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**CULTIVATING A CULTURE OF ADHERENCE TO
PHYSICAL ACTIVITY AMONG ISRAELI
PHYSIOTHERAPISTS**

Ph.D. Summary

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INTRODUCTION

"Physical inactivity - the biggest public health problem of the 21st Century"
(Steven N. Blair, 2009)

A well-known researcher in the field of Physical Activity made this statement. He called the world to consider seriously the phenomenon of a gradual and significant decrease in the level of physical activity within the population, due to western lifestyle and the severe implications of this phenomenon to public health, longevity and prevalence of chronic diseases

A direct correlation exists between physical activity and the healthy state of the cardio and pulmonary system by decreasing risk of Chronic Heart Disease, Chronic Vascular Disease, strokes and hypertension (Bauman, 2004). Additionally, physical activity improves cardio-pulmonary fitness, and it is in a direct dose-response relation with intensity, frequency and duration of physical activity. As professionals working in the field of health, Physiotherapists are in an excellent position to promote and educate physical activity in the many clients who come to them for physiotherapy, with problems that could be averted if they led a more active life style. Thus it is important to understand which factors are connected with long term adherence in physiotherapists to physical activity so that they can serve as advocates of an active lifestyle for their clients (Shirley, 2010).

This research takes place in Israel, by a physiotherapist researcher, who has been trying for years to promote the domain of physical activity among physiotherapists in correspondence with similar trends worldwide

This research is of great importance for promoting physical activity among the general population knowing that health professionals who engage in physical activity will promote an active lifestyle among their patients (Fie, 2011).

The research engages in the fields of physical activity, physical education, health, and psychology as it combines the field of physical activity and health on the one hand, and psychological aspects pertaining to the question of what causes a person to adhere to physical activity on the other.

Research Goals

1. To examine the influence of reasons to begin physical activity on physiotherapists adhering to physical activity in Israel
2. To identify the factors involved in long-term adherence to Physical Activity among physiotherapists in Israel

Research Questions

1. What is the influence of reasons to begin physical activity on adhering to physical activity among physiotherapists in Israel?
2. What are the factors involved with long-term adherence to Physical Activity among physiotherapists in Israel?

Research Hypotheses

1. There will be a positive correlation between the intensity of medical reasons, desire to lose weight, and social reasons to undertaking physical activity.
2. There will be a negative correlation between the level of physical activity during the work day and the degree of long term adherence to physical activity.
3. There will be a positive correlation between the intensity of leisure time physical activity, accessibility to sport activity facilities, the level of physical fitness and one's sense of self-efficacy to the degree of long-term adherence to physical activity.
4. There will be a positive correlation between age and one's state of health to the degree of long-term adherence to physical activity

Significance of the research

The significance of this research is the understanding of the factors connected with adherence to physical activity, in order to promote this topic among physiotherapists and professional healthcare personnel (nurses, doctors, etc.), and thereby increasing the percentage of patients actively engaging in physical activity. This research will increase our knowledge in understanding the complexity of adherence to physical activity. We would expect that people working in the health professions, who are aware of the important advantages of physical activity, would be more active themselves than the general population, and would promote it among their patients.

Part I. LITERATURE REVIEW

This section reviews the background of research, definitions of physical activity, epidemiology of physical activity in the world and in Israel, ways of evaluating and measuring physical activity in the population and theories that pertain to undertaking and adhering to physical activity over time.

Significance and advantages of physical activity

Physical activity definition

There are a number of additional terms used to denote physical activity, such as: physical exercise, physical fitness, etc. The physiological definition of physical activity is every movement that is "created" by the skeletal and muscular systems and which demands energetic expenditure. In addition, there are definitions that add the energetic expenditure into the definition, so that the energy expenditure must be larger than the state of rest.

Physical inactivity – a major and expensive problem

Lack of physical activity is considered to be a significant contributor in the frequency of non-communicable diseases in Western countries, and a factor that is rising significantly in countries with low and middle income (Bauman, 2012).

Lack of physical activity is responsible for more than 3 million cases of deaths per year around the world (Pratt, 2012) with non-communicable diseases (caused as a result of physical inactivity) accounting for 60% of all cases of death around the world, and for more than 80% of deaths in countries with a low to middle income per capita (Pratt, 2012). In epidemiological terms, there has been a change/transition in calculating the economic burden of contagious diseases with that of non-communicable diseases, (caused as a result of physical inactivity) in countries with low to moderate incomes, a process which was in the past characteristic of moderate-high incomes (Miranda, 2008). With regards to the cost of lack of physical activity, many analyses of health systems have been published on this subject. Reviews that evaluated this cost took place in six developed countries using their health systems' data (Allender, 2007). The results were quite similar. Between 1-2.6% of general health expenditures resulted from lack of physical activity. The last review found that direct expenditure on cardiovascular illnesses resulting from a lack of physical activity were quite similar (1.5-3%) (Oldridge, 2008). In addition, a decrease in national product as a result of early death and various disabilities is harder to evaluate and sometimes it is difficult to find any correlation with a lack of physical activity specifically. For example, in Canada in 2004, Katzmarzyk reported that indirect costs resulting from a lack of physical activity were more than double direct costs. It appears that there have been no new estimations since 2007 of direct medical costs

resulting from a lack of physical activity. It is possible that the few estimates that have been published refer only to rich and developed countries in which these estimates have been done.

Evaluating the economic burden turns this problem into a significant public problem (Shephard, 2004). In addition, some relevant policies do not suit academic studies in the area. In low socio-economic countries, where health systems are only beginning to deal with the epidemic of non-communicable diseases, there is a particularly high need to analyze the economic costs of this situation. The gap between the burden on health systems and public health could help to promote dealing with non-communicable diseases (WHO, 2011).

An economic evaluation will of course lead to different orders of preference in order to lead to important health policies. Promoting physical activity and preventing non-communicable diseases becomes a central goal in many countries. Analyzing lack of physical activity becomes necessary as part of an appropriate public health policy. According to the conclusions and recommendations published by the WHO and the literature review of the topic, it is a recognized fact that there is a direct and positive correlation between physical activity and the healthy state of the cardiopulmonary system by decreasing risk of Chronic Heart Disease, Chronic Vascular Disease, strokes and hypertension (Bauman, 2004). Physical activity improves cardio-respiratory fitness, and physical fitness is in direct dose-response relation with intensity, frequency and duration of physical activity. Furthermore, there is a direct cause and effect relationship with Chronic Vascular Disease and Chronic Heart Disease. The risk level decreases with a level of 150 minutes of medium intensity aerobic physical activity per week. Additionally, there is a direct relationship between physical activity and metabolic health including a decrease in risk of diabetes and metabolic syndrome (Bauman, 2005). Another effect of aerobic physical activity is the balanced use of energy and the maintenance of proper body weight. The goal of energy expenditure from physical activity is attainable also in shorter segments of time throughout the day, and not necessarily in one continuous session: for example, short 10 minutes activity as opposed to a single half hour session (Bauman, 2005).

