



**UNIVERSITI PUTRA MALAYSIA**

***EFFECTS OF TRANSTHEORETICAL MODEL (TTM) STAGE-BASED  
INTERVENTION ON TTM VARIABLES AMONG  
IRANIAN SEDENTARY HIGH SCHOOL STUDENTS***

***ZEINAB GHIAMI***

**FPP 2014 80**



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By

**ZEINAB GHIAMI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirement for the Degree of Doctor of Philosophy**

**October 2014**

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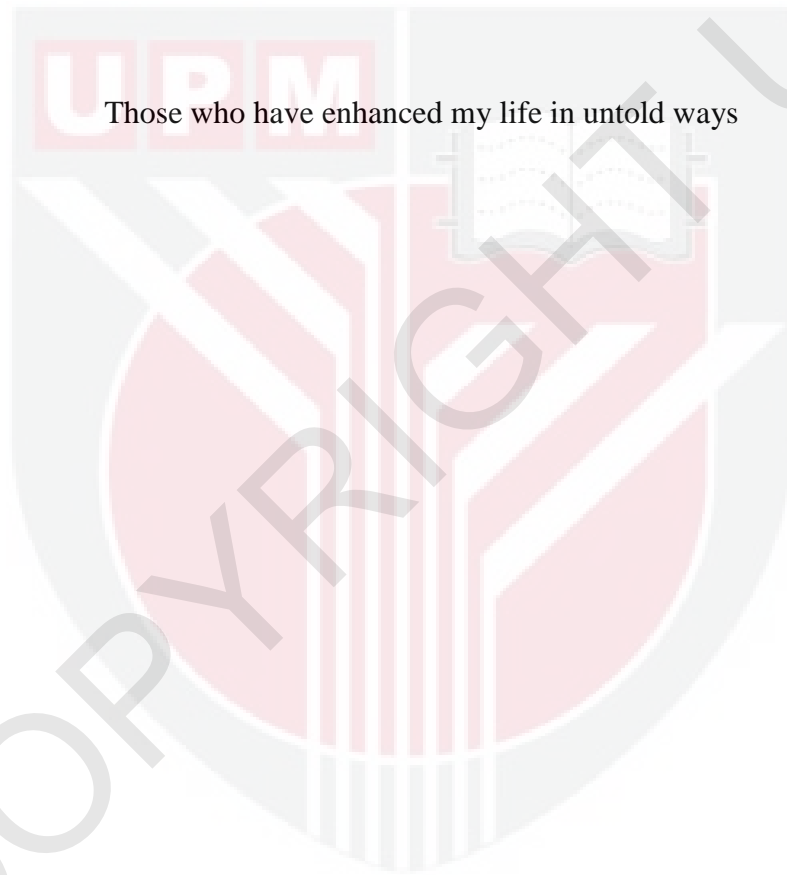
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Dedicated

To

Those who have enhanced my life in untold ways



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

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By

**ZEINAB GHIAMI**

**October 2014**

**Chairman: Associate Prof. Soh Kim Geok, PhD**  
**Faculty: Educational Studies**

This study aimed to evaluate the effect of a stage-based intervention on psychological variables among Iranian sedentary high school students. Another objective of the study was to examine relationships of TTM variables (processes of change, decisional balance and self-efficacy) with stages of change (action stage) to identify determinants of improving physical activity. Participants in this study were Iranian sedentary high school students (N=56) who were randomly assigned as an experimental group (n = 28) and a control group (n= 28). A pretest- posttest design was used in the present study. The experimental group received a 16-week TTM stage-based intervention, while the control group attended regular physical education course. The intervention developed in this study consisted of a flexible series of strategies that aimed to help those in the sedentary category live an active life by influencing their attitudes towards physical activity. After the completion of the intervention, four tests were administered to all participants to measure their processes of change, decisional balance, self-efficacy, and stages of change. The pre-test, post-test 1, and post-test 2 scores in all tests were analyzed to determine the effectiveness of the TTM stage-based intervention on the experimental group. The mean test scores of processes of change, decisional balance, and self-efficacy in the pre-, post-test 1, and post-test 2 measurements in the experimental group,  $F(2, 54) = 163.863, p < .05$ ;  $F(2, 54) = 152.404, p < .05$ ; and  $F(2, 54) = 151.359, p < .05$ , respectively. Further, the independent samples t-test analysis of the post-test 2 scores of the experimental and control groups revealed that the difference between the mean scores of the two groups was significant in processes of change ( $t = 20.46, df = 39$  and  $p < .05$ ), decisional balance ( $t = 24, df = 53$  and  $p < .05$ ), and self-efficacy ( $t = 20, df = 52$  and  $p < .05$ ). Thus, the findings of the study provided evidence that stage-based intervention had a significant effect on TTM variables, which have been shown to be related to physical activity behaviour.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

