



Developing The Pattern of Taijiquan Exercise of Elderly by Using The Sport
Commitment Model

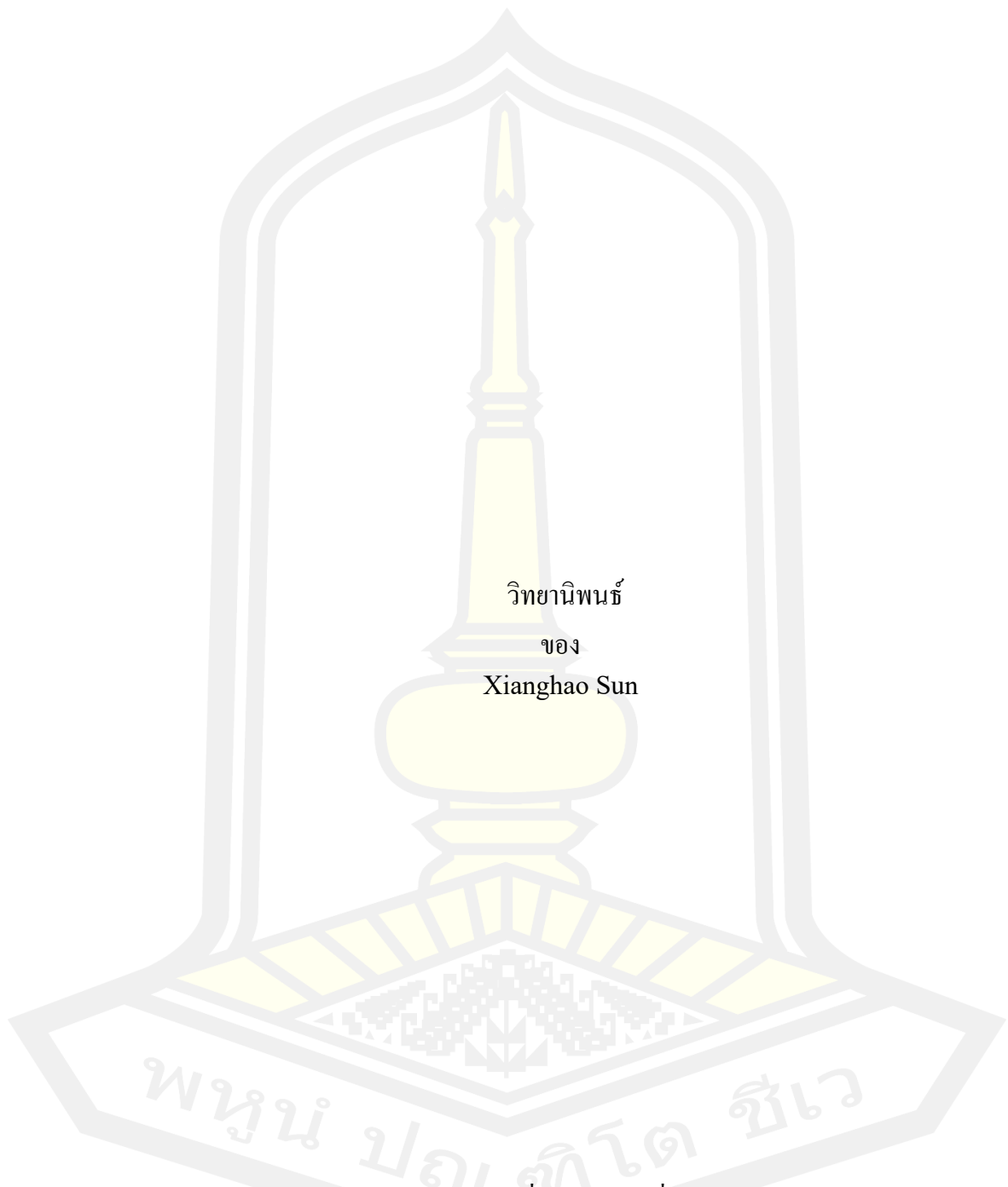
Xianghao Sun

A Thesis Submitted in Partial Fulfillment of Requirements for
degree of Doctor of Philosophy in Exercise and Sport Science

February 2023

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The examining committee has unanimously approved this Thesis,
submitted by Mr. Xianghao Sun , as a partial fulfillment of the requirements for the
Doctor of Philosophy Exercise and Sport Science at Maharakham University

Examining Committee

.....	Chairman
(Asst. Prof. Kurusart Konharn , Ph.D.)	
.....	Advisor
(Asst. Prof. Chairat Choosakul , Ph.D.)	
.....	Committee
(Asst. Prof. Arporn Popa , Ph.D.)	
.....	Committee
(Asst. Prof. Yada Thadanatthaphak , Ph.D.)	
.....	Committee
(Assoc. Prof. Vorapoj Promasatayaprot , Ph.D.)	