For adults who engage in physical activity, the risk for hip or back fracture is reduced, and as exercise increases, the risk for osteoporosis is lessened (Paterson, 2007). Physical activity enhances muscle mass, strength and neuromuscular connections (Bauman, 2005). Average physical activity exercise is related to a decrease in the incidence of breast cancer, colon cancer - 6-30 minutes of daily routine physical activity significantly reduces the risk of breast cancer and colon cancer (Warburton, 2007). There are many testimonies which show that in comparison with people who do not engage in physical activity on a regular basis, those who do have fewer cases of death due to heart disease or high blood pressure, stroke, diabetes, metabolic syndromes, colon cancer, breast cancer and depression (Bauman, 2005; Warburton, 2007). That being the case, then on the basis of these many clear advantages of physical activity, this research is of great importance for

understanding adherence among health professionals firstly to maintain their own personal health and secondly to exert a positive influence on their patients.

Epidemiology of physical activity

In 2012, prior to the Olympic Games, Lancet published a comprehensive review of the problem of lack of physical activity on a global level. The data in this review are global, and attempt to depict the problem comprehensively. The following figure depicts the rates of inactive populations:

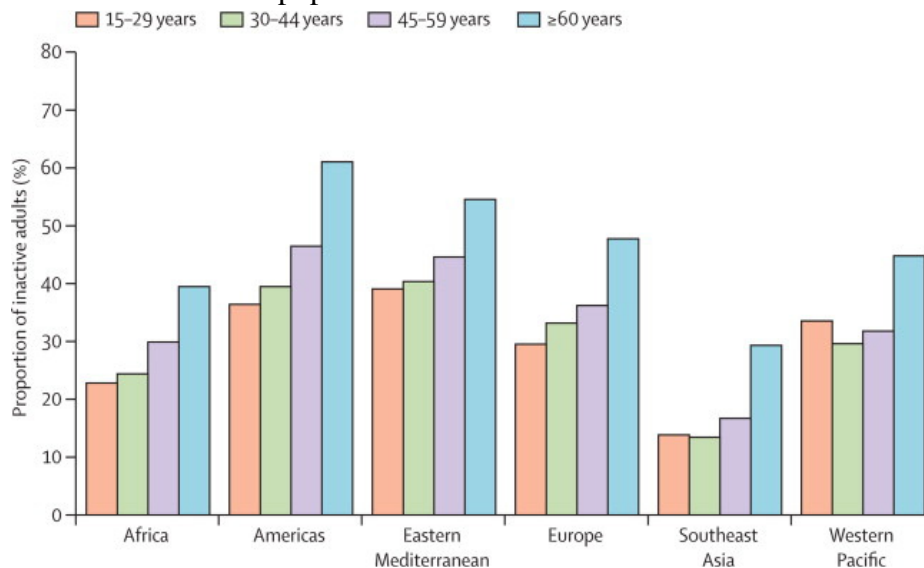


Figure 1: Physical inactivity in age groups by WHO region (Hallal, 2012)

As mentioned earlier, about 31% of the world's population "suffers" from inactivity. The prevalence of the problem increases with age. Physical inactivity is more common in countries where the population lives in medium-high socio-economic conditions (Hallal, 2012). Walking is the most prevalent activity, which also serves as a means of "transport" and physical activity.

Physical activity at a vigorous intensity is known to correlate with health benefits arising from physical activity (Haskell, 2007). In this area diversity is great: In Africa reports are of 38% of the people engaging in vigorous activity, compared to 24.6% in America, 43% in the Middle East etc. In all age groups men have the advantage over women. According to World Health Organization data, some 31% of the world's population was insufficiently active in 2008 (34% women and 28% men), meaning about 3.2 death cases per year are attributed to insufficient physical activity. In 2008, insufficient activity was especially prevalent in U.S.A and the Middle East. In these areas, some 50% and 40% of women were insufficiently active in the U.S. and 36% were insufficiently active in the Middle East. In South East Asia, the rate of insufficient physical activity is the lowest: 15% for women and 19% for men, meaning it is a highly active area. Globally, men are more active than women, with the most significant gap being between men and women in the Eastern Mediterranean region. World Health Organization data reveal that the levels of insufficient or no

physical activity are partly due to lack of participation in physical activity during leisure time and an increase in a sedentary lifestyle at work, as well as a decrease in house chores activity.

Furthermore, there has been an increase in using "passive" transportation (no more walking or riding a bicycle, but driving an automatic car), which also contributes to the decrease in activity. Increased urbanization is connected to some factors that might halt physical activity such as: violence, dense transportation, air pollution, and insufficient parks, walkways and accessible sports facilities (http://www.who.int/dietphysicalactivity/factsheet_inactivity/en/index.html).15/8/13

An additional survey reflects totally different data. According to National Health and Nutrition Examination Survey, less than 5% of the adult population are physically active according to health organizations' recommendations (World Health Organization, American College of Sport's and Medicine), being 30 minutes of moderate aerobic activity on most weekdays. Men are more active than women and there is a decrease in activity during a lifetime. These data are in contrast to those presented earlier. The main explanation of the difference is the way in which the evaluation of activity level was done. In this specific comprehensive survey, the activity was assessed by an accelerometer, which objectively measures activity, whereas previous surveys relied on questionnaires and/or interviews. Hence, the data are so different. It appears, then, that there are different perceptions of the level of physical activity. The level of activity changes considerably over the years. A number of longitudinal studies showed a significant diversity in the level of physical activity with age. In general, the level of physical activity in childhood is high and decreases in adolescence and adult life. Adults manifest a low level of leisure time physical activity, and are less involved in vigorous physical activity. A decrease in the level of physical activity was hard to compare in different surveys, because the way of assessment has differed from one survey to another, but compared to other living creatures, it seems that animals as well, manifest a decrease in physical activity with age. The conclusion, then, is that this decrease in physical activity is not only dependent on the western lifestyle, but also on physiological changes which occur with age, as a natural physiological decline in the human body's motoric and neurological capabilities.

In summary, a review of world data reveals that questionnaires with "high" results reveal 50% physical activity, but in more objective activity measures, the picture is completely different, and we can see a low rate of those who reach satisfactory physical activity levels corresponding to the world's health organizations' guidelines.

