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DOCTORAL THESIS - Summary

**Effect of aerobic and anaerobic activity on attention levels
among children suffering from learning disabilities**

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Introduction

Key words: Attention and concentration, Learning disabilities, Physical Activity, aerobic activity, anaerobic activity.

Attention and concentration are basic human abilities but focusing attention is accorded special importance in the educational process from a young age, first by parents and later by educators who attempt to harness this ability to scholastic tasks that expand attention in terms of range, duration and specificity (Flavell et al., 1993; Kaniell, 2001; Hale & Lewis, 1979).

In recent years attention and concentration have received greater public awareness as part of a broader phenomenon of learning disorders (Manor & Tiano, 2001; Shapira, 2004; Lembert & Sandoval, 1980). Many studies have been conducted in an attempt to find means of identifying, diagnosing and treating children classified as learning disabled. Recognition of the problem requires professional tools (Shapira, 2004; Haber, 1990; Sharon et al, 2008; Smith & Kalka, 2007) but at the same time simple creative tools are also needed to enable parents and educators to deal with the expanding phenomenon (Manor & Tiano, 2001; Smith & Kalka, 2007).

One such tool can be adopted from psychometric characteristics of children in the developmental process, such as physical activity, movement and sports. The ever-more sedentary nature of modern life, fueled by the availability of multiple stimuli and resources through televisions and computers with no need to leave one's seat, hints at the growing gap between the child's natural need for movement and actual physical activity. It is important to investigate in depth whether controlled; adapted and planned physical activity can be used to improve the attention abilities of all children, but especially those affected by various learning disabilities (Aman, 2002; Ratey, 2008; Wendt, 2001).

Researchers have proposed many theories to explain the link between physical activity and changes in behavior and mood. Such a multiplicity of theories indicates that more than one mechanism is involved in such processes at any given time (Dubnov & Barry, 2000).

The present study examines some of these questions and was influenced by the work of Tantillo (2002), Vigal et al. (2003), Mor (1997), Mahar et al. (2006), and especially by the Wendt's (2001) model about the effect of physical activity on behavior, anxiety levels and academic achievements among children. Based on the survey of the literature, it was found that this study could contribute to filling the gap in knowledge by testing a broader population of children with special needs (learning disabilities).

The quantitative research examined the link between physical activity and attention and concentration in a population of male adolescent school children with learning disabilities, comparing them to a matched control group of boys without learning disabilities. The innovation in this study is that examines the differences in attention and concentration following aerobic and anaerobic types of physical activity by means of specific tests of attention and concentration (Falkenbach et al., 1992; Mor, 1997; Raviv & Low, 1990).

The quantitative research hypothesized that in the base line differences would be found in attention measures between the learning disabled group and the control group. After aerobic and anaerobic activities no differences would be found between the groups. In other words, the learning disabled group would register improvements in their attention test results.

This study offers an additional dimension, over and above that mentioned in previous studies. It combined both quantitative and qualitative research methods in order to ,obtain a richer and deeper picture of the situation

Not only did the study investigate the quantitative effects of physical activity on attention tests, it also examined the context of the phenomenon in three directions by means of qualitative research. It examined the effects of aerobic vs. anaerobic activity on attention and concentration; and it examined the attitudes of parents and also of the therapists towards the effects of this physical activity on the children's behavior, attention and concentration.

Aspects of the treatment processes using physical activity can be examined through qualitative constructivist holistic investigation. This approach views the context of the phenomenon as essential for understanding its reality (Stake, 1995).

The study examines the phenomenon in its natural location (Shkedi, 2003), that is, in treatment centers which use physical activity as a tool. The aim in the qualitative examination is to understand the phenomenon and various conditions related to it (Henwood, 1996; Lincoln & Guba, 2000).

Brief theoretical background

Chapter 1: Attention

In daily life we experience many situations in which attention plays a central role. These include situations involving survival and danger, as well as daily activities and intensive learning in school.

In any given situation, we are exposed to many different types of stimuli. However, when describing what we have perceived we find that we have processed only a small part of the events and stimuli while others have disappeared. It is usually said that those events and stimuli we perceive and process are the ones to which we have allotted a certain amount of attention or mental resources, while the others have not been attended to or have received only a minor amount of attention (Shalev-Mevorach, 1999).

One of the basic requirements facing a learner the learning process is to focus attention on the task and on the performance setting (Singer, 1980; Schmidt, 1991). We all possess an attention mechanism for general or specific information processing. In essence, almost any task we perform requires that we concentrate on a certain element and ignore other, whether the task is a complex sports activity, reading a book or simply walking along a road (Raviv & Low, 1990).

It is difficult to describe the process of mastering a skill without possessing the ability to block out external stimuli such as noise, visual stimuli unconnected to the performance and changes in the setting background, or internal stimuli such as negative thoughts, daydreaming or fear of performance results during the performance itself. It can also be said that failure to focus attention may directly affect achievements.

Despite the extensive research that has been conducted on the attentional process over the years, especially in cognitive psychology, researchers have still not reached a consensus as to a definition of the process. This is because attention is not one element but rather an array of cognitive components (Boutcher, 1992; Johnston & Dark, 1986).

When attentional mechanisms do not function, we encounter behavioral, personality and social phenomena that dramatically affect the course of life. These difficulties in learning, attention and concentration, and their affect on human functioning, are the subject of the following chapters.

Chapter 2: Children with Learning disabilities & difficulties in Attention and Concentration

Various definitions can be found for learning disabilities. One of the first to use the term was Samuel Crick who, in 1963, proposed it to describe children who had difficulties in learning but did not suffer from mental retardation. Understandably, parents and professionals welcomed this description of the children in question (Hyman, 2000). Over the years, the term “special learning disabilities” developed, as can be seen in the definition of the American Committee for Special Education in 1977: “A special learning disability is expressed in one or more disabilities from among the basic psychological processes that involve understanding or the use of spoken or written language, which develops into a complete inability to listen or

think, speak, read, write, spell or perform mathematical calculations (Yazdy, 1995; Bienstock, 2007).

Additional attempts to define learning disabilities were made by researchers such as Ross who focused mainly on the hyperactive domain (Ross & Ross, 1976); Halahan and Cohen who emphasized the gap between performance level and intellectual capability (Haber, 1990); Ray and Ray who referred in their definition to the etiology of the disability and spoke of “minimal brain damage” (Yazdy, 1995)..

2.1 Learning disabilities and difficulties in Attention and Concentration

Today, attention and concentration disorder is considered one of the most prevalent neurological and psychiatric disturbances among children, with ramifications for the emotional, behavioral and academic future of children suffering from it (Shapira, 2004).

Attention and concentration disorder may also include hyperactivity in which case it is called ADHD (Attention Deficit Hyperactivity Disorder). The “pure” form of the disorder, ADD, refers to Attention Deficit Disorder. Concentration is the total of brain activities, emotional, mental and environmental states that allow us to sit quietly in a chair and absorb what is happening around us. It is affected by moods, fatigue, sorrow, motivation and interest. Attention is the element that physically allows concentration to occur (Manor & Tiano, 2001).