Maharakham University has granted approval to accept this Thesis as a
partial fulfillment of the requirements for the Doctor of Philosophy Exercise and
Sport Science

.....
(Assoc. Prof. Chowwalit
Chookhampaeng , Ed.D.)
Dean of The Faculty of Education

.....
(Assoc. Prof. Krit Chaimoon , Ph.D.)
Dean of Graduate School

TITLE	Developing The Pattern of Taijiquan Exercise of Elderly by Using The Sport Commitment Model		
AUTHOR	Xianghao Sun		
ADVISORS	Assistant Professor Chairat Choosakul , Ph.D.		
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ABSTRACT

The purposes of this study was to develop a Taijiquan exercise program for Chinese elderly (TEP-CE). In order to achieve this target, we take the Sport Commitment Model as the theoretical basis, and use the Research and Development methods, CIPP evaluation model, Community Empowerment Theory, and Taijiquan physical activity to develop TEP-CE. We divided this project into four different phase to carry out research. The first phase (Researching R1) is to validate the scale of Taijiquan exercise commitment for Chinese elderly (TECS-CE), and the relationship between exercise commitment and behavior. The second phase (Developing D1) is to develop the TEP-CE. The third phase (Researching R2) is the implementation experiment of the developed TEP-CE. The fourth phase (Developing D2) is to evaluate the first three phase of this chapter in order to evaluate and improve the TEP-CE. SPSS 23.0, AMOS 6.0 and Nvivo 12.0 software are used to process and analyze relevant data.

The research findings were as follows:

In the phase one, this thesis determined the items and factors of the TECS-CE through exploratory and confirmatory factor analysis, and tested the reliability and validity of the scale. Through the structural test of the theoretical model, the TECS-CE is composed of 2 dimensions, 6 factors and 33 items. The commitment dimension is composed of 2 factors (want to and have to) and 9 items, and the commitment determinant is composed of 6 factors (satisfaction, social constrain, involvement alternative, personal investment, social support, involvement opportunity) and 24 items.

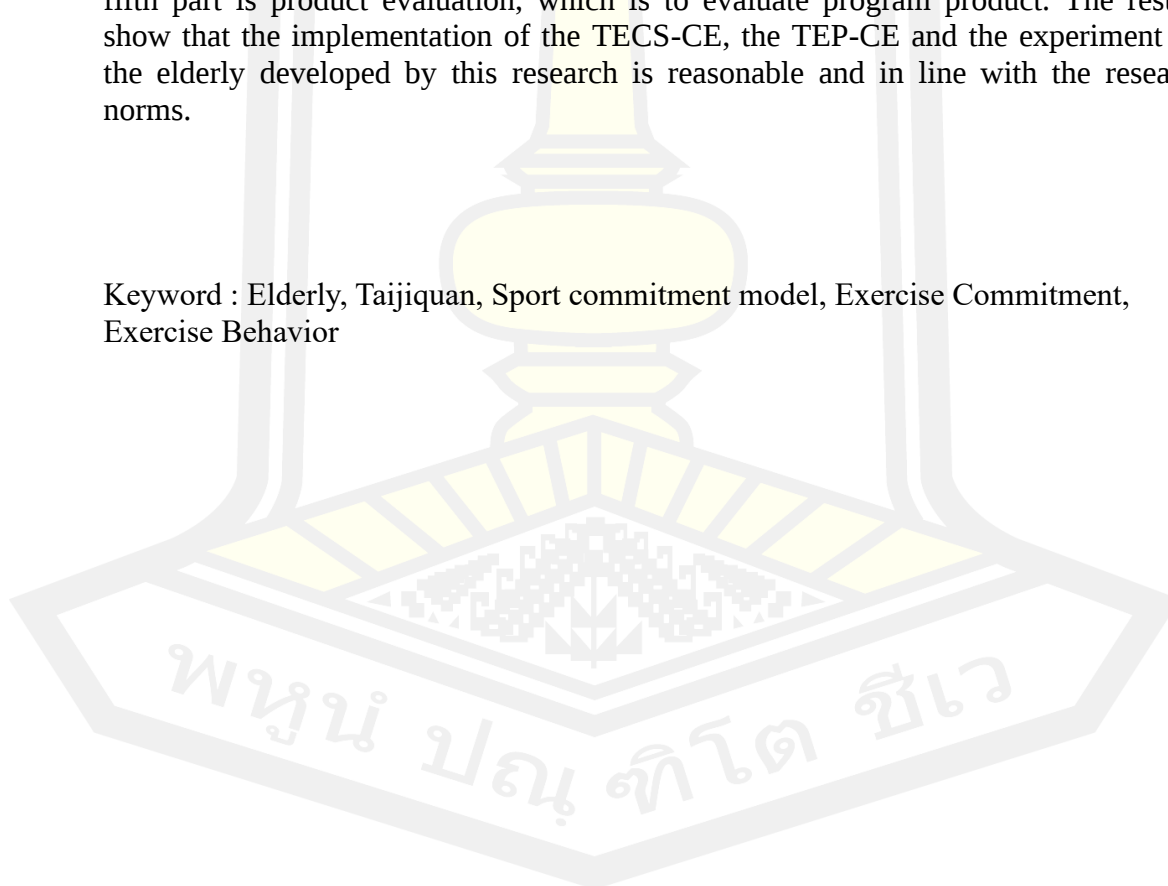
In the phase two, based on in-depth interviews, we developed an outline of the intervention program of Taijiquan exercise for Chinese elderly, whice is used the guideline of developing Taijiquan exercise program. We divide the TEP-CE for elderly into five parts. The first is the Taijiquan exercise content. The second is language voice intervention from tape. The third is the instructional intervention from leader. The fourth is the communication and interaction intervention between and