**KESAN INTERVENSI BERPERINGKAT BERASASKAN MODEL  
TRANSTHEORETICAL (TTM) TERHADAP PEMBOLEHUBAH TTM  
DALAM KALANGAN PELAJAR SEKOLAH TINGGI YANG TIDAK AKTIF**

Oleh

**ZEINAB GHIAMI**

**Oktober 2014**

**Pengerusi : Associate Prof. Soh Kim Geok, PhD**

**Fakulti : Pengajian Pendidikan**

Kajian ini bertujuan untuk menilai kesan tahap intervensi berperingkat berasaskan Model Transtheoretical (TTM) terhadap pemboleh ubah psikologikal dalam kalangan pelajar sekolah tinggi yang tidak aktif di Iran. Objektif lain dalam kajian ini adalah untuk mengkaji hubungan antara pemboleh ubah-pemboleh ubah TTM (proses-proses perubahan, keseimbangan dalam membuat keputusan dan efikasi sendiri) dengan tahap perubahan (peringkat tindakan) dan bagi mengenalpasti faktor yang menentukan tahap meningkatkan aktiviti fizikal. Responden kajian ini terdiri daripada pelajar Iran di sekolah tinggi yang tidak aktif dalam aktiviti fizikal ( $N = 56$ ) yang dibahagikan secara rawak kepada kumpulan eksperimen ( $n = 28$ ) serta kumpulan kawalan ( $n = 28$ ). Ujian Pra dan Ujian Pasca telah digunakan dalam kajian ini. Kumpulan eksperimen telah melalui tahap intervensi berperingkat berasaskan TTM selama 16 minggu, manakala kumpulan kawalan telah mengikuti kelas Pendidikan Jasmani seperti biasa. Intervensi yang dibangunkan dalam kajian ini terdiri daripada beberapa siri strategi yang fleksibel dengan tujuan membantu mereka yang kurang aktif dalam aktiviti fizikal untuk menjadi aktif dengan mempengaruhi sikap mereka terhadap aktiviti fizikal. Setelah selesai intervensi, empat ujian telah diberikan kepada semua responden untuk mengukur proses-proses perubahan, keseimbangan dalam membuat keputusan, efikasi sendiri dan tahap-tahap perubahan. Skor responden dalam kesemua ujian-pra, ujian pasca 1 dan ujian pasca 2 dianalisis untuk menentukan keberkesanan tahap intervensi berperingkat berasaskan TTM terhadap pemboleh ubah-pemboleh ubah TTM bagi kumpulan eksperimen. Hasil dapatan bagi ujian ANOVA berulang menunjukkan masing-masing terdapat perbezaan yang signifikan antara skor min proses-proses perubahan, keseimbangan dalam membuat keputusan dan efikasi sendiri dalam ujian-pra, ujian pasca 1 dan ujian pasca 2 bagi responden kumpulan eksperimen,  $F(2, 54) = 163,863, p < .05$ ,  $F(2, 54) = 152,404, p < .05$ , dan  $F(2, 54) = 151,359, p < .05$ ). Seterusnya, analisis ujian-t sampel bebas bagi ujian pasca 2 kumpulan eksperimen dan kumpulan kawalan menunjukkan terdapat perbezaan yang signifikan antara kedua-dua kumpulan bagi skor min dalam proses-proses perubahan ( $t = 20.46, df = 39, p < .05$ ), keseimbangan dalam membuat keputusan ( $t = 24, df = 53, p < .05$ ) dan efikasi sendiri ( $t = 20, df = 52, p < .05$ ). Oleh itu, dapatan kajian menunjukkan bahawa intervensi berperingkat berasaskan TTM mempunyai kesan yang signifikan terhadap

pemboleh ubah TTM, dimana ianya telah menunjukkan peningkatan faktor psikologikal dan juga tahap perubahan tingkah laku mengenai aktiviti fizikal pelajar yang kurang aktif.



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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

**Soh Kim Geok, PhD**

Associate Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Chairman)

**Aminudin Yusof, PhD**

Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Member)

**Ismi Arif Ismail, PhD**

Associate Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Member)

**Mohd Sofian bin Omar Fauzee, PhD**

Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Member)

---

**BUJANG BIN KIM HUAT, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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Signature: \_\_\_\_\_  
Name of  
Chairman of  
Supervisory  
Committee: \_\_\_\_\_

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Name of  
Member of  
Supervisory  
Committee: \_\_\_\_\_

Signature: \_\_\_\_\_  
Name of  
Chairman of  
Supervisory  
Committee: \_\_\_\_\_

Signature: \_\_\_\_\_  
Name of  
Member of  
Supervisory  
Committee: \_\_\_\_\_