ADHD refers to chronic difficulties faced by children, adolescents and adults in maintaining attention, concentrating, and acting with impulsivity and hyperactivity. These symptoms usually appear chronically in early childhood and are not traceable to neurological sensory, language or motor problems, mental retardation or serious emotional disturbance (Barkley, 1998). Attention disorder constitutes a serious social problem: 35% of those suffering from it do not complete high school, 52% of those who are not treated become addicted to drugs or alcohol, 19% become regular smokers, 43% of hyperactive boys are arrested for delinquency before age 15 (Ibid.).

2.1 Diagnosing and evaluating learning disabilities

A survey of the research literature about learning disabilities reveals their widely varied nature in terms of both symptoms and etiology. This variety makes it difficult to evaluate and diagnose the abilities or problems of children who come for consultation.

The various basic assumptions that guide the process constitute the first stage from which the diagnostic process begins. Usually the process will focus on seeking the pathology according to a line of thinking in which the problem resides in the learner himself and diagnostic action is directed to locating the disability and evaluating its severity. The various systems for categorizing and classifying deviations are also based on this assumption. A different basic assumption is also possible, one in which the problem does not lie in the learner but rather in the setting in which he learns. This leads to a diagnosis which tries to unravel the environmental factors affecting learning (Haber, 1990).

In order to include all of the characteristics of the learning disabled population of children and the environmental data in which they operate, the evaluation and diagnostic process should be multi-dimensional and based on a variety of sources

(Last, 1987). It should focus on the interaction between the child's traits and the environment in which he lives.

2.2 Treatment of Learning disabilities and difficulties in Attention and Concentration

Treatment to be effective must be multi-systemic and deal with all human domains (biological, psychological and social). Therefore, treatment must also include the pharmaceutical component. Treatment will be determined in an individual program based on the main disturbance, the accompanying morbidity and the preferences of the child and family.

There are many settings that provide assistance to children of pre- and kindergarten age (some of the methods are also suitable for older ages, and even adolescents) like remedial teaching, psychological treatment, guidance for the school staff, guiding parents, behavioral therapy, neurotherapeutic. Some of the frameworks and methods are well known while others are offered by private institutes and practitioners. (Haber, 1990)

Chapter 3 : Physical Activity and Its effects on Human bodily Functioning

Physical activity is as old as humankind. It accompanied humans from their first steps on Planet Earth. For as long as they have had to fight for survival by seeking food and escaping from predators and hostile tribes, humans have been on the move (Aviram, Benayahu, Aviram et al, 1959; Elyakim & Nemet, 2008). In addition to the physical fitness aspect for the survival of both the individual and society, another aspect of physical education must be mentioned, which is the value ancient society attributed to physical exercise as a means of nurturance, sharing feelings, solidarity and unifying a society, tribe or nation. Physical exercise served as a means of acquiring psychological influence over the masses.

3.1 Definitions of physical activity and physical education

Nishri defines physical activity as physical movement intended to develop and strengthen the body and limbs that are moved, and the organs that provide the energy for activity (Nishri, 1970). Physical activity is also defined as physical movement initiated by the skeletal muscles, as a result of which energy is expended (Ruskin, 1990).

Physical exercise is structured, planned, repeated activity with specific trends intended to improve and preserve one or more of the components of physical fitness (Ibid.).

3.2 Types of physical activity

Sports activity is physical activity organized according to the rules of a given game. It is possible to differentiate between several levels of activity (Nice & Inbar, 2003). Leisure time and recreational physical activity: Social activity for entertainment, usually at low to moderate levels of intensity, for example hikes and sports-for-all games.

3.3 Classification of physical activity

Physical activity in the various sports can be classified according to the movement patterns each requires.

Cyclical movement patterns. In cyclical physical and sport activities, movement is rhythmical, such as basic skills like running, swimming and bicycle riding.

Non-cyclical movement patterns. Activities that do not have rhythmic cyclical patterns, such as ball games, judo, tennis and fencing.

Physical activity includes a wide range of skills. Skills are generally divided into two categories according to the conditions in which they are executed:

Closed skills: These skills are performed in a set environment that does not vary, such as high diving.

Open skills: These are skills that are performed in varying conditions, such as the spike in volleyball or the kick in a soccer game (Nice & Inbar, 2003).

3.4 Physical activity effect

Physical activity causes temporary or permanent changes in all body systems. The circulatory, respiratory, skeletal and muscular, nervous, hormonal.

3.5 Nutrition and energy supply

Energy for physical activity is made available by oxidation of the food we eat. The energy potential in food lies in its carbohydrates, fats and proteins, which are the principal components of foods – the nutrients. Utilizing and exploiting this energy potential is made possible by the breakdown of the high-energy molecule known as adenosine triphosphate, or ATP (Mekel, 2005). ATP is stored in all body cells and when broken down, it releases energy that makes work possible. This process occurs in all body cells (ibid). ATP is formed by the combination of an inorganic phosphorus molecule with a molecule of adenosine diphosphate (ADP). This combination requires energy. To obtain mechanical energy, in this case a change in muscle fiber length, the phosphorus molecule has to be separated from the ATP molecule. This separation is done by means of water or, alternatively, in an accelerated chemical process by the enzyme ATPase. Separation of one phosphorus molecule (Pi) from an ATP molecule releases energy (E) equal to 7.3 Kcal, according to the following formula:



3.5.1 Energy paths for physical activity

Three metabolic pathways are used to rebuild ATP:

The ATP-CP pathway, the anaerobic glycolytic pathway, and the aerobic pathway. Each of these pathways is adapted to the nature, intensity and duration of specific types of physical activity (Kanitz, 2004; Mekel, 2005).

Table 1 presents the main characteristics of the three metabolic pathways.

PATHWAY CHARACTERISTIC	ANAEROBIC-ALACTIC ATP-CP PATHWAY	ANAEROBIC – LACTIC ACID PATHWAY	AEROBIC PATHWAY
SPEED OF RESPONSE	IMMEDIATE	HIGH	SLOW
ENERGY SUPPLY	VERY HIGH	HIGH	LOW
AMOUNT OF ENERGY	VERY LIMITED	LIMITED	UNLIMITED

(Nice & Inbar, 2003)

Table 2 Percentage of relative contribution of the anaerobic and aerobic pathways for releasing energy according to race duration and distance

EFFORT DURATION	10 seconds	50 seconds	2 minutes	4 minutes	15 minutes	30 minutes	60 minutes	120 minutes
Running distance (meters)	100	400	800	1,500	5,000	10,000	20,000	40,000
Anaerobic	90	75	60	40	12	5	2	1
Aerobic	10	25	40	60	88	95	98	99

(Mekel, 2005)

3.6 The process of fatigue

Physical effort inextricably involves physical fatigue which is expressed as an inability to continue a given activity over time or a decline in the level of performance. Physiologically, fatigue is defined as the inability to maintain energy output

3.7 Running skill

Running skill develops after the walking stage among infants. Running is a natural skill that improves during childhood from running and playing tag games, and later from sprints or longer races. A comparison between walking and running skills indicates a clear difference between the two. In walking one foot is always in contact with the ground while in running, this is not true. Because of the vigorous push-off by the rear foot at the end of a stride, the rear foot breaks contact with the ground before the front foot lands, creating a momentary state of the body floating in air. This difference between the two skills explains why running is more intensive and consumes greater amounts of oxygen, which means greater energy expenditure per minute of activity in comparison to walking. In terms of heart rate, running even at the slowest rate will entail oxygen uptake of at least 60% of maximal pulse rate. Running imposes loads on the running body because of the impact created when the foot comes in contact with the ground, at a force equal to about 2.5 the runner's body weight (Kanitz, 2004).