In light of the importance attributed to physical activity from the perspective of health reasons, gender differences, and taking into account the risks involved in the decline of physical activity, it is imperative to examine the factors of adherence in order to gain a better understanding of how this trend of sedentary behavior and decrease in physical activity can be halted.

Physical activity in Israel

A survey of the Amateur Sport Association conducted in August 2012 found that 61% of the adult population in the State of Israel engages in physical activity at least once a week and the majority (55%) engages in physical activity twice a week. In this respect, there has been a moderate, non-significant increase compared to a previous survey. Despite general correspondence between statements and physical exercise in practice, some gaps were found. Regular engagement in physical activity – once or twice a week – is higher among young people aged 18 – 22, and among adults aged 45 and above. It was also found that the rate of those who intensively engage in physical activity – 5 times a week or more – is higher among people aged 55 and above, and among youngsters (aged 18 – 24), than in ages 25 – 44. In general, men are more active than women, though the difference is not significant. The survey also found that walking remains the main regular physical activity leaving all other activities far behind. Comparison to a previous survey reveals a significant increase in the rate of people stating they walk, but comparison to earlier surveys reveals a moderate, insignificant increase without a significant difference between men and women who engage in walking as a physical activity, which is most prevalent in the 35–45 age groups. The rate of those engaging in outdoor exercise is rather high among women, whereas men engage more in jogging and ball games.

Significance of Measurement

The reasons why physical activity is a necessity rather than a matter of choice were listed earlier. However, in order to evaluate and measure how many people engage in physical activity and what type they choose, the world of science has to develop appropriate tools.

This section reviews the prevalent measuring tools which are accepted in contemporary physical activity related research. The chapter will discuss the limitation of each tool and summarize the advantages and disadvantages of each. For the purpose of measurements in this research, a unique questionnaire was devised, which consists of a number of accepted questionnaires for measuring physical activity and adherence

Questionnaires

The oldest and most common recall questionnaire is the International physical activity Questionnaire – International physical activity questionnaire (Craig, 2003). International physical activity questionnaire developed as a result of the need to evaluate physical activity and sedentary behavior in a way that would reflect different physical activity domains, such as sedentary behavior, moderate physical activity, vigorous physical activity and the time dedicated to walking during the day. The long

format of the questionnaire pertains to leisure activities, house chores, physical activity as part of one's job, gardening and transportation (bicycle, walking, driving a car and so forth). This questionnaire is common in its telephone version (Bauman, 2009; Craig, 2003; Hallal, 2010). International physical activity questionnaire was translated into some 20 languages and has been in use all over the world (Brown, 2003). Research pertaining to this questionnaire's reliability shows a wide reliability range (0.34 – 0.43) in test-retests measurements (Craig, 2003). Some researchers have examined the questionnaire's accuracy level and revealed a tendency of over-evaluating physical activity (Welk, 2002); for instance, Rzewnicki (2003) obtained information regarding physical activity by means of the International physical activity questionnaire, and immediately after that, he conducted interviews to better understand the participants' answers and responses. The interviews revealed that nearly half of the participants reported in the questionnaire a number of activities such as moderate to vigorous walking, when they were supposed to report inactivity. Moreover, almost 50% of the participants were marked as those who reach adequate physical activity levels according to the accepted instructions, while in fact they were not on that level. They were marked that way due to over-reporting physical activity. Furthermore, about 5% of the participants reported such a high level of physical activity that it seemed impossible. This phenomenon of over-reporting is not only typical of the International physical activity questionnaire tool. All self-report based measuring tools often suffer from 35% - 50% exaggeration in reporting the level of physical activity (Lagerros, 2007). Over-reporting is of great significance when using a recall questionnaire, but other physical activity self-report measures also has limitations; for instance, the use of recording or logbooks which affect the 25 patterns of the measured activities (LaMonte, 2001). There is a good deal of research pertaining to validity and reliability of the International physical activity questionnaire, and since 2002, a shortened version, International physical activity questionnaire short form, has also been in use. The shorter version was also used in various populations and cultures in the world. Oyeyemi (2011) found the shorter version to be reliable for vigorous intensity physical activity, but less reliable for moderate activity. These findings resemble those of research pertaining to the original questionnaire.

Lee (2011) conducted an extensive literature review examining the correlation between International physical activity questionnaire short form and objective measurements and found a lower correlation than was believed. The questionnaires yield a higher evaluation of the level of physical activity than the objective measurement, for instance, by an accelerometer. Hence, the use of self-report questionnaires to evaluate the level of physical activity is highly problematic.

Physical activity research also seeks to examine the validity of the questionnaires in the adult population, or within populations of persons with chronic diseases. A review by Williams (2010) examined a large number of existing questionnaires (104 different questionnaires) and reached the conclusion that there are indeed different questionnaires referring to four different physical activities: (1)

physical activity related to general activities and mobility; (2) physical activity related to activities of daily living; (3) physical activity related to work, social or leisure time activities; (4) Disease-specific symptoms related to physical activity. The contents of the questionnaires are different and varied and there is no consensus regarding their contents and format, mainly with the adult or chronically ill population. It was also found that no one questionnaire covered all four categories.

The validity of the International physical activity questionnaire short form was also examined regarding the context of chronic fatigue syndrome. Physical activity with this syndrome is a significant factor for the success of treatment, recovery and return to proper functioning. To evaluate the level of chronic fatigue syndrome patients, a measuring tool is required. Meeus (2011) examined the validity of the questionnaire for the chronic fatigue syndrome population. 56 chronic fatigue syndrome patients were asked to fill out the questionnaire after they "had been examined" by a Tri-Axial accelerometer and kept physical activity diaries for a week. Analysis of the questionnaire findings and accelerometer measurements, a low correlation was found in the measurement, as chronic fatigue syndrome patients do not reach the level of moderate physical activity. They are hardly active. Hence, the International physical activity questionnaire -SF questionnaire does not suit the evaluation of physical activity in that specific population, probably because the chronic fatigue syndrome patients' level of physical activity is below average, and it is known that the questionnaire does not measure low levels of physical activity.

In addition to the International physical activity questionnaire, there is also the global questionnaire, which is characterized by being shorter, and therefore providing limited information on the participant's physical activity. Since the questionnaire is relatively short, it is missing details about specific habits, the intensity of physical activity and how long each type of activity takes. The main goal of this questionnaire is to provide general information about the physically active/physically inactive (Matthews, 2002)

This is a telephone questionnaire which served to evaluate physical activity in about 50 States (Armstrong, 2006). It consists of 16 topics that have to do with commitment to physical activity at work, transportation (mobility) from place to place, leisure time activity and time dedicated to lack of physical activity (watching television, using the computer and so forth). The activities are divided into three major categories: moderate (about 4 metabolic equivalents), vigorous intensity (8 metabolic equivalents) and inactivity (1 metabolic equivalents). It takes about five minutes to complete the global physical activity questionnaire, and the score is either by categories, where the score is a summary of the duration of activity in minutes per day or minutes per week, or by the intensity of physical activity – thus there is an evaluation of the subject's energy expenditure.