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## LIST OF ABBREVIATIONS/ NOTATIONS/ GLOSSARY OF TERMS

ACSM	American- College of- Sports- Medicine
BP	Behavioral ó Processes
CP	Cognitive- Processes
CNCD	Chronic- Non-Communicable óDiseases
CVD	Cardio-Vascular óDisease
DB	Decisional-Balance
DBQ	Decisional -Balance óQuestionnaire
PA	Physical óActivity
POC	Processes -Of óChange
PCQ	Processes of -Change- Questionnaire
PE	Physical - Education
SE	Self-Efficacy
SEQ	Self-Efficacy óQuestionnaire
SCQ	Stage of- Change- Questionnaire
SCT	Social -Cognitive óTheory
TTM	Transtheoretical- Model
WHO	World- Health Organization



# CHAPTER 1

## INTRODUCTION

### 1.1 Overview

The first chapter introduces the background and nature of the present study. Essentially, it is about the importance of physical activity and the role of Transtheoretical Model (TTM) in enhancing the related psychological factors and improving the stages of change related to physical activity. The chapter starts with a description of the public health recommendations for participation in a physically active lifestyle. Then it continues with a review of health benefits of participating in physical activity and importance of TTM stage-matched interventions aimed at the promotion of a physically active lifestyle. The problem statement, significance, limitations and delimitations of the study are also presented. The operational definitions of key terms used in the study are the last part of this chapter.

### 1.2 Background of the Study

Health behavior refers to any activity undertaken by an individual, for the purpose of promoting, protecting or maintaining health as well as preventing or detecting disease (World Health Organization, 2002). Accordingly, regular physical activity can be also regarded as a health behavior (Lee, Paffenbarger, & Hennekens, 1997; Paffenbarger, Hyde, Wing, & Hsieh, 1986) as this behavior helps individuals maintain and promote their physiological health through improving cardiovascular endurance, improving lipoprotein and blood pressure profiles in at-risk youth, as well as improving immune system function (Biddle, Gorely, & Stensel, 2004; Cecchini et al., 2010; Church & Blair, 2009; Gaeini & Kazemi, 2009). Insufficient physical activity may cause negative effects to health such as increasing the risk of cardiovascular disease, diabetes, and obesity, and greatly increasing the risks of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression and anxiety (U.S. Department of Health and Human Services, 2008). Physical inactivity is also prevalent during the early years of life as it contributes to the higher levels of obesity as well as other serious medical problems among children and adolescents worldwide (Livingstone, 2001; Speiser et al., 2005). Findings of Warburton, Nicol, and Bredin (2006) mirror the findings of previous studies in that physical inactivity is a major contributor to chronic diseases, and is ranked between second and sixth among the most important risk factors causing diseases in western countries.

Strong evidence shows that physical activity is crucial for individuals' psychological health (Netz, Wu, Becker, & Tenenbaum, 2005; Steptoe & Butler, 1996). There are positive psychological health benefits, such as enhancing self-esteem and reducing anxiety and depression (Alpert & Wilmore, 1994; Blair, Kohl, Gordon, & Paffenbarger, 1992; Calfas & Taylor, 1994). Psychological and emotional distress is more prevalent among children whose activity levels are low. Exercise and sport contribute to success in children and adolescents through improving their social well-being, self-esteem and self-perceptions of body image and competence. In addition,

highly physically active children are more likely to have better cognitive functioning (Sibley & Etnier, 2003).

Despite the benefits of regular physical activity for health, more than 60% of the population surprisingly fails to be active for 30 minutes daily doing moderate intensity physical activity (World Health Organization, 2005). It was also estimated that almost 75% of adolescents were inadequately active. It is rather alarming that according to WHO, non-communicable disease will constitute around 75% of all deaths in developed countries by 2020. Regarding global situation, the bulk of research findings show that physical activity and physical fitness levels are declining in all age groups in the developed and developing countries alike (Caspersen, Pereira, & Curran, 2000; Saidi, 2008).

Studies on the changes of physical activity patterns in terms of age and gender demonstrated a large portion of inactivity among adolescents. They showed that although most young children are physically active, rates of PA decrease sharply during adolescence and early adulthood and goes on well into adulthood (Caspersen et al., 2000; U.S. Department of Health and Human Services, 2000), and lack of activity in society is more prevalent among women, the adolescents, the elderly, and lower socioeconomic classes (Heydarabadi, Barekati, Gilasi, & Moosavi, 2013; U.S. Department of Health and Human Services, 2008)

In the context of Iran, patterns of physical inactivity bear some similarity to the rest of the world and adolescents constitute a major portion of society who faces the problem of physical inactivity (Kelishadi et al., 2006; Pirasteh, Hidarnia, Asghari, Faghihzadeh, & Ghofranipour, 2011; Taymoori & Lubans, 2008). In a study by Sanaeinasab, Saffari, Nazeri, Karimi Zarchi, and Cardinal (2013) which aimed at investigating physical activity knowledge, attitude and performance of Tehran's students, the number of students who lacked the required physical activity was 81.5%. The study by Kelishadi et al. (2006) on elementary, middle and high school students showed a significant decrease in physical activities among the girls. This decrease occurred in both high and moderate intensity during high school. Also the result of a theory based study by Taymoori, Niknami, and Ghofranipour (2007) which was carried out on Iranian adolescents revealed that only 35.9% of girls against 64.1% of boys were in the stages of doing and maintaining physical activity.