3.8 Adapted physical activity and therapeutic sport

Movement, physical activity and sport have been used to cure the body and soul for many centuries and in many ancient cultures. Some of the ancient curative, therapeutic and rehabilitative principles of movement have been preserved to this day and have earned recognition and renewed implementation in modern medicine. Today they are used for individuals with special needs and other challenged groups. “Therapeutic sport” has become a broad professional domain of interest to academicians, educators, professionals from many fields, health organizations, insurance companies, parents and consumers (Aharoni, 2006).

Chapter 4: Literature review: The effect of physical activity on human behavior

Participating in movement, physical activity and sport to cure body and soul has been known since the dawn of history in many ancient cultures. Processes of treatment and rehabilitation through movement in these cultures have been preserved to this day and have earned renewed recognition and serve as the basis for movement therapy and for healing, treatment and rehabilitation in modern medicine.

From the studies and experience that have accumulated in the field, we learn that physical activity is the natural, best and most effective way to increase energy, reduce tensions and improve mood. Studies indicate that hormonal and chemical changes in the body as a direct result of participating in physical activity. Although we still do not understand these changes completely, they undoubtedly have a significantly good effect on our behavior. Physical activity can help almost everyone, but above all, it helps various groups of children, adolescents and adults with special needs, who suffer from conditions that limit their daily functioning in a variety of situations. Participation in movement, physical activity and sport, under controlled and structured conditions, helps to stimulate improved mental and physical health for these populations. Participating in and experiencing physical activity provides them with cognitive, physical, emotional and social challenges and contributes to their self-efficacy as well as strengthening their belief in their ability to withstand challenges of all kinds (Aharoni, 2006; Ratey, 2008).

4.1 Theories explaining the effect of physical activity on human behavior

A number of theories have been formulated to explain the factors underlying behavior changes resulting from physical activity (Dubnov & Barry, 2000; Aharoni, 2006).

4.1.1 The neurobiological theory

This is the central theory explaining the effect of physical activity on human behavior. The theory is supported by studies conducted by brain researchers and physicians. The main contention is that, under certain conditions, vigorous physical activity causes changes in the levels of many chemical substances released in the body, including hormones, and affects how nerve receptors and transmitters function.

Actions that begin in the brain as a result of physical activity and stress set off a chain reaction of hormonal and neurological processes.

The effect of these substances on learning and memory also works through an intra-cell mechanism in the nervous system called LTP, or long term potentiation. In this process, nerve cells become stronger and more able to send signals in the synaptic space, which facilitates better communication between the synapses (Ratey, 2008).

4.1.2 Distraction theories

Physical activity distracts us from daily problems. It becomes a form of “time out” from sources of stress and depression. This distraction allows us to recover and generate new energies

4.1.3 The thermogenic theory

Physical activity raises brain temperature. This temperature change may cause biochemical changes that lead to alterations in mood.

4.1.4 The success theory

Those engaging in sports experience a sense of success with their involvement and from the physical activity itself. This success leads to a feeling of satisfaction and enjoyment, which evidently reduces depression levels.

4.1.5 Arousal theories

Physical activity that involves risk taking and higher arousal levels, such as car racing, free fall diving, extreme challenge activities or, among children, jumping down from a very high place in the playground, is of medical and psychological value for individual development or recovery (Zuckerman, 2007). Risky physical activity strengthens participants, raises self image and contributes to a feeling that “I am capable and able” as well as providing enjoyment from the activity itself. Many challenge sport programs and survival treks for youngsters and adolescents suffering from adjustment problems are based on this phenomenon.

Physical activity rapidly and quite reliably reduces tensions and improves mood. Almost any type of movement activates the musculo-skeletal system and reduces stress (Baumel, 2000;). Physical activity raises arousal level, giving individuals a feeling of heightened energy that helps them to function more effectively and more objectively, even in making cognitive decisions (Cotman & Engesser-Cesar, 2002).

Chapter 5 : From a gap in knowledge to a contribution to knowledge

5.1 Quantitative research

Considering literature reports of the positive effects of physical activity on human behavior in general, and especially in dealing with attention and concentration disorders among children, it is important to examine more closely all the options latent in physical activity as a rehabilitative and healing factor. From the recommendations of the studies cited in the literature review, it appears that studies of

various activity parameters and means of measurement of human behavioral abilities should contribute significantly to an understanding of the phenomenon and to formulating ways and means of working with children and adults suffering from behavioral difficulties (Vigal et al., 2003; Mor, 1997; Tantilo, 2002).

In light of growing interest in the connection between physical activity and the brain (Ratey, 2008) and previous studies that proposed hypotheses and recommendations about further research (Mor, 1997; Tantilo, 2002; Vigal et al., 2003), the present study is intended to supplement some of the knowledge missing about the effect physical activity on attention and concentration.

5.2 Gap in knowledge

Based on the literature review presented earlier, a number of research directions remain unexamined in terms of research populations, and methods of measurement and of physical activation. From a survey of the literature it appears that studies of the connection between physical activity and cognitive functioning in adults and especially in children with learning disabilities and attention and concentration deficits have involved small experimental groups (Allen, 1980; Vigal et al., 2003; Tantilo, 2002; Wendt, 2001).

In many of these studies, the experimental group included children who conform to DSM or other criteria for attention and concentration deficits. Such diagnoses did not take into account a large number of children with mild or complex cognitive disorders whose attention and concentration abilities were borderline or low and were not included in those studies. In terms of measurement, the literature review reveals several methods for examining the effects of physical activity. Most of the studies of children with attention and concentration disorders employed indirect methods, such as measuring blood levels of catecholamine, which affects attention and concentration levels (Vigal et al., 2003). Another method used subjective questionnaires of behaviors that indicate attention and concentration functioning. These were usually completed by educators or family members (Wendt, 2001).

Studies are lacking that directly measure attention levels objectively and accurately, and that combine direct and indirect methods of evaluation.