The Minnesota Leisure Time physical activity Questionnaire is one of the first questionnaires that used an extended list of 63 items pertaining to sport, leisure time activity, house chores and more (Lagerros, 2007). The questionnaire seeks to identify the types and intensity of physical activity so as to estimate energetic expenditure.

The time required for exercising the interviewees, contacting the participants and cataloguing the information is the great disadvantage of this tool.

In summary, self-report questionnaires are problematic tools for the evaluation of physical activity, because they are inclined to over-reporting physical activity levels in comparison with other, more objective tools. However, despite being insufficiently accurate, they are still the cheapest, simplest and most available tools for evaluating physical activity in specific populations, and this is the tool used by the researcher in this research. Knowledge regarding over-evaluation allows the researcher to accept the data with this limitation. Therefore, in the discussion chapter of this research, the researcher will have to consider the limitations of the questionnaire as a physical activity measuring tool and conduct a more accurate assessment of the results.

Theories pertaining to undertaking and adhering to physical activity

Adherence and long-term adherence are necessary for maintaining the advantages of physical activity in the long term. Research which examined adults' participation (Morey, 2002) in physical activity programs over 10 years and compared them to non-adherent people, found that those who adhere have a higher life expectancy than the non-adherent ones. Other studies found that in comparison to non-adherent people, the adherent ones experience a significant improvement in their physical fitness, day-to-day functioning and quality of life (Belza, 2002). In contrast, research reveals that of all those who start engaging in physical activity, 50% will quit within a few months (Dishman, 1988). Quite a few reviews have attempted to examine the circumstances of adherence to physical activity. In the context of this research, it is important to discuss these factors because they can provide conceptual grounds for the research findings and help in understanding the phenomenon under investigation in the Israeli context.

Seven categories have been found to be linked to adherence to physical activity.

1. Demographic conditions - age, gender, ethnicity, and socioeconomic status
2. Health factors – chronic diseases, poor health and excessive weight
3. Cognitive and psychological factors - barriers to physical activity, lack of enjoyment of the activity, low expectations of the benefits of physical activity, poor mental health, a low sense of self-efficacy in the context of physical activity, low motivation for physical activity, lack of readiness to change, poor physical fitness
4. Behavioral factors - physical activity in the past, smoking and type A character
5. Social factors - lack of contacts in a group training together, lack of support and encouragement from the health care system, lack of social support of physical activity

6. Factors related to the intervention program - high intensity of activity, duration of activity - too long
7. Environmental factors - lack of access and low safety in the context of parks and sports facilities

Motivational Aspects of Adherence to physical activity

Behind the human need to "please" others there is psychological motivation – the need to get a "reward" or behavior norms that cause pleasure. Underlying this psychological motivation are two types of motivation: (1) Intrinsic Motivation referring to acting due to an internal need or pleasure; (2) Extrinsic motivation referring to some need as it will lead to a result that can be separated or detached (Ryan & Deci, 2000). These types of motivation are the acting forces behind any human action or decision. When an action or a decision can be "categorized" under intrinsic/extrinsic motivation, it is easier to understand how a person operates. The factors affecting motivation or how a decision is made or an action done, but only thinking that leads to action allows for genuine change in life.

Motivation for Change theory

In the last 30 decades, research has recognized the need to construct a dynamic model which is comprised of stages. This thought has not influenced the types of interventions for the promotion of physical activity, but in the 1990s Marcus et al. (1992) developed the Trans-Theoretical Model of Stages of Change for use in physical activity research. Trans-Theoretical Model is a general model which includes the use of cognitive and behavioral processes in different stages of the change process. The first to develop the Trans-Theoretical Model were Prochaska & DiClemente (1983). The model describes embracing physical activity and adhering to a healthy lifestyle as a process which consists of five stages.

- **Pre-contemplation Stage:** Not ready to exercise nor interested in pursuing exercise
- **Contemplation Stage:** Not active, but thinking about pursuing exercise (thinking about making a behavior change)
- **Preparation Stage -** Doing something related to exercise but not reaching the recommended levels – not enough
- **Action Stage:** Meeting recommendations for exercise for less than 6 months
- **Maintenance:** Exercising for 6 months or more. Moving from one stage to the next is spiral with advances and regressions along the way.

Cognitive Aspects of Adherence to physical activity

Self-Determination Theory is a cognitive "super-theory" of motivation (Deci & Ryan, 1985, 1991), according to which health human development and proper functioning require the satisfaction of three basic psychological needs, which are innate and universal: personal competence characterized by a sense of capability and a perception of efficiency in doing things, autonomy characterized by an internal locus of control and free choice of activities as well as self-regulation and belongingness characterized by satisfaction with the social world and involvement in it. This theory integrates two approaches pertaining to human motivation. The first maintains that humans are naturally active creatures and have an innate need to maintain a high level of stimulation (Hebb, 1955), and the other maintains that humans have a basic need to perceive themselves as personally competent (White, 1959) and self-determined.

Behavioral Aspects in Adhering to physical activity

According to the Theory of Planned Behavior (Ajzen, 1985), it is possible to better understand the relationship between attitudes and behavior if we accept the assumption that humans are reasonable creatures who consider the implications of their actions. Hence, attitudes and beliefs alone cannot guide their behavior.

The model presents the intent to behave in a certain manner and the perception of controlling behavior as more solid grounds for predicting behavior than just beliefs. In the Theory of Planned Behavior, which is an expansion of the Theory of Reasoned Action, where the main factor affecting behavior is the intention to commit it, intentions teach us about the level of effort people are willing to invest in order to do something. The more serious the intention, the greater the chance it will happen. As a rule, the more positive the attitude, the more subjective the norm and the more control of one's behavior is perceived as broader, the stronger the intention and the higher the chance for it to actualize.

Self-Efficacy and physical activity

Self-efficacy plays a very important role in adherence to physical activity, and has been proven to be a strong, significant factor in the process of embracing physical activity and adhering to it. First, self-efficacy can influence the likelihood that a person will undertake regular physical activity (Norman, 2005). Additionally, self-efficacy is the mediator between intention to start activity and practice (Sniehotta, 2005). Researchers have also found that although a person may intend to undertake physical activity, he/she will not do it without a high sense of self-efficacy.