Psychological readiness, not physical readiness and facilities, is likely to be the main barrier to activity for most of the people. Most of the people consider the idea of starting a performance or an action, but they usually fail to make it realized, while others do some physical activity but have not quite figured out how to make it a habit of sufficient frequency and duration to obtain. Assessing psychological constructs related to change becomes especially important as researcher work to discover what helps unmotivated people move toward considering a more active lifestyle (Marcus & Forsyth, 2009).

Many health behavior theories have been proposed and subsequently used to attempt to explain the factors that may influence the decision to become physically active and the subsequent engagement in the behaviour. Most of this models and theories (e.g. Social Cognitive Theory, Theory of Planned Behavior/Reasoned Action) have a series of variables that are proposed to move individuals from inactive to active,

without consideration of the pre-existing differences in motivational readiness. These theories do not account for cognitions and behaviors necessary to move from sedentary to active that likely occur throughout the stages, which may not result in changes in physical activity behavior.

The model of motivational readiness for change consists of stages which are founded on the notion that individuals have different levels of readiness to behavior change. Thus, programs need to use different techniques and strategies to produce desired behaviour change (Marcus & Forsyth, 2009). TTM, an eclectic of hundreds of theories of psychotherapy relating to behaviour change, complements previous theories in change by accounting for cognition and behavior process of change and providing a temporal dimension for classifying the physical activity behavior change process (Prochaska & DiClemente, 1983).

Transtheoretical Model has been recognised as a powerful behaviour change model since as opposed to other models for the exercise intervention, it does not focus only on individuals prepared for action (Marcus & Forsyth, 2009). Other models tend to focus on those individuals ready for a change, while only a small proportion of people actually are ready for action. Identifying the needs of the participants leads to more effective interventions that are tailored to meet the needs of the participants rather than expecting them to comply with an action-oriented program.

Instrument development and validation studies have been conducted supporting the use of behaviour modification programs design with the intention of increasing physically active lifestyles (Marcus & Simkin, 1994). However, only some experimental research intervention programs have been done, and the samples for the majority of them are adults (Cardinal, 1995; Marcus, Rossi, Selby, Niaura, & Abrams, 1992b), yet findings of these studies have been far from conclusive. Also the empirical evidence that can describe the application of stage of change paradigms to physical activity is scarce in the Iranian context. Additionally, there is not enough published literature found about the application of the TTM in high school female students in Iran. Consequently, factors related to the physical inactivity including poor exercise habits acquired in youth, have attracted the attention of so many scholars. It is rather alarming to know that the formation of any unhealthy habit during adolescence will have sustainable negative consequences in their later stages of the life.

TTM based intervention are usually designed to aid the sedentary students in moving through the stages of change and help them avoid pitfalls on what can be an arduous journey. These studies also help them understand how their behaviour regarding physical activity is like other behaviours they have succeeded in changing in the past. Their involvement in this kind of treatment will help to build their confidence in themselves and in setting realistic goals that they can achieve to make them feel proud and successful (Marcus & Forsyth, 2009). Regarding that one of the basic principles of the intervention is to attract the attention of individuals by exposing them to information specific to their predisposition and motivation levels to act (Godin, Lambert, Owen, Nolin, & Prud'homme, 2004), implementation of a strategy that uses stage-specific interventions based on transtheoretical model of behavior change is one of the most effective approaches in order to help the students to adopt physical activity (Cardinal, 1997).

### 1.3 Statement of the Problem

Despite the significant number of evidence regarding the benefits of an active life style (Boreham et al., 2004; McAuley, Blissmer, Katula, Duncan, & Mihalko, 2000; Strong et al., 2005), there has been a constant decline in the level of participation in physical activity regularly with the advancement in age (Lindgren, Baigi, Apitzsch, & Bergh, 2011; Meyers, Gamst, & Guarino, 2013). Furthermore, it has been more obvious in female adolescents who often avoid compulsory physical activity (Caspersen et al., 2000). Bauman, Sallis, Dzewaltowski, and Owen (2002) also reported that girls were less active than boys (27% versus 40%) regardless of nationality and age groups.