In terms of physical activity, studies used a wide variety of activation means prior to testing cognitive abilities. Many studies employed physical activation related to cardiopulmonary endurance, often in laboratories on ergometric bicycles or treadmills for close monitoring of activity intensity and volume. Others made use of physiological markers that were evaluated in the laboratory using diagnostic tools (Vigal et al., 2003; Tantilo, 2002). Other studies conducted physical activity outside of the laboratory (Mor, 1997; Allen, 1980) with or without base monitoring devices such as pulse meters for short-burst high intensity (anaerobic) activity or submaximal physical activation (Mor, 1997). Some studies measured intense physical activity connected to muscular power. No studies were found that compare different types of activities for the same fitness component (such as swimming and bicycling for aerobics) on the same population group, comparing different types of physical activity such as yoga and running or studies that examine the effect of aerobic vs. anaerobic activity on the same population group.

5.3 Contribution to knowledge

On the basis of the different research methods and interventions not examined to date in this field, it was decided that this study would address the following components in order to supplement knowledge in these areas:

It will examine a population of children with learning difficulties, which constitutes a broader population than children with attention and concentration disorders only.

It will use a direct method to evaluate attention and concentration after physical activity. This is in contrast to indirect methods used in other studies of children with attention and concentration disorders.

It will compare different conditions of physical activation in terms of energetic requirements pertaining to the duration, intensity and volume of effort.

In past studies, different physical tasks were selected to examine their effect on attention, concentration and various executive functions. The aim of this study is unique, in comparison to others cited in the literature review, in that it employs a test specifically constructed to examine attention and concentration and also compares two activity conditions, aerobic and anaerobic, using children with learning disabilities as the participants in the study.

The information that this study is intended to contribute to the corpus of knowledge on the subject is both theoretical and applied.

In terms of theory, this study can contribute to existing knowledge about how physical activity affects attention and concentration in terms of immediacy and duration of effect, and which types of physical activities have an effect. It can also help to construct a theoretical concept about the potential role of physical activity in cognitive learning processes. In terms of research innovations, this study employs reliable and valid tests of attention to examine the effect of physical activity on children with learning disorders. In terms of creativity, this study compares two different conditions of activity, aerobic and anaerobic, which will expand the scope of research for examining differences between different types of physical activities. In terms of actual application, this study can provide tools for determining how to use physical activity to improve attention and concentration abilities in the following aspects: the duration and intensity of activity required for creating the physical activity effect on attention and concentration, and the physical activity methods that best facilitate the positive effect of activity on behavioral and cognitive abilities.

5.4 Aim of the quantitative part of the study

The aim of this quantitative study is to test the hypothesis that a connection exists between physical activity and children's ability to concentrate. The research will employ a field test rather than a laboratory test, in order to simulate the natural conditions in which children function during the day.

This study will examine the effect of physical activity on learners' concentration. As mentioned in the introductory chapters, concentration is one of the most important and base components of learning.

Analysis of the findings may indicate the various ways in which to obtain the physical activity effect on attention and concentration.

Attention and concentration were selected as the cognitive task to be examined in this study for the following reasons:

These are clear and defined tasks with valid and reliable tests

Attention and concentration are base abilities necessary for all behaviors and learning

The effect of various types of physical activity on attention and concentration may lead to the use of such activity to promote a variety of cognitive and behavioral aims.

5.5 Qualitative research

Physical activity as a therapeutic tool for behavioral problems represents part of the overall therapy process. Therapeutic processes are multidimensional, and especially when dealing with children with special needs. Parental involvement in these processes and the attitudes of the therapists toward therapeutic ties are significant components of the process.

Physical activity and sport have been used for therapy for many years but the aspects that have been researched in this field deal mainly with physiological, motor and cognitive processes of the treatment. Insufficient information is available about the nature and components of the therapeutic process.

With the expansion of interest in behavioral problems connected to concentration and attention, psychological and neurological research has increased in recent years and many more patients with these problems have been referred to therapeutic sport centers. Health services and supplementary medical insurance companies have recognized this type of therapy, allowing parents to bring their children to such centers and receive treatment intended to improve the children's abilities through movement, games and sport, including therapeutic swimming and therapeutic horseback riding.

5.6 Gap in knowledge

A gap in knowledge exists about the attitudes and stances of parents and therapists toward these therapeutic methods, attitudes towards the children, and the behavioral and affective procedures that constitute part of the physical activity therapeutic process, this gap calls for deeper investigation. This is especially true about the perceptions and attitudes of parents and therapists towards the effect of aerobic and anaerobic physical activity on behavior, concentration and attention.

Questions pertaining to how much parents and therapists know about the factors within physical activity that affect the behavior, attention and concentration of children in treatment, and the various components of the activity and their effect on treatment, are important for the therapeutic process. Information in the research literature addresses the primary mechanisms of influence but does it reach the consumers and service providers? If so, what use do they make of it in the therapeutic process?

5.7 Contribution to knowledge

This study examines the use of sport and physical activity to treat children with learning disabilities and behavioral problems, from the point of view of parental involvement in the process.

The uniqueness of the field of therapy through physical activity stems from the type of therapists in this field. The training process they undergo is not uniform as is training for occupational therapy or physical therapy. Most of these therapists are physical education teachers by training, some are specialists in special education and some have undergone a specific training process in therapeutic sport. The transition from education to therapy creates difficulties in perceiving their role: are the activities

they conduct considered a lesson or treatment? These difficulties are reflected mainly in their written reports and their approach to what occurs during therapy.

This study can shed light on an area of therapy that has not been studied until now: parental attitudes and involvement, and the attitude of sport therapists. The study will challenge and supplement existing knowledge in the field by focusing more on behavioral and affective aspects of treatment as opposed to the information that has been gathered until now in this field, which emphasized physiological and cognitive aspects of physical activity effects. The study can show the gap between what is available in the professional literature and the perceptions of parents and therapists about the effect of physical activity on concentration and attention among children with learning disabilities.

From a theoretical viewpoint, this study can reveal parents' attitudes toward children in the process of therapy utilizing physical activity, emphasizing the advantages of the process and revealing the processes that occur in therapy from the point of view of the parents and therapists. The results of the study will make it possible to fill in the missing theoretical information in this domain.

From the practical viewpoint, the knowledge accumulated can contribute to an improvement in the processes of therapist training, the quality of therapy itself and control processes over the therapists. The results can present the basic insights of the sides involved in the service, create a common language for future dialogue, and provide recommendations for improving communication between therapists and parents, and clarify aspects of parental involvement in the therapeutic processes.

The uniqueness of the study population is in its variety of populations. The parents and therapists come from different treatment centers around the country. Gathering information from different centers can provide a broader range of views about methods, opinions and attitudes.

The new insights emerging from the qualitative part of this study will enable the development of a field-anchored theory about perceptions and attitudes among service consumers (parents and children being treated) and service-providers (therapists), about treatment methods using physical activity. This theory can help to produce a workable therapeutic model.