Self-efficacy is the key to undertaking physical activity and persevering at it. Similar results were presented in a study by Annesi (2006) after 12 weeks of an intervention program, where self-efficacy was found to be directly and closely linked to an increase in physical activity. Another research by Trost (1999) found that among

children and adolescents there are self-efficacy differences between those who are active and those who are not. Active children scored high on a perceived physical activity self-efficacy test. These children had greater self-confidence in their ability to overcome different obstacles related to physical activity.

Self-efficacy plays an important role in undertaking physical activity and adhering to it. Focusing on the individual's influence of sense of self-efficacy may have great influence on the level activity and adherence. Hence, the research questionnaire contains questions for examining and evaluating self-efficacy. There is evidence that interventions may lead to increased physical activity lasting beyond 12 months in adults aged 55 to 70 years. Theoretically, people who are high in self-efficacy regarding their ability to be more active are more likely to initiate an increase in physical activity and adhere in the face of obstacles and setbacks (Bandura, 1997).

A recent systematic review of correlates of physical activity identified self-efficacy as one of the most consistent predictors of physical activity in adults in general (Bauman, 2012). However, the evidence that self-efficacy is a determinant (Koeneman, 2011) or mediator or cause (French, 2013) of changes in adults' physical activity is still not entirely compelling, partly because studies seeking to provide such evidence have not been conducted.

A review that limited the age of subjects to 50 and above identified self-efficacy as one of the significant factors for taking up and adhering to physical activity at these ages (Van Stralen, 2009). There is also evidence from longitudinal studies of a stronger correlation between self-efficacy and physical activity in adults than in young people (Schwarzer, 2000). Previous studies identified the best way to increase and strengthen the correlation between self-efficacy and physical activity. They found that in subjects over the age of 60 and in overweight populations (Williams, 2011) that the way to change behavior cognitively had a stronger correlation to positive change in self-efficacy and from here in physical activity too. For example, in subjects under the age of 60, this type of intervention resulted in a significant, clear increase in physical activity and self-efficacy (Williams, 2011). These techniques also correlate with the most significant increases in physical activity alone.

Researchers have defined a concept of "Adherence Motivation" meaning, the motivation pertaining to the continuation of the activity regardless of the difficulties and obstacles it entails (Singer, 1999). Explanations pertaining to the essence of motivation mostly rely on the Theory of Planned Behavior theory according to which a person's intention is the main and direct stimulus for adherence to physical activity, which is mediated by the person's attitude towards the activity, his/her ability to enjoy it and to learn new skills. Explanations of adherence motivation are often based on Bandura's Social Learning Theory. The significance of self-efficacy constructs and the expectation as described above, as factors which increase motivation are emphasized in the field of physical activity. Self-efficacy appears to mediate the motivation to adhere, not only in carrying out a specific plan, but also in future activities (McAuley, 1992). Studies engaging in health also support the claim, for

example, that self-efficacy is a more accurate and suitable variable for the prediction of adherence motivation than physical abilities.

Nevertheless, self-efficacy leading to increased efforts and adherence, is highly influenced by constantly changing environmental and situational factors, and so it is therefore important to ground the measurements of adherence in a longitudinal study, as over time there are changes in the factors affecting self-efficacy, and therefore on motivation to adhere; for instance the influence of some factors decreases (pain, anxiety and more) while the influence of social factors increases.

In summary, based on the above and a great number of studies in the field of physical activity, extrinsic motives increase motivation for participation in physical activity, and involvement and intrinsic motives are significant for adherence in the long-term (Ryan, 1997).

Part II: THE PILOT STUDY

Two research stages were planned for the pilot study on physiotherapists employing two research tools: a quantitative questionnaire comprising three different questionnaires and different physical tests to evaluate physical fitness.

The first stage of the pilot study comprised a quantitative questionnaire constructed from an amalgamation of three different questionnaires, each of which was relevant and reliable, but have never before been merged into one questionnaire for a research population of physiotherapists. The questionnaire comprise three different questionnaires: The purpose of the first questionnaire was to evaluate physical activity habits throughout the day and during free time. A valid and reliable closed-ended questionnaire (Jacob, 2001) based on an original questionnaire by Baecke (1992). This questionnaire examines physical activity habits as well as areas of physical activity and attempts to distinguish between leisure time physical activity and non-leisure time physical activity, an area that is significant for physiotherapists who are not sedentary during their working hours. The second questionnaire refers to adherence and is called the adherence questionnaire. This is a closed, valid and reliable questionnaire (Cloninger, 1993), that includes five categories ranging from highly incorrect to highly correct. Finally, the self-efficacy questionnaire, the third one, also is a valid and reliable closed-ended questionnaire (Chen, 1999). This section attempts to examine personal characteristics associated with adherence to physical activity.

The second stage of the pilot study comprised four physical fitness tests, valid and reliable tests whose purpose was to examine whether there is a connection between fitness and adherence.

Following the pilot study of the research tools, the conclusion was to introduce the following changes in this research:

1. The trends of the quantitative questionnaire were good, the findings were clear, but for the purposes of the research, a more detailed demographic questionnaire should be added in order to acquire more details about the research population. These details examine data relevant to this research, such as family status, place of residence, years of experience as a physiotherapist, area of physiotherapy, etc.
2. Amalgamating the questionnaires did not create confusion or incomprehension and therefore it was possible to leave them as they were for the pilot, with the exception of the additions described in paragraph 1 above.
3. The physical fitness tests were carried out well, but from the pilot it was learned that the Hand Grip Strength Test should be measured as an average of the results of each hand, rather than each hand alone, because it appears that physiotherapist's hands are both extremely strong and not just their dominant hand. For this reason, I will employ a table of norms relating to the combined results of both hands and not each hand separately.

4. After reviewing the findings, it appears that it remains difficult to explain the reasons and factors relating to adherence through quantitative variables alone, a qualitative section must be added in order to really understand physiotherapists life circumstances, habits, points of view, etc. with regard to adherence to physical activity.

Part III: METHODOLOGY

The current research is a mixed methods research. According to Creswell & Plano Clark, (2007), mixed methods research is a research design (or methodology) in which the researcher collects, analyzes, and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry.

The research combines the qualitative approach in an attempt to understand the overall circumstances of the participants leading to the beginning and adherence to physical activity and physical and other measures expressed in the closed-ended questionnaires leading to quantitative analyses of the structured questions.