Based on the results of previous studies, this situation is especially evident among Iranian adolescents (Pirasteh, Hidarnia, Asghari, Faghihzadeh, & Ghofranipour, 2008; Taymoori, Niknami, Berry, Ghofranipour, & Kazemnejad, 2009). A recent research on Iranian female adolescents showed only 36% of them to be in the acceptance stages of physical activity (Taymoori et al., 2009). Also a study on adolescents aged 11 to 18 showed that 53.9% of males and 79.3% of females were physically inactive (Kelishadi et al., 2005). Findings of the study by Kelishadi et al. (2006) mirror the previous studies in that a significant decrease in physical activities with high and moderate intensity are prevalent among girls especially during their high school years. Considering the prevalence of inactivity among females and also based on research published in the British Journal of Sports Medicine suggests that, from age 30, physical inactivity has the biggest impact on this risk in women (Marie Ellis, 2014), the current study has been focused on the population of female to change their sedentary behavior.

The mechanisms which have been hypothesized to be responsible for physical inactivity mentioned above, include increasing number of children who stay at home and prefer to use electronic entertainment media rather than play outside (Gordon-Larsen, Nelson, & Popkin, 2004; Rivera, Silva, Silva, Oliveira, & Carvalho, 2010). Moreover, there has been a decline in the rates of participation in walking or cycling as active transports (Huybrechts, Bourdeaudhuij, & Henauw, 2009; Voss & Sandercock, 2010). Additionally, there are some specific cultural obstacles in the Iranian context including a great emphasis on academic success and school performance, safety concerns, inconsistency in the access to sport and exercise equipment and facilities, constraints regarding exercising in public, parents' unhealthy modeling, lack of willingness to exercise, unsatisfactory results, and the perception, probably based on religious teachings, that physical activity and sports are more masculine rather than feminine undertakings (Amiri et al., 2011; Kelishadi et al., 2010). As a result, they are more likely to be at the risk of adopting a sedentary lifestyle.

According to the TTM theory, some psychological constructs contribute to being physically active among individuals which the most important of them are processes of change, self-efficacy and decisional balance. As shown by previous research, the sedentary students seem not to possess or make use of these essential psychological factors to improve their intention to change their sedentary behavior, engage in physical activities and maintain a more active lifestyle.



Numerous studies have been done to explore the effectiveness of a counseling intervention which derives its focus from psychological literature related to physical activity (Marcus, Bock, et al., 1998; Prochaska & DiClemente, 1983). Transtheoretical model of behaviour change as a direct result of these studies has been created by integrating hundreds of theories of psychotherapy relating to behaviour change. However, a large part of studies which have been conducted according to TTM framework has been cross-sectional studies. Cross-sectional examinations of theory have been cited as a weak test of the constructs and processes involved with the TTM since they are unable to sufficiently provide us with a comprehensive picture of how behavior change actually happens in physical activity (Weinstein, Rothman, & Sutton, 1998). Hence, there seems to be a need for interventional studies activity behavior as a result of implementing various strategies in different stages of change. They have highlighted the importance of the processes of change, self-efficacy, decisional balance and relationships between different TTM components; however cross-sectional studies do not usually contribute to the actual change or improvements in physical activity among sedentary individuals (Weinstein et al., 1998). Therefore, this seems to signify the need for more stage-based interventional studies on TTM constructs and their contribution to the overall physical activity among individuals to help them improve, if not at least maintain their level of exercise.

In light of the fact that physical activity intervention programs have been crucial for all age groups and sexes, and driven with the lack of studies of this kind regarding the use of appropriate intervention programs which use psychological factors for the change in exercise behaviour, the application of TTM stage-based intervention programs seems to be necessary in order to motivate participants to move on to higher stages, as well as to maintain regular exercise. In other words, high frequency of inactivity among adolescents in high schools and the probable role of school environment in this process highlight the importance of assessment of physical activity patterns among young people and counseling about physical activity in high schools.

Regarding the mentioned issues, more TTM stage-based interventional studies are needed to identify psychological factors contributing to changes in PA behavior among sedentary students. Also stage-based intervention should examine the barriers which result in sedentary behavior and employ effective strategies to help young individuals overcome the barriers. Furthermore, considering the fact that behavior change is not an easy process, these kinds of studies will help sedentary students on understanding more about the benefits of becoming physically active and balancing their decisions towards engaging in physical activity and overcoming their personal barriers to behavior change. In order to fill the mentioned gap in literature, the current study will consider the TTM components, i.e. processes of change, self-efficacy, and decisional balance in combination with the stages in sedentary individuals to shed new light on behavior change process.