among participants. The fifth is the implementation-monitoring table.

In the phase three, we verified the TEP-CE through experimental intervention. Before the experiment, there was no difference in Taijiquan Exercise Commitment and Behavior between the Experimental Group and the Control Group. After the experiment, there were differences between the Experimental Group and the Control Group in Taijiquan exercise commitment and behavior. There was no difference in Taijiquan exercise behavior and exercise commitment in the Control Group before and after the experiment. There were differences in Taijiquan exercise behavior and commitment in the Experimental Group before and after the experiment. The results show that the program can promote the exercise commitment and behavior of the elderly Taijiquan exercisers in China.

In the phase four, we divided it into five parts according to the CIPP evaluation model. The first part, we develop a questionnaire of Taijiquan exercise project evaluation. The second part is context evaluation, which is to evaluate program context. The third part is input evaluation, which is to evaluate program input. The fourth part is process evaluation, which is to evaluate program process. The fifth part is product evaluation, which is to evaluate program product. The results show that the implementation of the TECS-CE, the TEP-CE and the experiment for the elderly developed by this research is reasonable and in line with the research norms.

Keyword : Elderly, Taijiquan, Sport commitment model, Exercise Commitment, Exercise Behavior



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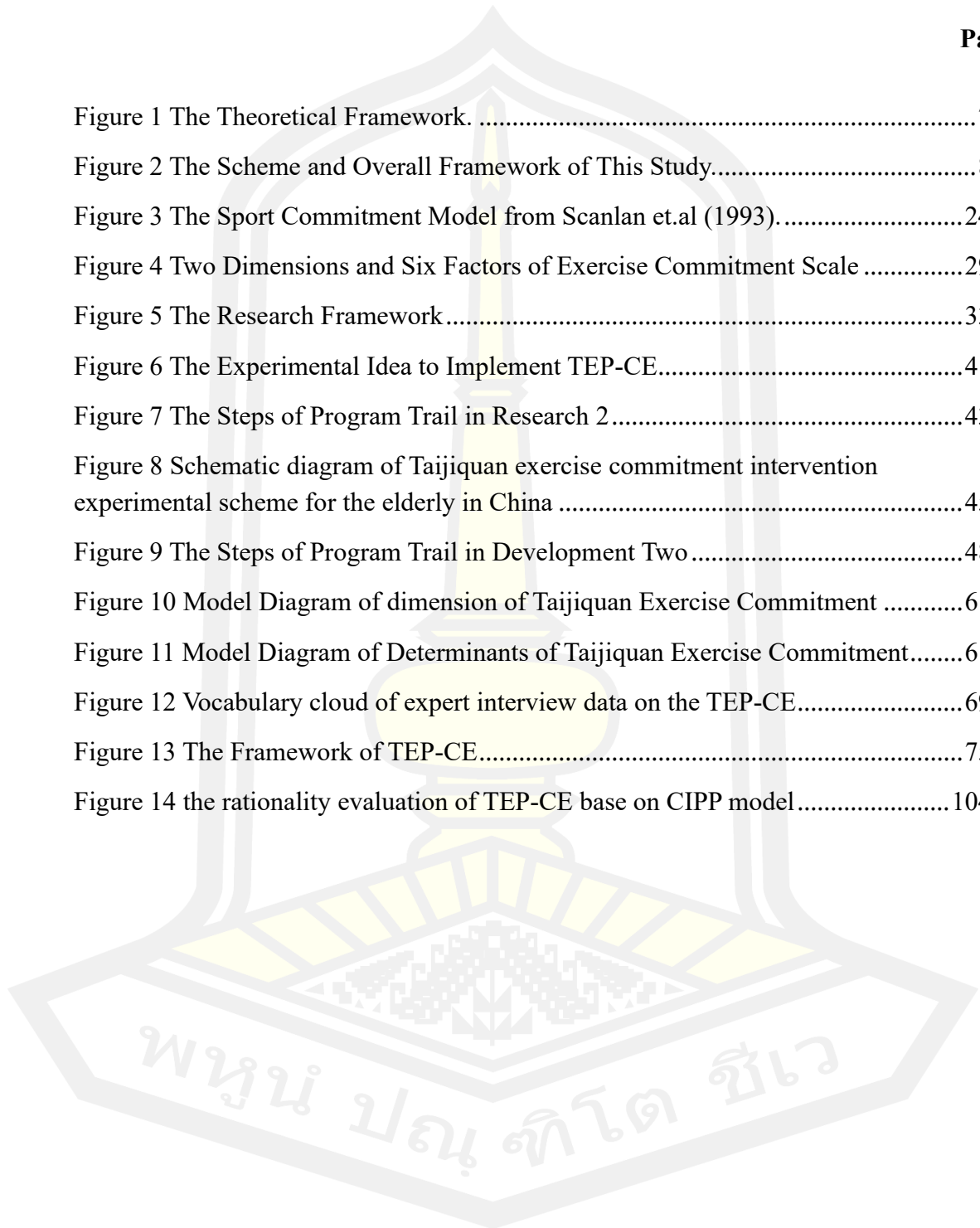
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CHAPTER I

INTRODUCTION

Background

“People are living longer lives, and both the share and the number of older persons in the total population are growing rapidly. Globally, there were 727 million persons aged 65 years or over in 2020.” and “Globally, the population aged 65 and over is growing faster than all other age groups.” were pointed out by Department of Economic and Social Affairs and Population