5.8 Aim of the qualitative part of the study

The aim of the qualitative part of the study was to examine a number of questions connected to parents' and therapists' knowledge about the factors in aerobic and anaerobic physical activity that affect the behavior, concentration and attention of children in treatment, the various components of the activity, therapeutic processes, parents' attitudes and involvement in the process and their influence on the results of the treatment. Another aim was to examine questions about the attitudes and perceptions of therapists engaging in the treatment of children with behavioral problems through therapeutic sport.

The importance of these aims can be summarized as the opportunity the study provides to gather and examine information in depth, draw conclusions about how the service consumers (the parents) see the phenomenon, and how the service providers (the therapists) understand the phenomenon and how these perceptions are reflected in the treatment processes and results.

Chapter 6: Methodology

6.1. Quantitative research

This part of the study makes use of acceptable and relevant methodologies deriving from scientific principles. It is based on a scientific sample considered adequate by the positivist quantitative approach, which uses objective measurements or observations, experiments, surveys or tests whose scores can be quantified, counted or replicated.

6.2 Research approach

The research approach in this study is quantitative, in keeping with the positivist research method selected. The phenomenon under investigation is the cognitive ability called attention. Attention can be measured quantitatively by means of tests that evaluate attention. The test selected has been found to be valid and reliable and applicable to the age group under examination. This test of attention facilitates quantitative research and is supported by the collection of numerical data. As the research aim is to investigate the effect of physical activity on attention, using quantitative measurements of attention, it can be said that a correspondence and consistency exist between the research aims and the positivist research paradigm that was selected.

6.3 Research tools: d2 test

Psychological tests such as IQ tests examine general mental abilities, which are comprised of many parameters. Therefore, tests for mental attention and concentration are preferable for eliciting information about these specific human abilities (Manor & Tiano, 2001).

The present study employs quantitative methodology, using the d2 test (Brickenkamp, 1962), a test which has been found to be valid and reliable for measuring attention levels. The d2 test belongs to specific tests for attention, selective attention and attention span (Lazak, 1995). It is a test designated to measure selective attention and mental concentration. Participants must focus on a variety of stimuli and then filter out the irrelevant stimuli while performing the task rapidly, accurately and within a given time period

6.4 Experimental Group

20 boys ages 11-13 were selected from the "Orchot Hayim" religious school in Bnei Brak, in the center of the country. Not all of the children completed all of the tests for a variety of reasons, including illness and a lack of desire to participate in one or more of the tests.

The sample population was selected from a special education school in the religious sector. The catchment area for the school is the entire central area, from Netanya (30 km north of Tel Aviv) to Ashdod (30 km south of Tel Aviv). Children are placed in this school if they cannot not find a place within the regular ultra-orthodox education system. All of the children in the school were first diagnosed as having various types of learning disabilities. The sample group was selected random.

The children's ethnic background was diverse, as was their families' socio-economic status. The sample represents a population of adolescent aged children with diverse learning problems who attend special education schools. In this study, this experimental group represents children with learning difficulties. This population was chosen to answer the research question, which deals with children with learning difficulties, with no clear diagnosis of attention and concentration problems. The age of the study sample was chosen so that the participants could deal effectively with test instructions despite their learning difficulties and perform the d2 test according to instructions.

The school from which the population was selected is part of the independent school network and combines a program of religious studies with regular school studies. Physical activity in the school is provided as healthful physical activity, which is supplemented by activity during recess, whether or not it is initiated by teachers.

6.5 Control group

20 boys ages 11-12 from grades 5 and 6 in the Kochav Hazafon school in Ashkelon comprised the control group. The children selected were reported by the educational staff as not suffering from learning disabilities.

Not all the children performed all the tests, either because of illness or personal reasons on one of the test days.

Population characteristics

The sample population was selected randomly from children in a state school in the city of Ashkelon. The ethnic origins of the children were varied as was the socio-economic status of the children's families.

The sample population represents with no known or diagnosed learning problems. None of the children in the group was identified by the school staff as suffering from learning disabilities. This population represents "normal" school children in the regular school system.

This population was selected in order to represent a contrast to the experimental group. In addition, it can also help to elucidate the effects of physical activity on attention and concentration among school children classified as not affected by learning disabilities.

As with the experimental group, the age of the study sample was chosen so that the participants could deal effectively with test instructions. The number of participants selected to participate in the control group matched the number of participants in the experimental group.

The school from which the children were chosen is part of the regular state secular school system. The school has in recent years absorbed a large number of new immigrant children, mainly from the former Soviet Union. In terms of physical activity characteristics, the school offers each class twice-weekly Physical Education lessons, in keeping with Ministry of Education requirements. In addition, active recesses and intramural ball game tournaments offer additional physical activity.

6.6 Research Design

The research design included three stages, each of which was followed by the d2 attention test: the base stage, the aerobic effort stage, and the anaerobic effort stage.

Base (B) level – d2 test not preceded by physical activity

The test form was completed with no intervention before or afterwards.

Aerobic effort (A) stage – d2 test after aerobic exercise

The children were given an explanation of the nature of aerobic effort, with an emphasis on there being no competition between children, each one moving at his own pace. Activity consisted of 12 minutes of continuous effort of running/fast walking without stopping. The walking/running was performed on the specially prepared 30 meter-long area. Children maintained aerobic heart rate using the Polar watches they wore and in accordance with safety instructions. After the run/walk was completed and the children had rested for two minutes, they then completed the test form.

Anaerobic effort stage (U) – d2 test after anaerobic effort

The children were given an explanation of the nature of anaerobic effort, with an emphasis on there being no competition between children, each one moving at his own pace. The children ran 120m in the specially prepared 30m area (four times the length) with no stops. Maximal time for completing the effort was one minute. After the run was completed and the children had rested for two minutes, they completed the d2 test forms.

The experimental and control groups met with the testers three times each, with a one-week interval between meetings. Each child was tested three times, once in each condition, once at each meeting. The test order for each of the children was determined randomly in order to minimize the learning effect when performing the tests.

6.7 Researcher's role

In this study the researcher coordinated the tests and formed part of the team that checked each stage of the test for both the experimental and control groups. The researcher provided explanations to the educational staff, helped conduct the test procedures, which included demonstrating and explaining how to complete the d2 test and timing the tests. The collection and input of data to the computer were done by a research assistant.

6.8 Research hypotheses

In condition B (Base), that the control (CONT) group would score higher on various attention variables (AV) than the experimental (LD) group. The AV include TN, E1, E2, CP and FR.

In condition A – after aerobic activity – no difference would be found in AV variables between the LD and CONT groups.

In condition U – after anaerobic activity – no difference would be found in AV variables between the LD and CONT groups.

6.9 Variables measured

Dependent variables – concentration and attention measures of the d2 test

Independent variables – base condition, without physical activity; aerobic activity condition; anaerobic activity condition.

6.10 Statistical procedures

Two-way analyses of variance with repeated measures (RM) were conducted for the various measures of the d2 test. The design was 3X2: 2 groups (LD and CONT) in 3

test conditions (base, aerobic and anaerobic). LSD was used as a follow-up test for all the statistical comparisons. Level of significance for all the statistical comparisons was set at 0.05.