## 1.4 Objectives of the Study

As participation in regular physical activity and exercise is an important way to improve health and prevent disease, the major aim of this research is creating an intervention based on behavioral change theory and examining its effect on improving the level of activity in sedentary individuals. The objectives of this study were to:

- 1) evaluate the effect of a TTM stage-based intervention on using processes of change of physical activity as measured by the processes of change inventory at baseline, two months and four months
- 2) evaluate the effect of a TTM stage-based intervention on students' decisional balance (perceived barriers and benefits of physical activity) as measured by the decisional balance inventory at baseline, two months and four months.
- 3) evaluate the effect of a TTM stage-based intervention on activity self-efficacy as measured by self-efficacy of exercise inventory at baseline, two months and four months.
- 4) evaluate the effect of a TTM stage-based intervention on stages of change as measured by the stages of change inventory at baseline, two months and four months.

## 1.5 Research Hypotheses

The effects of the TTM stage-based intervention on TTM variables were evaluated through the following null hypotheses.

- 1) There is no significant difference between pre-test, post-test 1, and post-test 2 scores of the processes of change in the experimental group of Iranian sedentary high school students.
- 2) There is no significant difference between the experimental and control group's processes of change in the post-test 2 of Iranian sedentary high school students.
- 3) There is no significant difference between pre-test, post-test 1, and post-test 2 scores of the decisional balance in the experimental group of Iranian sedentary high school students.
- 4) There is no significant difference between the experimental and control group's decisional balance (pros and cons) in the post-test 2 of Iranian sedentary high school students.
- 5) There is no significant difference between pre-test, post-test 1, and post-test 2 scores of the self-efficacy in the experimental group of Iranian high school students.
- 6) There is no significant difference between the experimental and control group's self-efficacy in the post-test 2 of Iranian sedentary high school students.

7) There is no significant difference between pre-test, post-test 1, and post-test 2 scores of the stages of change in the experimental group of Iranian sedentary high school students.

## 1.6 Significance of the Study

Several studies have been conducted on the Iranian sedentary students but most of them were descriptive and just confirmed that there is a relation between TTM constructs and physical activity stages of change (Pirasteh et al., 2011; Sanaeinasab et al., 2013; Taymoori et al., 2009). Despite these beneficial findings, not enough studies have been undertaken to use this model practically by designing an intervention and using the benefits of TTM strategies by the time of this study. The results of the current study can contribute to designing effective interventions for adolescents.

The contribution of this study is the development of a model for "changing a behavior for good" by taking into consideration factors related to improving the attitudes towards their ability for doing an activity (self-efficacy) and factors that cognitive characteristics like consciousness-raising about chronic diseases and health benefits. Using the constructs of the theory (i.e. processes of change, decisional balance and self-efficacy) as strategies to design an intervention to psychologically motivate sedentary individuals to change their unhealthy behavior expanded the practical application of the theory. Results from this study can theoretically confirm the robustness of the TTM in a different context. Additionally, original TTM was limited to drug users and smokers. The present study would provide support for efficacy of this model in physical activity context. This study can therefore help the dynamism and evolution of the TTM.

Using experimental design, this study would methodologically help to overcome limitations of survey descriptive design commonly used in this area of study. Evaluating the effects of an intervention using a control group can show the cause and effect relationship in a strong fashion. Therefore, outcomes about relationships between constructs are not biased. Also implementing a stage-based intervention provides more detailed information about effectiveness of the intervention on TTM constructs and PA behaviour change.

Policy making bodies such as the Ministry of Health can use the findings of the study to plan for stage-based interventions which have the potential to enhance the self-health management capabilities of inactive individuals, increase individuals' participation in physical and psychological disease prevention as well as encouraging behavior change and influencing health outcomes. Curriculum developers in the Ministry of Education can also benefit from this study by considering the intervention program used in this study in the process of developing a curriculum for physical education subject in high schools. The findings of this study can also be beneficial for physical education teachers to enhance the sedentary individuals' willingness level and acceptance rate to engage in physical activities during their classes intentionally and care about their health and happiness.

Also teacher trainers can benefit from the findings of this study through teaching to future teachers the psychological strategies which can help sedentary students improve their attitudes towards physical activity and also the strategies that increase their confidence towards engaging in physical activity. Considering the fact that teachers have a key tqng"kp"gpjcpekp"uvwfgpvuø" knowledge and attitude, providing them with the knowledge about the importance of psychological factors in the process of behavior change ecp" rqukvkxgn{" kphnwgpeg" uvwfgpvuø" rj {ukecn" cevkkv{" behavior and help them maintain an active lifestyle.

The findings of the current study can also be useful for Ministry of Health and health care professionals in order to design an intervention based on TTM to prevent non-communicable diseases cpf" ko rtqxcg" vjgkt" ugfgpvct{" rcvkpgvuø" jgcnvj" fwtkpi" vjgkt" recovery period by enhancing their stages of physical activity. The way that this study followed is simple to understand; indeed it takes so much sense that most people grasp it immediately. It can help to introduce the concepts to those therapists and health professionals who wish to know more about the model of behavior change. It will be especially helpful for those who have an unhealthy behavior and would like to change. Following the strategies given by the current study, self-changers can learn new skills, draw upon their inner strength, enhance their self-sufficiency, and avoid becoming dependent on others for solutions, thus building their self-confidence for change.