Division from United Nations in the report “World Population Aging 2020 Highlights ---- Living arrangements of older persons”. (World Population Ageing 2020 Highlights | United Nations, 2020.). “These conditions (such as elderly disease, medical care, pension, entertainment, social security) constitute an increased burden on healthcare systems as well as an enormous human cost in the suffering they cause.” was argued by Peter (Peter, 2018). These means that the world’s population is trended to the ageing society. In view of the development trend of global population aging, in fact as early as 2011, the World Health Organization (WHO) launched a report about Global Health and Ageing, said that “Population aging is a powerful and transforming demographic force. Thereby, we need prepare for a new demographic reality, and then action based on evidence-based policies.”

As a country highest number population in the world, China has a huge aging population. According to the data of China’s National Bureau of Statistics, “by the end of 2019, there were 176.03 million people whose aged more than 65, accounting for 12.6% of the total population.” (China Statistical Yearbook—2020.). In view of China’s population trend, as early as 2015, WHO issued the China Country Assessment Report on Ageing and Health, pointed out that “From 2010 to 2040, it is predicted that the proportion of people aged 60 years plus in China will increase from 12.4% (168 million) to 28% (402 million)” (World Health Organization, 2015). With the trend of population aging, so researchers pointed out that “There is a progressive shift in the burden of disease to chronic Non-Communicable Diseases (NCDs), the reason including sedentary behavior, smoking, alcohol consumption and poor dietary etc.(Thomas et al., 2020a). “Almost 80% of deaths in China in people aged 60 years are from chronic NCDs”(“Rapid Health Transition in China, 1990–2010,” 2013). Thus, we can get the serious problem from this report that the physical health, mental

health, entertainment, medical and care of the elderly have become significant social problems in China.