The research design is presented in table no 1:

Table 1: Summary of Research Design- Mixed Methods Research

	Aim	Research Tool	Sources of Information / Research Population
Stage 1: Quantitative Research	The correlation between the causes of embarking physical activity and adherence, and causes of long term adherence among physiotherapists in Israel	1. physical activity and adherence questionnaire	Existing diagnostic tools adjusted to the current research. Administered to about 1000 physiotherapists
		2. Physical fitness tests	Existing diagnostic tools examined some 100 physiotherapists
Stage 2: Qualitative Research	Deepen the knowledge and understanding of the circumstances that influence undertaking physical activity and adherence to it	Semi-structured interviews	Structured interviewed with 30 physiotherapists.
Statistical analysis which will help understand the causes of undertaking physical activity and adhering to it among physiotherapists in Israel			

Research population

The electronic version of the structured questionnaire was e-mailed to 580 e-mail addresses. 100 questionnaires were filled and sent back (17%). The written version was administered to physiotherapists in the national conference of physiotherapists, and out of some 700 participants, 230 filled out the questionnaire (32% response), in total, $230+100 = 330$ filled both electronic and hard copy questionnaires. 16 questionnaires were disqualified so the total number of questionnaires for the current research was 314.

Since the questionnaires were addressed to all physiotherapists in Israel, both electronically and on paper, respondents were random, and hence sampling was random.

83 physiotherapists took part in the physical tests, 17 could not take the tests because of health problems. Sampling for the physical tests was a cluster-sampling: different workplaces were chosen that are typical of physiotherapists: hospitals, rehabilitation centers for both young people and the elderly and an institute in the community. Sampling within the workplaces was random. The number of subjects was approved by an expert in statistics. The number is validated for the population. And finally, for the purpose of conducting in-depth interviews, a sample of 30 physiotherapists was chosen to represent the characteristics of the population that filled in the questionnaires. Selection of interview participants was based on an attempt to vary the profile of respondents in the domains of age, work seniority, position (manager or subordinate), specific area of occupation, gender and more, in order to represent the entire researched population.

Research tools

The research tools used in this research were

✓ Closed-Ended Questionnaire

The closed-ended questionnaire is comprised of different questionnaires

1. **The physical activity Questionnaire** is a questionnaire with a valid structure based on the Baecke original questionnaire (1982) for the measurement of habitual physical activity.
2. **The Adherence Questionnaire** was taken from the Szold Institute Research. Tools Inventory: The Temperament & Character Inventory (Cloninger, 1993).
3. **Self-efficacy Questionnaire:** self-efficacy was found to be closely connected with the ability to adhere to physical activity (Norman, 2005).
4. **Demographic Questions:** General details – this part includes all the personal information of the respondent such as gender, seniority in the profession, area of physiotherapy, place of residence, access to sports facilities and more.

✓ **Physical Fitness Tests**

Tecumseh Step Test (a multiple choice sub-maximal aerobic fitness test) (Mackenzie, 2002). The test is a modified version of the Harvard Step Test (1943). The current test lasted a shorter time and the step level was lower. Numerous studies have examined the reliability and validity of the Tecumseh Step Test and found it to be reliable and valid as a field test for aerobic fitness (Nikolaidis, 2011).

Hand Grip Strength Test (HGST) – This test is done with the help of a manual dynamometer. The hand grip strength is a general measurement of muscle strength. A low grade in this test has been associated with early mortality in the interim and adult ages (Metter, 2002; Takata, 2007).

Measuring Weight, Height and Resting Heart Rate Measuring weight and height in this research will be conducted in order to calculate the participants' body mass index. These measurements are important in order to examine the connection between the independent variable of "motivation to lose weight", for instance, as one of the causes of undertaking physical activity and the dependent variable in this research – adherence.

✓ **Semi-Structured Interviews**

For the present study, semi-structured in-depth interviews were chosen to allow the informants to tell their stories about the phenomenon under study, in their own way and in their own language (Shkedi, 2003). The questions for the interview were set in accordance with the research aims and research questions, and were constructed on the basis of the parameters that the researcher wanted to study. The interview used in this research was comprised of a questionnaire especially constructed and was based on the research aims and research questions, on the basis of the results of the closed-ended questionnaires and the researcher's experience in this field.

FINDINGS

Quantitative Findings – Questionnaires

Table 2: Pearson analysis between reasons for activity and adherence

	Adherence	REASONS						
		1	2	3	4	5	6	7
1.Recommendation/ Medical problem	-.09							
2.Wish to lose weight	.36**	-.07						
3.Wish to look better	.57**	.13*	-.01					
4.Previous habit I recently quit	.16**	.17*	.17*	-.23*				
5.Social Reasons	.19**	.14*	.14*	.12*	-.09			
6.Through the workplace	.41**	.16*	.00	.11	.23*	-.05		
7.Practice towards competition	.35**	.30*	.14*	.07	.07	.01	-.05	
8.Setting an example for the children	.19**	.24*	.18*	.23*	.26*	.18*	.29*	.08

* $p < .05$ ** $p < .01$ *** $p < .001$

According to table 2, we can see that except for the reason of "Recommendation/Medical problem", there is a positive and strong correlation between the reasons no. 2, 3, 6 and 7 listed above and adherence to physical activity. All correlations were found to be significant ($p < .01$), where the reasons of "wish to look better", "wish to lose weight", "through the workplace", and "practice towards competition" are the most strong and positively correlated compared to reasons of "social reasons", "previous habit I recently quit" and "setting example for the children" that found to be weak.

These findings confirm the research hypotheses regarding the positive correlation between the wish to lose weight and adhering to physical activity as well as social reasons and adherence.

The part of the research hypothesis regarding a positive correlation between the strength of medical reason and adherence to physical activity was refuted. A non-significant negative correlation was found between the two. Nevertheless, a positive and significant correlation was found between adherence and "wish to lose weight".

Table 3: Pearson Analysis between physical activity habits and adherence

	Adherence					Variables				
	1	2	3	4	5					
Physical activity at Work: Objective	-.102									
Physical activity at Work: Subjective	.079	-.406**								
Physical activity Leisure: Objective	-.006	.092	-.050							
Physical activity Leisure: Subjective	.236**	.019	.177**	-.415**						
Routine physical activity-Non- leisure time physical activity	.153*	.033	-.185**	.142*	-.215**					
Accessibility	.075	-.107	-.026	.216**	-.168**	.045				

* $p < .05$. ** $p < .01$. *** $p < .001$

According to the table 3, there is a negative non-significant weak correlation between the level of physical activity at work based on objective reporting and adherence to physical activity. This finding confirms the research hypothesis stating that "There is a negative correlation between the level of physical activity during the work day and the degree of long term adherence to physical activity".