6.11 Ethical Considerations

6.11.1 Authorization by the school principle

The aims of the test, the nature of the activity and tests to be performed, the significance of the results for the children, and the contribution of the findings to the educational process were explained to the principal in a telephone conversation. After the principal expressed his willingness to allow the tests to be conducted, he conditioned final approval on written permission from the test children's parents.

6.11.2 Request from parents

The school principal sent the parents a letter in which he detailed the aims of the test and nature of the activity. The parents were asked to authorize the activity. As a result of the letter, several parents called to receive additional clarifications about the test, and after the school principal received all of the letters signed, he gave permission to begin the tests.

6.11.3 Discretion

In collecting data, only the first names of the children were taken. The test data were saved in the computers of the researcher and of the statistical adviser and were not disclosed to any other party.

6.12 Qualitative research methodology

This section of the study employed the qualitative approach with its many research approaches, traditions and methods (Zabar Ben Yehoshua, 2001).

Qualitative research investigates things in their natural context and tries to elicit meanings or interpretations of phenomena in terms used by the people involved. This definition emphasizes the importance of the research text, the interpretive activity of qualitative researchers and the natural connections they investigate (Denzin & Lincoln, 2000).

In this study, the object of the study is to investigate the perceptions and attitudes of the parents and therapists to using aerobic or anaerobic exercise and to the nature of physical activity and the factors contributing to therapeutic success in treating children with learning disabilities and behavioral problems through adapted physical activity (therapeutic sport).

In order to enter the inner world of the parents and therapists, to learn of their perceptions of the various treatment processes undergone by the children with learning disabilities through physical activity, it is necessary to interview and listen to parents and therapists instead of trying to explain the phenomena through laws, generalizations and percentages as is done in quantitative research.

During the process of design research questions arouse a central question related to parental involvement that can affect the views and their attitudes.

Extensive literature describes parental involvement in educational and therapeutic processes. The involvement is described through models and empirical studies that present the connection between parents and therapists and the educational and therapeutic processes in which they participate.

6.13 Research method.

The research method in this paper was a case study. A case study is defined in several ways but all have a common element: the understanding that no matter how unique a case may be, several things can be learned from it about personal or organizational human behavior, and thus about the processes that occur in the case under study (Yosephon, 2001 in Zabar Ben-Yehoshua, 2001).

In this study the research method is based on the collective case study. A relatively large number of cases (11) were studied. Each case had two sources of information which included interviews with parents and with therapists, for a total of 22 informants. It examines the cases within a specific type of therapeutic environment.

6.14 Research tools

The research tool employed was in-depth interviews in which the rules of ethics, privacy and confidentiality were maintained. From the answers provided in the interviews, units of information are extracted that form ideas and insights about the subject of the research.

6.15 Research procedure.

Interviews with the parents and with the therapists were held at the therapeutic sport centers without the presence of the children. Preceding the interviews, parents were told the research question and aim, after which they were asked open questions about the therapeutic processes. Each interview lasted one to one-and-a-half hours. The aim of the interview was to learn about the parents' and therapists' attitudes and perceptions of the effect of aerobic and anaerobic physical activity on the child being treated and on various aspects of the therapeutic processes. Absolute confidentiality about the content of the interviews was assured.

6.16 Test materials

The equipment used for this part of the study included interview pages with instructions for carrying out the interview and guiding questions for the meetings with the parents and therapists.

6.17 Research population

The research population included parents and therapists from therapeutic sport centers around the country. The total number of participants was 22: 11 parents and 11 therapists.

8.18 Data analysis

In qualitative research, data analysis is an analytical process with intuitive characteristics whose aim is to give meaning, interpretation and generalization to the phenomenon under investigation. The research is directed according to the cumulative findings which are then connected into a theory and to the findings of other researchers, in order to create a generalization and to expand the reliability of the conclusions.

The process of building and formulating the categories included three main stages: Open coding: initial stage, in which subjects that appear repeatedly are identified and characterized; data are divided into meaningful segments and names are given to similar phenomena;

The categorization process

In this process the variables were identified and defined in order to determine the dimensions of the analysis. The components worthy of investigation were chosen (Goetz & LeCompte, 1984). The improving, refining and reformulating processes were part of all stages of the study, ending only with the final analysis of the categories (Zabar Ben-Yehoshua, 2001).

During content analysis, the researcher organizes the phenomenon into categories and relationships between categories, based on several instances. Afterwards he refines, alters and revises the category definitions. Data are classified into defined dimensions and the frequency is examined for each dimension. By combining these two actions it is possible to formulate and design general criteria for analysis that suit the entire collection of cases under study, and to quantify the findings and examine the frequency of the phenomenon in each dimension (Goetz & LeCompte, 1984).

6.19 Reliability

Reliability of a research tool indicates the extent of variable errors in measurement (Zabar Ben-Yehoshua, 2001), where high reliability indicates that similar data were obtained in repeated measurements.

In this study the principle of patternization was maintained through many observations, the use of the collective case study tool, which allowed the examination of 22 cases in this study. This tool made it possible to identify repetitive patterns among parents and therapists in the centers.

Documentation, uniform protocols, and building a broad data base were also performed in this study. Each of these components helped to shed light on phenomena that appeared as repetitive patterns in the parents' and therapists' attitudes in the therapeutic sport centers.

6.20 Validity

In this study internal validity was based mainly on the cross-checking of data from two sources, the interviews with the parents vs. those with the therapists. The information elicited from these two sources made possible more accurately organized categories and generalizations. The meaning given to the description of the reality by these two agents provided validity to the repetitive patterns that were noted, from

which it was possible to draw conclusions and develop insights from the findings of the interviews.

During the process of defining the research questions and categories, separate examinations of the content matter were conducted by two independent referees, one from the domain of qualitative research and the other from therapeutic sport. As the questionnaires were constructed, the extent of agreement between the researcher and the two experts was found to be very high. On the few items that provoked disagreement regarding analysis, a process of reciprocal persuasion was undertaken until all sides agreed. In addition, the researcher in charge of the study served as triangulation validator, as is usual in such cases (Zabar Ben-Yehoshua, 2001). Additional validation by external referees was obtained by sending the various categories, interview questions and conclusions for evaluation by two additional referees. These referees were directors of therapeutic sport centers with more than 10 years of experience in the field. Their comments and insights helped to design the discussion and evaluation process in this study.

Chapter 7 : Findings

7.1 Quantitative research Findings

In general it can be said that differences were found between the Learning Disabilities group and the Control group in some of the Attention Variables of the d2 test. The findings indicate a group x condition interaction in some of the Attention Variables measures of the d2 test.

An examination of the findings pertaining to the conditions alone, indicates no significant differences in AV measures of the d2 test between conditions (B) base, (A) aerobic and (U) anaerobic.