It is a truth universally acknowledged that proper physical activity is beneficial to people's health. As the point by Watson et al., "Regular physical activity is vital for healthy aging because helps delay, prevent, or manage many costly, chronic diseases. Physical activity can also reduce the risk of premature death."(Watson et al., 2016). Some researchers also argued, "PA in older people is critically important in the prevention of disease, maintenance of independence and improvement of quality of life." "Increasing the PA will help minimize the burden on health and social care through enabling healthy ageing"(Fei et al., 2013). However, although people have realized that physical exercise has many benefits, there are still many elderly people who do not have the commitment to exercise or do not participate in physical exercise. "Physical activity levels globally are low and not rising" (Lightfoot et al., 2019). For example, "Physical inactivity is estimated to account for more than 69 million disability-adjusted life years and 3.2 million deaths each year". The researcher have also pointed out that "The sedentary lifestyles that predominate in older age results in premature onset of ill health, disease and frailty."(Mcphee et al., 2016).

In order to cope with the aging population and improve the quality of life of the elderly, WHO (2018) suggested that "Maintaining healthy behaviors throughout life, particularly engaging in regular physical activity and strength training to maintain muscle mass." Earlier than this, some researchers have pointed out that beginning a new exercise regimen in old age leads to significant improvements to health (Hamer et al., 2014) and cognition (Lautenschlager et al., 2008). The researcher pointed out that "Tai Ji Quan is a component of traditional Chinese medicine that has been popularized throughout the world as a means to improve health and prevent" (Li, 2016a). Taijiquan and the elder adults related research has been applied in many fields. Such as, the public health benefits (Li, 2016b), in mental disorder (Abbott & Lavretsky, 2013), psychological (Wang et al., 2014), memory (Tao et al., 2016), health(Jahnke et al., 2010), osteoarthritis patient (Cho et al., 2007), body balance (Mahaprom et al., 2017), sleep quality and emotional eating of older adults (Lo & Lee, 2013),etc. There have been pointed out that "to improve the health of older adults, Taijiquan interventions must be translated into community programs that meet the needs and abilities of older adults (Stevens et al., 2014).

From all above, on the one hand, we can get that the condition is most of the

old people are lack of physical activity, and Taijiquan is a good physical activity for elderly. On the other hand, there are still some problems in Taijiquan exercise for the elderly that also pointed by existed researches, such as some researcher pointed out “Although the government organizes and teaches the elderly Taijiquan exercise for free every year, it has not achieved good results. Most of the elderly will quit shadowboxing after free teaching, or cannot adhere to shadowboxing for a long time.” (Longwei, 2017 & Chengpeng, 2021). “We should improve the elderly Taijiquan association or community Taijiquan organization construction at all levels; Taijiquan should be further popularized in the elderly fitness groups. It is necessary to strengthen the scientific and normative publicity of Taijiquan’s healthy thoughts, sports characteristics and technical essentials.” (Wang & Zhang, 2020). In addition, some researcher also pointed out that the elderly to exercise Taijiquan using a single mode (Yunjun, 2015 & Jing, 2019), lack of continuity (Haonan, 2020), and some elderly often dropout from Taijiquan exercise (Dailiang, 2017). Thus, a problem worth studying is what affects the reason why they continue to adhere to Taijiquan exercise, what is their internal psychological commitment, motivation or admiration for implementing Taijiquan exercise, and how to establish a Taijiquan exercise model so that more elderly people can continue to participate.

Commitment is a one kind of interesting psychological determinants of exercise behavior (Corbin et al., 1987). Its meaning has its roots in a Latin word, which means “to connect” and “to entrust” (Choosakul et al., 2009). Social psychologists have used the concept of commitment to illustrate a set of factors that can explain why people stay in relationships or continue involvement in activities (Rusbult & Caryl, 1983). In the field of sports, commitment is used to explain people’s willingness and motivation to participate in sports. Sport commitment is defined as a psychological state representing the desire or resolve to continue sport participation (Scanlan, Carpenter, Simons, et al., 1993b). And then a model was built called SCM that is to distinguish between athletes who continue their participation, those who drop out, and those who burn out and to examine the motivation underlying persistence in organized sports (Schmidt, 1991; Scanlan et al., 1993a). In currently, this model has made great progress. The reliability and validity of sport commitment scale were verified and revised in many countries around the world, such as Thailand (Choosakul et al., 2009), Greece (Konstantinos, Charalambos, 2002), Japan (Goichi, 2017), US (Judy, Arianne, 2013; Davis, Matthew, 2012), Canada (Medic, Nikola, 2007; Roy, 2005), Malaysian (Arthur, 2019) and China (Chen, 2007;