Furthermore, according to this table, there is a significant weak and positive correlation ($p < .01$) between adherence and subjective reporting of leisure time physical activity, meaning, the more active a person is at leisure (subjectively), the more one adheres to physical activity. This finding confirms the research hypothesis stating that "There is a positive correlation between the intensity of leisure time physical activity and level of adherence to physical activity".

Additionally, a significant positive but weak correlation was found between adherence and the level of non- leisure time physical activity($p < .05$) – the more one is active during the day, the more one adheres to physical activity.

The correlation between accessibility to sports facilities and adherence was found to be positive, weak and non-significant, which confirms the research hypothesis about accessibility, maintaining that "There is a positive correlation between the degree of accessibility of physical activity and level of adherence".

Table 4: Pearson analysis between personality aspects and adherence

	Adherence	Self-Efficacy	Ambition
Self-efficacy	.208**		
Ambition	.166*	.739**	
Sociability	.063	.168**	.120*

* $p < .05$. ** $p < .01$. *** $p < .001$

Examination of the correlation between personality aspects and adherence yielded a positive, significant but weak correlation ($p < .01$) between a sense of self-efficacy and adherence as stated in the research hypothesis, "There is a positive correlation between one's sense of self-efficacy and the level of long term adherence to physical activity." Additionally, a positive, significant and weak correlation ($p < .05$) was found between ambition and adherence. No significant correlation was found between sociability and adherence to physical activity. In summary the hypothesis regarding self-efficacy was confirmed.

Table 5: Pearson analysis between health and adherence

	Adherence
Age	.233**
Health 1	.209**

* $p < .05$. ** $p < .01$. *** $p < .001$

There is a significant positive weak correlation ($p < .01$) between age and adherence to physical activity. This finding confirms the research hypothesis maintaining that "There is a positive correlation between age and one's state of health to the degree of adherence to physical activity", meaning adherence to physical activity improves with age.

Quantitative Findings - Physical Tests

Table 6: Pearson analysis between physical activity variables and adherence

	Adherence for active persons	Resting Heart Rate	Heart Rate at the end of test	Body mass index	Maximum result non-dominant hand	Maximum result dominant hand	Maximum results sum
Resting heart rate	-.129						
Heart rate at the end of the test	-.128	.576**					
Body mass index	-.056	.079	.214				
Maximum result non-dominant hand	-.049	-.088	-.230*	.354**			
Maximum result dominant hand	.010	-.104	-.229*	.357**	.958**		
Maximum results sum	-.019	-.098	-.232*	.359**	.989**	.990**	
Difference mean maximum results	-.206	-.062	-.102	.029	.351**	.352**	.355**

* $p < .05$. ** $p < .01$. *** $p < .001$

No significant correlation was found in the attempt to examine whether there is a correlation between adherence and some physical data, but there is an apparent negative correlation in most tests, which is reasonable, as the longer one adheres to physical activity, the more likely it is for the resting heart rate to be lower. The same is true for body mass index and more.

In summary, it is impossible to confirm the research hypothesis regarding a positive correlation between the level of physical fitness and adherence to physical activity. Some measures are positively correlated to adherence (body mass index, resting heart rate and heart rate at the end of a task), but no significant correlation was identified in this research.

In conclusion, this section dealt with physical tests but did not refer to the research hypotheses, but rather presented an additional aspect of adhering to physical activity.

Qualitative Findings

First Theme - Current physical activity Habits

In summary, most professionals understand the importance of exercise in their free time, including non-sporting activity, but they do not always manage to do it.

Second Theme - Reasons for Undertaking Exercise

Many interviewees stated that childhood habits, pleasure, weight loss, looking after one's health were the main reasons for undertaking physical activity in the present.

Third Theme - Perceptions of the Circumstances for Adherence to physical activity

Pleasure is the most significant motivating factor to adhere to physical activity, followed by secondary benefits such as losing or maintaining weight and finally habit.

Fourth Theme: Physical Fitness and Adherence

Being fit makes it easier to adhere, which possibly explains why adherence at the beginning of the journey is more difficult, more to cope with, especially physically until acclimation and achieving greater physical fitness. One can learn that the beginning should be very gradual, friendly and enjoyable so that, in the end, people will adhere and will not abandon it quickly and break.

In summary, the qualitative findings above were congruent with the themes that emerged from the data. One can say that with regard to the physical activity habits of physiotherapists in Israel, they are active and in constant motion at work. Their work as physiotherapists, when it is not solely management, includes movement, walking around, helping patients, lifting etc. Those in management positions are managers in every way, sit most of the time and their level of physical activity is typical of the management profession.

Summary of Research findings

Quantitative

1. There is a positive correlation between the reasons for undertaking and adherence to physical activity.
2. There is a positive correlation between adherence and subjective reporting of leisure time physical activity, meaning the more active a person is at leisure, the more one adheres to physical activity.
3. There is a positive correlation between adherence and the level of physical activity in non-leisure time physical activity (but not at work) – the more one is active during the day, the more one adheres to physical activity.

4. The correlation between accessibility to sports facilities and adherence was found to be positive but insignificant.
5. There is a positive correlation between a sense of self-efficacy and adherence to physical activity.
6. There is a significant difference between married and single people regarding the level of adherence to physical activity.
7. There is a positive correlation between age and adherence to physical activity.
8. There is a positive correlation between objective state of health and adherence to physical activity.
9. There is an insignificant correlation between adherence and some physical fitness data.

Qualitative

1. Adherence to physical activity among physiotherapists is characterized by a gap between their knowledge of the significance of physical activity and their actual engagement in this area.
2. Causes of undertaking physical activity and adherence to physical activity among physiotherapists are influenced by extrinsic motivation, but intrinsic motivation has a greater effect on adherence to physical activity.
3. Adherence to physical activity among physiotherapists is influenced by barriers that are agreed upon in the literature and pertain to the overall population.
4. Adherence to physical activity among physiotherapists can improve when physical fitness is good, but no direct and positive correlation was found between them.

Factual conclusions

Conclusions emerging from the quantitative findings

The conclusions that emerged from the discussion of the quantitative findings show that the correlation between reasons for embarking on and adherence to physical activity pertains to a complexity of aspects involving social, value-related and behavioral factors. Moreover, it seems that adherence to physical activity is directly and positively connected to the extent to which one dedicates time to leisure time physical activity. This positive correlation derives from positive feelings of pleasure, success and high self-efficacy. Also, adherence to physical activity is directly and positively connected to the extent to which one dedicates time to non-leisure time physical activity.