The results of this study correspond to the results of other studies in the field, indicating the effect on attention and concentration as a result of physical activity. The main and most important measures of the d2 test, TN and CP, indicated changes in attention and concentration measures in the LD group as a result of aerobic physical activity that brought them on a par with the results of the control group. Thus, the aim of this research appears to have been attained, indicating that changes in attention and concentration measures in a group of learning disabled children were created even after a relatively short period of aerobic physical activity – a matter of a few minutes.

7.2 Qualitative research Findings

The aim of the qualitative research was to examine the attitude of parents and therapists regarding the effect of aerobic and anaerobic physical activity on attention and concentration as part of therapeutic physical activity. During the investigation additional questions that were connected to the central question arose, such as: Which children with learning and behavioral difficulties come for physical activity treatment and what are their characteristics? Another question arose: What is the extent of parental involvement in the therapy in terms of ties with the therapist and the therapeutic process? This is important because involvement might affect the parents' attitude and knowledge about the effect of aerobic and anaerobic physical activity on attention and concentration.

From the answers given by the parents and therapists to the interview questions, descriptions were collated and encoded in various categories. The relative weight of each category, from among all the descriptions, was also examined.

In general a correspondence was found between the parents' and therapists' responses to the various questions. For example, parents and therapists both perceive the children's main characteristics to be learning and behavioral difficulties. Parents and therapists both believe that physical activity can contribute to children's learning and behavior. Both groups cite behavioral learning processes as an important component affecting attention and concentration.

Neither parents nor therapists pay much attention to body-soul effects in therapy. Both groups have a basic understanding of the differences between aerobic and anaerobic physical activity. Their explanations, however, deal more with the nature of activation in the two conditions and less to the differences in energy requirements that they demand of the body. Thus, parents and therapists describe the tasks in the lesson as built from intense, short anaerobic exercises with very little aerobic activity.

As for the therapeutic process, the descriptions of the parents and therapists refer mainly to what the child underwent in the session and the stages of treatment.

Both groups report that treatment is adapted to the child. The parents describe this adaptation in terms of the child's progress. The therapists also describe how they adapt the activities to the children's needs.

Regarding the results of treatment, parents and therapists report improvement in several domains. The main domain mentioned is behavior, with the first signs of improvement appearing after a few lessons or after a few months of treatment.

Most of the parents describe their relationship with the therapists as based mainly on professional ties. A few of them mention closer relations that develop mainly because of the therapists' empathy towards the children. The therapists also note their professional relationship and some state that the friendship that develops is based on feelings of mutual trust.

Parents and therapists make mention of exercises to perform at home and tasks assigned by the therapists. Some of the parents say that they performed the tasks while others admit that they are too difficult to carry out.

In some cases, the therapy goals are set by parents and therapist together.

The activities undertaken by the therapist to strengthen the parents entail instruction and empathy and imbuing parents with belief in the child's success.

Most of the parents express satisfaction with the therapist's functioning and mention very few cases of therapists not understanding the parents' difficulties. Almost no reports of parents' resistant behavior treatment appear among parents or therapists.

Parents and therapists perceive their cooperation as essential for the treatment success.

Parental involvement in the therapy is based mainly on regular updates by the therapists. The parents' view the therapists' ties with educational and therapeutic organizations as part of their involvement and as a source of strength for the parents.

The results of the qualitative research revealed a general correspondence between the reports of the parents and the therapists regarding the efficacy of physical activity in treating children with learning and behavioral problems. Both parents and therapists reported an improvement in the children's behavior, beginning after several lessons that included physical activity.

There is a correspondence between the responses of the parents and therapists regarding the structure of the treatment in terms of short intense exercises, indicating the parents' familiarity with what occurs in the session and the use of this structure of exercises by the therapists

Therapists and parents make little reference to the effects of aerobic physical activity on central bodily systems of the body, such as the nervous and hormonal systems, and on attention and concentration

There is a correspondence between the responses of the parents and therapists regarding the use of aerobic physical activity in the treatment, indicating that both these therapist and parents' say that the use of this structure of exercises is limited, findings underscore the lack of aerobic activity employed by the therapists.

Chapter 8 : Recommendations

8.1 Recommendations for quantitative research

It is recommended to consider conducting studies using a combination of measurement tools, including various sampling methods or brain scanning, computerized tests of attention and concentration such as TOVA and IVA (Manor & Tiano, 2001), tests of attention fields (Shalev-Mevorach, 1999), in parallel to physiological measures or subjective psychological tests.

It is recommended to conduct additional studies that compare direct tests of attention, such as the d2 test, TOVA and IVA, or sophisticated research tools such as brain imaging, with indirect tests of attention such as physiological tests that examine changes that occur in the body in terms of substances such as catecholamine, which is known to have an effect on the nervous system in terms of attention and concentration. Studies of this type can strengthen the criterion validity of the various measurement tools and create a synergy among researchers from various disciplines such as physicians and physiologists, both of whom use physiological measurement tools, and psychologists and educators who use psychological diagnostic tools (Wendt, 2001).

The possibility should be examined of conducting additional studies that include parallel examination – testing one group of participants with the same physical activity in different activity environments: laboratory tests can include studies that include comprehensive tests of children's base physical fitness ability, monitoring intensity of exercise by laboratory means, such as VO₂max, which are beyond simply measuring pulse, treadmills, or other accurate measurement methods for measuring intensity (Vigal et al., 2003; Eliakim et al., 2005). These can be compared with tests that use simpler monitoring devices that are suitable for use in the field, such as a pulse meter. Studies of this type will enable researchers in the future to better understand whether significant differences exist between the monitoring and measurement methods of the population or of the physical activity and whether it is sufficient to use field tests in studies of this sort, so that the studies will be simpler, enable physical educators to conduct them, keep the costs of the study lower and conduct them in the natural environment of the children and not in laboratories or hospitals.

8.2 Recommendations for qualitative research

It is important to continue to research the processes that occur during therapeutic sport activity both in professional terms of therapy aims, methods of treatment, diagnosis and evaluation, and in terms of the therapeutic process, ties between therapist and patient, ties with the parents and their involvement in the therapeutic process.

There should be an emphasis on the processes of training new therapists coming from the fields of movement, games and sport. They should be exposed to work methods anchored in the research field and in the knowledge that has been amassed from therapeutic centers that work with children with learning disabilities and problems of attention and concentration with a behavioral background, with an emphasis on implementing aerobic exercises.

Inservice courses should be made available to therapists already in the field in order to make them aware of practical experience and recent research studies about using therapeutic sport for treating children with learning disabilities and attention and concentration deficits.

Simple, effective and applicable tools should be made available to therapists and parents on the basis of research knowledge for activating children aerobically within the school, during therapy and at home.

8.3 Recommendations for developing a new theoretical and practical model

Ways must be found to examine the processes of behavior therapy through sport, movement and play and their effects on children should be investigated.

