lessons do not contribute and do not increase the sense of physical self-efficacy of both children without motor difficulties, and children with such difficulties.

It seems that the regular physical education lessons do not emphasize enough and do not strengthen enough the sense of physical self-efficacy and the motivation of the children. The physical education lessons given to these children, in

contrast to the lessons of the intervention group children did not include techniques designated for improving and increasing self-efficacy. These children were only exposed to general fitness training and learned the motor skills which were included in the curriculum of the Ministry of Education.

Regard the two other claims, the intervention program, in the format in which it was implemented, **contributed to the physical performance of DCD children**. **The study demonstrated that the experimental group children benefited from the motor training which used special techniques for promoting children's physical competence and functioning.** Their achievements were better than those of children with DCD as well as from those without DCD who participated in the regular physical lessons. However, the experimental group children did not demonstrate an increased sense of self-efficacy as a consequence of participating in the program. Therefore, we are not able to say, unequivocally, that the improvement in their motor skills is due to an enhanced sense of self-efficacy. The improvement in motor skills may be due to the physical training and the motor techniques which were presented to these children.

Children's sense of physical confidence did not increase in general. It is possible that in order for a significant change in the confidence of these children to occur, a longer period of training is required. It seems that 10 lessons which were given at a timeframe of 3 months are not enough for such children to change or to be aware of changes in their physical competence. Significant changes in behaviors and in their sense of physical confidence take probably more time to be noticed. It seems that the connection between "my muscles are stronger now" and "I therefore have more confidence and I am able to do more complicated and demanding activities" is not easily noticed and acknowledged by the child. The literature which deals with self-efficacy among athletes reports that sometimes, the athletes concentrate only upon their weaknesses and failures. Thus, it is not unlikely to find a successful athlete whose sense of physical self-efficacy isn't high. So we cannot conclude that success always brings a sense of physical self-efficacy (Feltz, Short and Sullivan, 2008). Bandura (1997) states in this regard that enhanced confidence is a result of the individual's interpretation of his success.

Furthermore, in regard to the item in the questionnaire related to the children's confidence during physical education lessons. The children were not asked regarding

their sense of physical confidence during their participation in the intervention program group. It is possible that in case they were asked regarding their confidence during the intervention program, they would have given a different reply.

6. THE STUDY INNOVATION

1. **The regular physical lessons at school do not contribute the DCD's self-efficacy**.

The present study points to a drawback of the regular physical education lessons in regard to children with motor difficulties. These children's physical needs and sense of physical self-efficacy should be taken into consideration. The present study shows that the regular physical education classes do not enhance the sense of self-efficacy of children with DCD and do not contribute to their motor achievements. It seems that their participation in a special program in which they were taught techniques designated for the improvement of their motor performance, contributed to their achievements in closed motor skills. These children demonstrated persistence, gratification and motivation during their participation in the special lessons. All these may have affected and enhanced their motor skills.

2. **The enjoinment and practicing in small groups**.

Forming special small groups within schools, for these children, should be contemplated in order to enhance and improve their motor skills and competence in accordance with their age. It seems that working in small groups contributed to the gratification from the physical activities of these children. The advantages of working in small groups were already apparent from the start. Each child had more time to act and to do his best; no discipline problems were detected; the exercises were fitted to the children's needs; and the work environment was pleasant, intimate and calm. Furthermore, the children in each group were homogeneous in regard to their skills. It can be assumed that the children did not feel threatened, but rather safe, among children who resemble them.

The experimenter concluded that the children who participated in the intervention group enjoyed the unique contents they were exposed to in the lessons. The children who participated in the experimental group arrived to the lessons of the

group happily. Throughout the training period they were vital, cooperated, demonstrated gratification, expressed their interest arrived on a regular basis, expressed curiosity and a will to improve their skills. The teachers reported that the children looked forward for the time of the lesson and at the end of the program they expressed their sorrow that it came to an end. The children persisted in attending the lessons and expressed their wish to reach the goals they set to themselves. According to Bandura (1997), Gratification, enjoinment, persistence and cooperation are all components of motivation. These components play an important role in strengthening and building sense of physical self-efficacy (Bandura, 1997).

3. Guiding the physical teachers how to contribute DCD's self efficacy.

In order to instruct such groups, the physical education teacher needs the appropriate knowledge and tools both in the physical realm and in the psychological realm, with a focus on the sense of self-efficacy. He has to start out from the assumption that a child with DCD experiences frustration, disappointment and failures which are expressed more intensely during physical education lessons. The physical education teacher should instruct the children to reach the goals set for that lesson. Several minutes should be devoted for reaching the goal during the lessons, according to a training program which was prepared in advance. It can be combined in every structured activity, towards its termination, after the children experiences some activities and acquires a reservoir of movements from which they can choose in order to reach the goal. It is also recommended to develop conversation regarding the movement and to involve in it feelings, to talk about the movement and the challenges it sets, the difficulties and the new opportunities such movement creates. Combining such techniques, besides the teaching of different motor skills can help the child with motor difficulties.

4. Building a knew self efficacy questionnaire

For a deeper understanding of the relationship between the sense of self-efficacy and the motor performance, the present study suggests that quantitative questionnaires should be formulated with suitable items for the child with physical difficulties.

The present questionnaire which has been used in this research was designated to examine the physical self-efficacy of children who do not have motor difficulties. An

appropriate questionnaire for the lessons content and population should be built for future studies.

Furthermore, the present study points to the weakness of the self-efficacy questionnaire which was used here for measurement of children's physical self-efficacy. A tool designated for this purpose should include items related to gratification derived from physical activity; motivation to engage in physical activity; the child's beliefs regarding his competence; and what motivates him to engage in such activities.

Future studies should also include qualitative analysis of observations and interviews of children with DCD.

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