### 1.7 Limitations of Study

Although this research provided some useful insights into influencing factors to physical activity behavior of high school students, there are some limitations that are worthy of attention. First, the data used in this study was self-reported and no additional data sources were used to verify the results. Therefore, some error may have occurred. For example, a high variability in stages of change among the students was observed. This variability may either represent students' actual activity pattern or it could also represent reporting error.

Second, the validity of the stage algorithm has been critiqued. Currently, there are many versions of the stage algorithm used to categorize stages of change in individuals based on the TTM concept. Since there is no "gold standard" of the algorithm to compare and test for validity of those various stage algorithms, the validity of these measures seem not to have been determined. Additionally, stage algorithms are generally based on self-assessment, which according to Adams and White (2005); Brug et al. (2005), may lead to misconception and the o kuencuukhkecvkqp"qh"vjg"kpfxkfwcnuø"qyp"rgthqt o cpeg. In order to come up with this limitation an additional questionnaire has been added in this study. The questionnaire of physical activity history (section 6, Appendix A) helps to determine the stages of individuals more accurately so considering the pattern in their responses in this questionnaire can prevent mistakes in categorizing them in stages which will provide a more valid measurement of stages of change. The single gender group may be considered as a second limitation. Even so, this study intended to gain a deeper understanding of factors influencing physical activity participation among female adolescents, rather than to generalize the results.



## **1.8 Delimitations of the Study**

The following delimitations were set by the researcher. First, this investigation included only high school students at the first three stages of change, between 14 and 17 years of age female, who reported a health status that was sufficient to participate in regular exercise. As such, the results may not be generalizable to other age and gender. Second, although different determinants of PA behavior have been proposed by different theories, only the three major psychological constructs, processes of change, decisional balance and self-efficacy were considered for the current study as the important determinants of stage transition.

## **1.9 Theoretical and Operational Definitions of Terms**

Following section provides theoretical and operational definition of the terms which are the focus of this study. In the light of this information, it is possible to have a clear understanding of the variables involved in this study.

### **1.9.1 Regular Physical Activity**

Regular physical activity has been defined as activities with the frequency of at least 3 times per week, duration of minimum 15-20 min, at a level of intensity with the target heart rate ranging 65-75% of maximum predicted heart rate (U.S. Department of Health and Human Services [USDHHS], 1996, 2000). Frequently, in this research the terms physical activity and exercise have been used interchangeably and are considered to have similar meaning. In the current study the duration of minimum 15- 20 min in moderate intensity equates with one hour session to reach an optimal heart rate, considering the low intensity of physical activity in PE classes.

### **1.9.2 Sedentary Behaviour**

Sedentary behavior is defined as failing to meet CDC/ACSM criteria for minimum physical activity participation (i.e. participating in moderate-intensity physical activity at least five days per week for a total of 30 minutes each day) (U.S. Department of Health and Human Services, 2005).

In the current study individuals who do no physical activity and do not intend to start in the next six months (precontemplators), and who do not participate in physical activity but intend to start in the next six months (contemplators) have been considered as sedentary individuals.

### **1.9.3 Stages of Change**

Stages of change represent a directional or tangible aspect of behavior change. They are dynamic or stable, meaning that one can be in a stage for an extended period of time. It has been shown that stages of change are more effective than past performance in predicting future behavior (Marcus, Selby, Niaura, & Rossi, 1992c). Stages also serve up as a good explanation for behaviors that are often aimed for change, such as physical activity. In the current study, the stages of change are measured using the stages of change questionnaire (Marcus & Forsyth, 2003).

#### **1.9.3.1 Precontemplation**

This stage is characterized by the lack of intention to change the behavior in question (usually within the six months). Individuals may stay in this stage due to not having enough knowledge about long-term consequences of their current behavior, and their hesitation about their ability to change, or their resistance due to social pressure to change (Prochaska & Marcus, 1994). In terms of pros and cons, precontemplators view their behavior, or lack of behavior in the case of exercise adoption, as having fewer pros than cons.

#### **1.9.3.2 Contemplation**

This stage is characterized by having the intention to change the behavior within the next six months. Although the intention to change is there, often the pros and cons are viewed as equal and the person continues to think about change instead of actually addressing the behavior. They often remain in this stage for up to two years by simply putting the behavior change off. Individuals may appear quite undecided about changing behavior in this stage, and as a result, this stage may require particularly designed interventions to support them in moving to the next stage (Prochaska & Marcus, 1994).