Zhu,2019). In addition, it is worth mentioning that many researchers have applied Sport Commitment Model (SCM) to sport training, sport persistence, sport consumption and other aspects related to sport behavior, such as, The relationship between commitment and exercise behavior (Wilson et al., 2004); The SCM's relationship with the participation frequency and purchase behavior of nature-based recreation (Lovelock et al., 2018), relationship between sport commitment and sport consumer behavior (Fernandes et al., 2013), sport commitment and exercise adherence (Han & Yang, 2018), and applying the SCM to strength and conditioning (Waldron et al., 2008).

Therefore, there is a project worth studying, which is to explore the factors of the elderly commitment to participate continuously in Taijiquan exercise, how to make more elderly people commit to participate in Taijiquan exercise. The research shows that maintaining and improving the individual's commitment to exercise is one of the main factors to promote exercise participation (Wilson et al., 2004). It is more reliable to predict and explain exercise behavior through exercise commitment (Chen & Li, 2005). However, in the research related to exercise commitment, we did not find the measuring tool of the elderly's Taijiquan exercise commitment. Wilson et al., have pointed out "The relationship between determinants proposed within the SCM and commitment warrants additional scrutiny particularly in applications of the model to new contexts or populations (Wilson et al., 2004)." Therefore, it is extremely necessary to develop a measurement tool of Taijiquan exercise commitment for Chinese elderly, which is also the first condition for in-depth research on related issues. In addition, some studies have used the theory of exercise commitment to explain or improve physical exercise behavior. For example, Jennifer and Nic Troupe have applied the Sport Commitment Model to strength and conditioning (Waldron et al., 2008). Weiss, WM has applied the Sport Commitment Model to sport injury rehabilitation (Weiss, 2021). Hence, this paper validates a TECS-CE, and then using this scale to measure the commitment antecedents of Taijiquan exercise of the elderly. On this basis, this study develops a new Taijiquan Exercise Program for Chinese elderly (TEP-CE). This study is expected of great significance to promote the adherence and participation of the elderly in Taijiquan exercise and reduce the withdrawal of the elderly in Taijiquan exercise.

Objectives

The overall goal of this paper is to develop a TEP-CE to promote the Taijiquan exercise commitment and behavior of the elderly Taijiquan exercisers. In order to achieve this goal, I complete the following specific objectives through the following steps:

R1: To validate TECS-CE, to test the relationship between TCES-CE and exercise behavior.

D1: To develop the TEP-CE.

R2: Using the quasi experimental method, through a 12-week control experiment, to verify the effect of TEP-CE for Chinese elderly's Taijiquan exercise commitment and behavior.

D2: To evaluate the rationality developed TEP-CE (from R1 – D1 – R2) by CIPP Model, to improve the TEP-CE after getting the result of the evaluating from R1 – D1 – R2.

Research Questions

1. Is the Exercise Commitment Scale suitable for Chinese elderly Taijiquan exercisers, that can the TECS-CE be validated?
2. What is the relationship between Taijiquan exercise commitment for Chinese elderly and exercise behavior?
3. How to use TECS-CE to develop TEP-CE?
4. Does TEP-CE have any effect for the Chinese elderly's Taijiquan exercise commitment and behavior.
5. How to evaluate the TEP-CE using CIPP model base on the results?

Theoretical Framework

Research and development (R & D) is a research method, which is an effective way to develop new programs. Therefore, for developing the TEP-CE, R&D is used as the research framework, the community empowerment knowledge is integrated, and the SCM is used as the theoretical framework of the experimental model.

Community empowerment theory is used as a theoretical framework. This approach have been proven to be powerful tools for solving local health problems, which explains that one of the most effective ways to encourage community health is to provide stakeholders (community members) with tools to improve the community (Kasmel & Andersen, 2011). It also is a model, which suggests eight steps to realize community empowerment to realize health promotion change. These steps are: (A) gathering information, (B) building alliances in the community, (C) creating teams to form goals and plans, (D) defining roles and responsibilities, (E) setting a timetable, (F) encouraging growth and supporting the project, (G) evaluating and (H) maintaining the project (Hildebrant, 2008).