Other conclusions are that adherence to physical activity is a demanding goal that the desire to reach it will directly affect the development and accessibility of sports facilities as part of a global ecological model to improve physical activity

within the adult population. Furthermore, adherence to physical activity is directly correlated with one's sense of self-efficacy; the higher the sense of self-efficacy the easier it is for one to overcome possible barriers and adhere to physical activity. In addition, adherence to physical activity differs between married and unmarried participants. It appears that adherence to physical activity increases with age, and this factor is a unique and innovative conclusion suggested by this study.

Another health-related factors leads to the conclusion is that long-term adherence to physical activity is directly influenced by the one's state of health so that those who report a good state of health are also in a good state of adherence. However, the correlation between adherence to physical activity and fitness state is not clear enough.

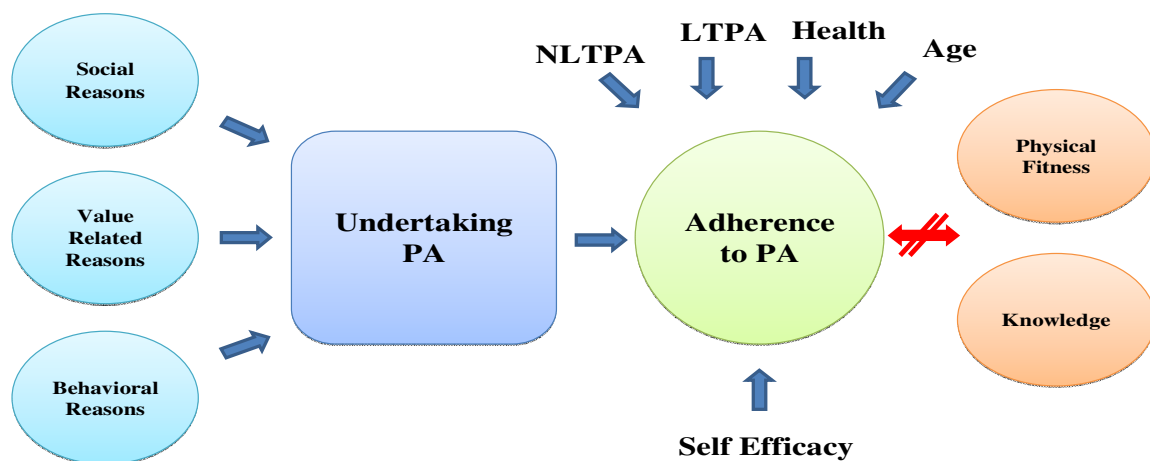
Conclusions emerging from the qualitative findings

The discussion of the qualitative findings show that adherence to physical activity among physiotherapist is characterized by factors relating to a gap between their knowledge of the significance of physical activity and their actual engagement in this area. Additionally, causes of undertaking physical activity and adherence to physical activity among physiotherapists are influenced by extrinsic motivation factors, but intrinsic motivation factors have a greater effect on adherence to physical activity. Moreover, adherence to physical activity among physiotherapist is influenced by barriers that are agreed upon in the literature and pertain to the overall population. Furthermore, adherence to physical activity among physiotherapist can improve when physical fitness is good, but no direct and positive correlation was found between them.

Conceptual conclusions - Shaping a culture of Adherence

Creating a culture of adherence to physical activity among physiotherapists is a process that is made up of a number of factors responsible for undertaking and adhering to physical activity.

The process begins when a culture of adherence is created through the integration of three areas: social, behavioral and value related reasons. In addition, the combination of age, health status and physical activity (leisure time and during the day) and self-efficacy creates a synergy which leads to the creation of a culture of adherence to physical activity. The CAPA Model describes all of the above.



“CAPA” model: A Culture of Adherence to PA

Figure 2: "CAPA" model: a culture of adherence to physical activity (Michal Azmon)

This model demonstrates the process of making a decision with regard to lifestyle change - and undertaking physical activity among physiotherapists. The reasons for undertaking physical activity are social and/or value-based and/or behavioral like Recommendation/Medical problem, Desire to lose weight, Desire to look better, Previous habit I recently quit, Social reason, Through the workplace, Practice for a competition and more

In order to adhere to physical activity, factors related to adherence are considered: non- leisure time physical activity, leisure time physical activity, health status, age, and self-efficacy. Two areas which were not found to influence adherence in this research are physical fitness and knowledge - awareness of the importance of physical activity among professionals.

Practical implications and recommendations

For the CAPA to exist it is recommended:

1. To encourage a change in lifestyle and undertaking physical activity through the workplace
2. To support and enhance education for physical activity at an older age as part of the culture of leisure
3. To ensure accessibility to sport facilities as culture of the city and country
4. To encourage physical activity during daily activities: encouragement and education with every means possible to take the stairs instead of an elevator, walking instead of moving vehicles, and so forth

5. To develop self-efficacy: Since early childhood education through the school, activities for the whole family and various sporting activities in the community
6. To provide education for a healthy and balanced lifestyle
7. To train professionals for the encouragement and change in lifestyle

Contribution to knowledge

The CAPA model (Michal Azmon) developed through this research fills the knowledge gap in the field of reasons for undertaking and adhering to physical activity among physiotherapists. It is an innovative model which constitutes a contribution to knowledge.

This research is based on four theories of behavior, motivation, adherence and self-efficacy: Trans-Theoretical Model of Stages of Change, Self-Determination Theory, Planned Behavior Theory, self-efficacy Theory.

This research added to the knowledge with regard to the whole process of change, adherence and a sense of self-efficacy in the field of physical activity. Additionally, as this is a model that integrates cultural aspects and physical activity, this also constitutes a contribution to knowledge.

Practical contribution to knowledge

This study closed the gap in knowledge regarding long-term adherence to physical activity; therefore, it contributes to theoretical as well as practical knowledge. Thus, the CAPA model can guide policy makers with regard to creating a culture of adherence to physical activity and therefore embodies a practical model as well. Since there is no such model in the literature, and since this model emerged from this study, it is presented as an original and innovative model. Additionally, the CAPA model also constitutes an original practical contribution to knowledge.

The CAPA model shows the processes of long-term adhering to physical activity from a cultural perspective and therefore another aspect of this model can also be a change in Israel's policy regarding a healthy lifestyle among health professionals by increasing funding for education, encouragement, information, accessibility of facilities, training professionals and more.

Further research

It is recommended to conduct further studies of the following issues:

- ✓ Examining the application of the CAPA Model among physiotherapists
- ✓ Examining the application of the CAPA Model among other health professionals such as nurses, doctors etc.

- ✓ Examination and promotion of the model among physical education teachers and teachers in general
- ✓ Longitudinal research of adherence – following professionals over time

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