#### **1.9.3.3 Preparation**

Change in this stage is seen as occurring within the next month. In this stage there is often a future plan of action, and attempts at the behavior change have been made. This stage is less stable than the earlier stages and individuals in this stage are much more likely to make progress in the following six months than (Prochaska & Marcus, 1994).

#### **1.9.3.4 Action**

This stage is represented by making behavioral changes within the preceding six months. Individuals in this stage, also use the most processes of change. Although

there is a positive movement in the action stage, it is the least stable stage, a high risk of relapse threaten individuals in the action stage (Prochaska & Marcus, 1994).

### **1.9.3.5 Maintenance**

The stage representing six months after the goal behavior has been reached and maintained. In this stage, individuals usually use fewer processes of change because they have successfully changed their behavior. Also the risk of relapse is this stage is in the lowest level. Although the maintenance is the final stage of change, individuals may setback and cycle through some or all of the previous stages (Prochaska & Marcus, 1994).

## **1.9.4 Processes of Change**

Processes of change describe the techniques that persons use to affect experience or environments when attempting to change their behavior. These represent the strategies people use to adjust their thoughts, feelings, and behaviors associated with the desired outcome, in this case, exercise. The processes are useful when paired with stage and different processes of change are associated with particular stages of change. The processes are divided into cognitive (or experiential) and behavioral constructs. (Lewis, Marcus, Pate, & Dunn, 2002; Marshall & Biddle, 2001). In the current study the techniques participants use to change and adjust their feelings and behaviors related to PA are considered as processes of change, which are measured using a POC questionnaire.

### **1.9.4.1 Cognitive Processes of Change**

The cognitive processes of change describe individuals' awareness and feelings of the benefits of behavior change. These processes are most important in the early stages of change for predicting and understanding progress (Callaghan et al., 2002; Prochaska & Marcus, 1994). Consciousness-raising is a cognitive process which describes the increase of knowledge about the benefits of behavior change. Secondly, dramatic relief is a process where individuals react to warnings about the risks of not changing a specific behavior. A third cognitive process is environmental re-evaluation where individuals care about the consequences of other people not changing an unhealthy behavior. A fourth cognitive process, referred to as self re-evaluation, essentially means comprehending and understanding the benefits of behavior change. Finally, social liberation is increasing the number of opportunities to participate in behavior change. These five processes all fall into the cognitive category of processes of change.

#### **1.9.4.2 Behavioral Processes of Change**

Behavioral processes of change are strategies that individuals can use to change an unhealthy behavior. These processes can help more to understand and predict movement from preparation to action stage and from action to maintenance stage (Callaghan, Eves, Norman, Chang, & Lung, 2002; Prochaska & Marcus, 1994). One example is self-liberation, where a person commits to a specific change in behavior. The second behavioral process is helping relationships, enlisting social support to help change a behavior. Thirdly, counter-conditioning is substituting alternative behaviours to promote behavior change. Reinforcement management is another behavioral process where an individual establishes and implements rewards for participating in a new behavior. The final behavioral process is stimulus control which involves reminders to change the targeted behavior. These five processes form the behavioral category of processes of change.

#### **1.9.5 Self-efficacy**

Self-efficacy describes the degree of confidence one has in the ability to perform a certain physical activity (Callaghan et al., 2002). Not only does self-efficacy impact a person's confidence, but it also influences choices made, effort expended, personal thoughts, emotional reactions, and behavioural performance (Bandura, 1991). In relation to the stages of change, self-efficacy typically increases as individuals move through the stages (Marcus et al., 1992c). In the current study, self-efficacy referred to individual sport and their effort for improving their performance which was measured by administering self-efficacy questionnaire which was adopted from (Marcus, Eaton, Rossi, & Harlow, 1994).

#### **1.9.6 Decisional Balance**

Decisional balance represents the pros and cons, or benefits and costs of the behavior (Sallis, 1998). In decisional balance the perceived benefits of change increase as one progresses through the stages, while the perceived cons of behavioral change decrease as one moves through the stages. This is an important mediator of the physical activity during the early stages, but not as relevant during the action and maintenance stages (Prochaska & Velicer, 1997). A global decisional balance score was computed as the difference between these two subscales (Marcus, Rakowski, & Rossi, 1992a). In the current study decisional balance was measured with decisional balance questionnaire which was adopted from (Marcus & Forsyth, 2009).

##### **1.9.6.1 Pros**

perceived positive aspects or facilitator of behaviour (Herrick, Stone, & Mettler, 1997, p. 50). In the context of this study pros represent benefits of physical activity that motivated the participants to engage in physical activity: physical, psychological and sociological benefits.

### 1.9.6.2 Cons

kv"tghgtu"vq"örgtegkxgf"pgicvkxg"curgevu"qt"dcttkgtu"vq"ejcpi glö"(Herrick et al., 1997, p. 50). In the context of this study cons represent barriers that kept individuals from participating in physical activity.



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