In the process of research, creation, experiment and revision of TEP-CE, this study will combine R&D with community authorized knowledge, follow and use relevant knowledge. The theoretical framework is depicted in Figure 1-1.

The first step of this study, Research one, is to collect information of demographic for Chinese elderly, to validate TECS-CE.

The second step of this study, Development one, is to collect information about Taijiquan exercise for the elderly in the community and establish an alliance, that is, Taijiquan exercise organization for the elderly. Then establish a team with researchers, to formulate goals and plans and define team roles and responsibilities. This study will use the existing Taijiquan alliance in the community to replace it, including managers, instructors, practitioners and researchers. According to the TECS-CE, the theoretical framework of TEP-CE is established.

The third step of this study, Research 2, is to formulate a timetable, conduct a randomized controlled experiment of the program, and collect and analyze the research results.

The fourth step of this study, Development 2, used the CIPP (Context-Input-Process-Produce evaluation) model to evaluate the research results of the program and maintain the program on the basis of evaluation.

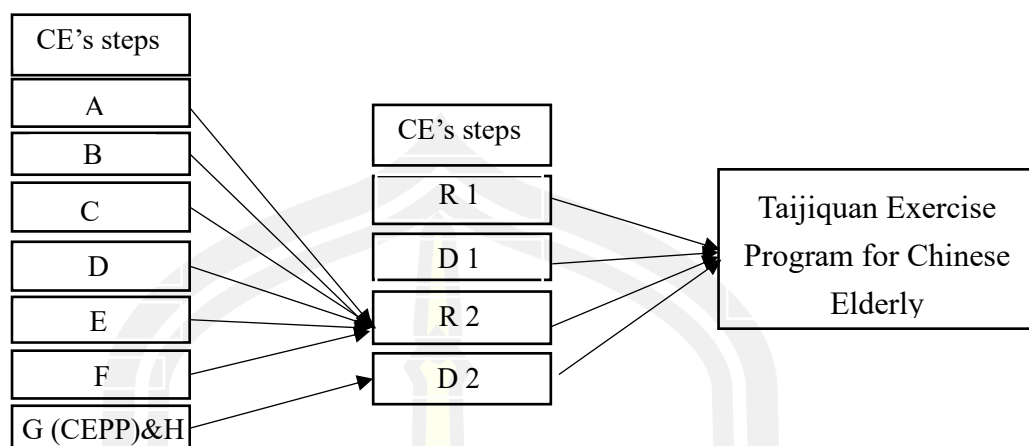


Figure 1 The Theoretical Framework.

Note: CE is community empowerment. Letters represent eight steps. A = gathering information, B = building alliances in the community, C = creating teams to form goals and plans, D = defining roles and responsibilities, E = setting a timetable, F = encouraging growth and supporting the project, G = evaluating, H = maintaining the project. CIPP is the model of Context-Input-Process-Product evaluation.