One way is investigating the various studies that dealt with the effect of physical activity on the brain and its processes, creating temporary or permanent changes in the brain functioning, established the physiological aspect of the use of physical activity as a therapeutic work tool for children or adults with behavioral problems. The finding of the present study and others indicates that aerobic activity should be used as the main physical activity, with its proven effect on the on behavior (Ratey,2008; wendt,2001).

Another area that arose in the literature review and from the findings of the qualitative research in this study is the use of physical activity as a model for changing values and behavior. The natural environment of children in play and sport, as a central and meaningful arena in their lives, offers educators an opportunity to utilize the game and sports processes to develop behavioral, personal and social skills that are based on the work tools of applied behavior analysis (Eldar, 2002). Educational tools such as feedback and reinforcement for positive behaviors and punishment as part of the rules of the game create clear behavioral boundaries. Ways must be found to examine the processes of behavior therapy through sport, movement and play and their effects on children should be investigated.

Another influence that may have theoretical significance and possibly practical significance is the use of the structure of various physical activity exercises as a tool for shaping and nurturing behavior as it was reported by the therapist and the parents in this qualitative study. In other words, planning exercises structured in advance so that they require perseverance, concentration, attention and restraint can lead to cognitive and behavioral changes in the person performing the exercises.

The theoretical and practical model proposed as a new field of study is the B.B.B model that combines the three dimensions mentioned above and that have an effect on human behavior as a result of physical activity:

Brain – the effect of physical activity on the brain and the changes in the brain that effect the human behavior.

Behavior – the use of activity characteristics of the rules of games and sport in order to educate for values

Building – the use of the structure of exercise and the nature of its activity to practice desired behavior.

The components of the **B.B.B.** theoretical model should be studied, individually and as a whole, comparing between the model components in order to find the benefits of each of the components.

Selected bibliography

Aharoni, H. (2006), Movement, physical activity and adapted sport: Tools for healing, treatment and rehabilitation. Rehabilitative Division of the Social Workers of Israel, Aman, D. (2005). Get your brain in shape in 15 days. Tel Aviv: Focus.

Aviram, Y., Benayahu, M., Gil, E. & Panon, R. (1959). Encyclopedia of sport and body culture. Jerusalem: Am Oved.

Barkley, R. A. (2000). Genetics of childhood disorders: The executive functions and ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 1064-1068.

Birnbaum, M (1993). Who's afraid of research work? University Publication Projects. Blumenthal, J.A., Babyak, M.A. & Moore, K.A. (1999). Effects of exercise training on older patients with major depression. *Arch Intern Med*, 159(19): 2349-56.

Brickenkamp, R. (1962). *Aufmerksamkeits-Belastungs-Test (Test d2)*. [The d2 test of Attention.] (1st ed.). Göttingen: Hogrefe.

Brickenkamp, R. & Zillmer, E (1998). *The d2 Test of Attention*, First US Edition. Cambridge: Hogrefe & Hober.

Broadbent, D.E. (1958). *Perception and communication*. London: Pergamon.

Calderon, R. (2000). Parental Involvement in Deaf Children's Education Programs as a Predictor of Child's Language, Early Reading, and Social-Emotional Development *Journal of Deaf Studies and Deaf Education* 5 (2). 140-155

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *Handbook of qualitative research*. Thousand Oaks, CA: Sage

Eldar, E. (2002). *Applied behavior analysis*. Tel Aviv: ABA Israel Publ.

Eliakim, A., Nemet, D., Zaldivar, F., McMurray, R., Culler, F., Galassetti, P. & Cooper, D. (2005). Reduced exercise-associated response of the GH-IGF-I axis and catecholamines in obese children and adolescents. *J. Appl. Physiol*, 100: 1630-1637.

- 2008). Physical activity among children in health and in (Eliakim, A., Nemet, D., illness. Personal publication.
- Elizur, Y. (1996). Involvement, partnership and empowerment: Model for developing a work alliance with families. *Conversations*, 10(2), pp. 92-104.
- Elleberg, D., & St-Louis-Deschenes, M.(2009). The effect of acute physical exercise on cognitive function during development. *Psychology of Sport and Exercise*, 11(2): 122-126.
- Guba, E. G., & Lincoln, Y. S. (1981). *Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches*. San Francisco, CA: Jossey-Bass.
- Guba and Lincoln, (1994). "Competing paradigms in qualitative research." In N.K. Denzin and Y.S.Lincoln (Eds.), *Handbook of Qualitative Research*, Thousand Oaks, Ca: Sage.
- Haber, D. (1990). *Don't like to read. Multidimensional treatment of learning disorders*. Tel Aviv: Ramot.
- Ingber, S., & Dromi, E. (2009). Demographics Affecting Parental Expectations from Early Deaf Intervention. *Deafness Education International* 11(2): 83–111. DOI [doi.2577/10.1002](https://doi.org/10.2577/10.1002)
- Jasmin, L. R., (2011).The behavioral effects of increased physical activity on preschoolers at risk for attention deficit hyperactivity disorder. A Thesis Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of master of science- Psychology.
- Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, N.J: Prentice-Hall.
- Kaiser, A. P., & Hancock, T. B. (2003). Teaching parents new skills to support their young children's development. *Infants & Young Children*, 16(1), 9-21
- Kaniel, S. (2001). *Psychology of the control of consciousness*. Ramat Gan: Bar-Ilan University Press.
- Kanitz, M. (2004). *Physical fitness: Personal guide to physical activity for health and weight loss*. Tel Aviv: Mentor.
- Posner, M.I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology*, 32:2-25.
- Rachmani, L. (1984). *Introduction to clinical psychology*. Tel Aviv: Diyoonon, Tel Aviv University & Henrietta Szold Institute.
- Ratey, J. (2005). *A User's Guide to the Brain: Perception, Attention, and the Four Theaters of the Brain*. Zmora Bitan

Ratey, J. (2008). *Spark: The Revolutionary New Science of Exercise and the Brain*. Eric Hagerman (Author). New York, Boston, London: Little Brown and Company.

Sagiv, M. (2004). *General physiology and physiology of exercise*.

Shapira, A. (2004). ADHD. Psychology Hebrew. net. (May 26, 2004)
<http://www.hebpsy.net/showProfile.asp?id=1148>

Shkedi, A. (2010). Narrative based theory: Structuring theory in qualitative research. In L. Cassan and M. Cromer-Nevo (Eds.), *Data analysis in qualitative research*, pp. 438-461. Beersheba: Ben Gurion University of the Negev.

Smith & Kalka (2007). *Nitzan Association scale of learning disabilities*.

Wendt, M. (2001). How running and exercise can impact the behavior of children. KidsRunning.com. Retrieved August 8, 2006, from <http://www.kidsrunning.com>

Zabar-Ben Yehoshua, N. (Ed) (2001). *Trends and traditions in qualitative research*. Jerusalem: Dvir Publication

Zakai, D. (2002). *Fundamentals of cognitive psychology, units 4-5*. Ramat Gan: Open University.