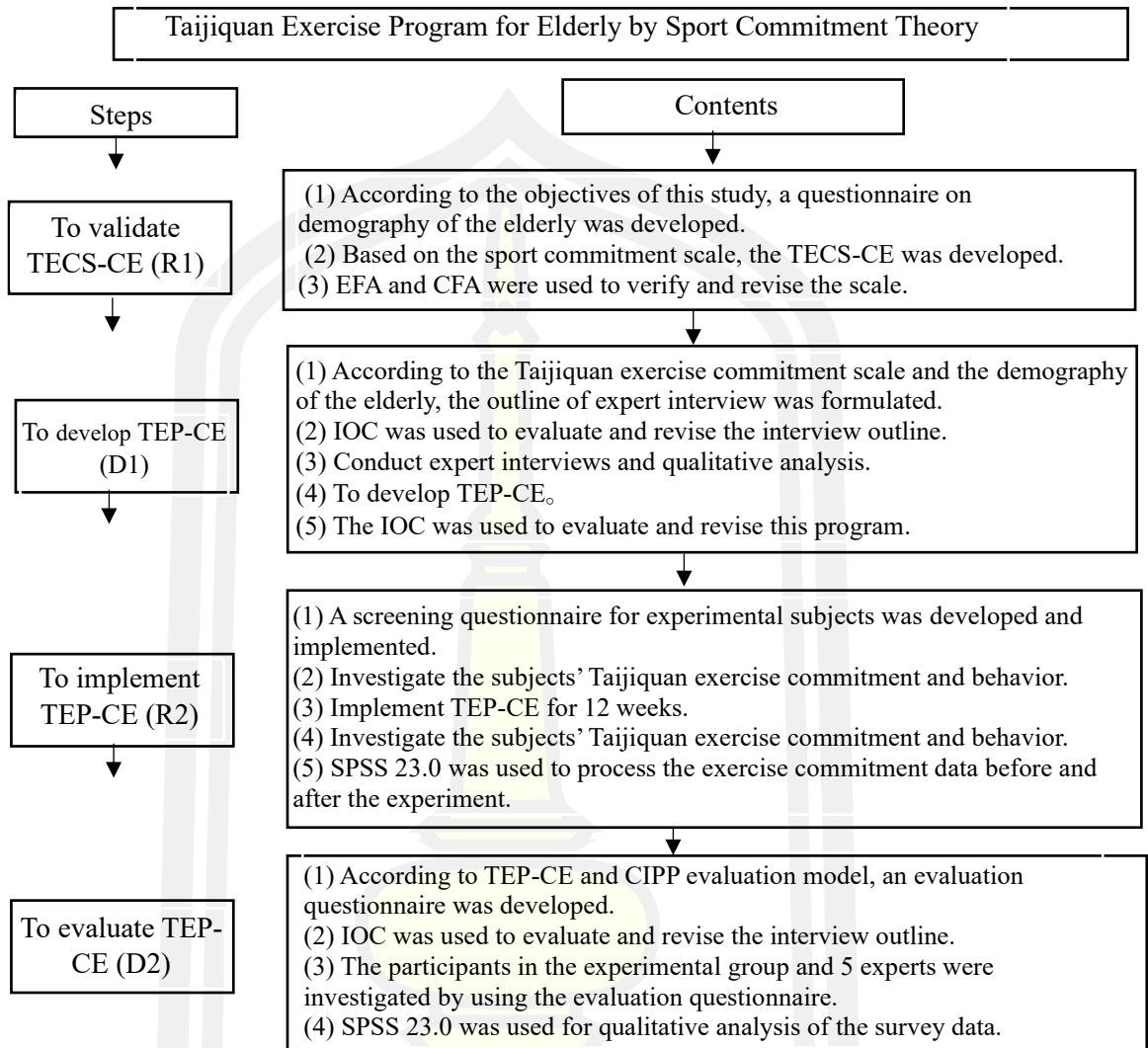


Figure 2 The Scheme and Overall Framework of This Study.

Note: R is the research. D is the development. TECS-CE is the Taijiquan Exercise Commitment Scale for Chinese Elderly. IOC is the Item-Objective Congruence. TEP-CE is the Taijiquan Exercise Program for Chinese Elderly. CIPP is the Context, Input, Process and Product.

Research Hypothesis

The research shows that maintaining and improving the individual's commitment to exercise is one of the main factors to promote exercise participation (Wilson et al., 2004). It is more reliable to predict and explain exercise behavior through exercise commitment (Chen & Li, 2005). Therefore, according to the determinants of exercise commitment, this study developed a measurement tool for

the elderly's Taijiquan exercise commitment. On this basis, according to the determinants of sports commitment, the program of intervention on the elderly's Taijiquan exercise commitment was carried out. Through this program, the participants in this study were given psychological intervention to improve the elderly's Taijiquan exercise commitment.

1. The TECS-CE is suitable for measuring the Taijiquan Exercise Commitment of the elderly Taijiquan exercisers in China.

2. The TEP-CE can be made, based on TECS-CE and the demographic characteristics of Taijiquan exercise for the elderly in China.

3. Through the comparison before and after the experiment, and through the comparison between the experimental group and the control group, the TEP-CE of the elderly in this study has obvious effect.

Significant of Study

1. Previous studies have shown that, on the one hand, physical activities are conducive to improving the health level of the elderly and reducing the risk of disease, especially Taijiquan exercise. On the other hand, the researchers also pointed out that not only the proportion of the elderly participating in Physical Activity is low, but also there are some problems in the current situation of Taijiquan exercise for the elderly. Therefore, it is necessary to conduct special research on Taijiquan exercise for the elderly, understand the factors affecting the elderly's participation in Taijiquan exercise, and determine the predictors of their Taijiquan exercise behavior, which will provide knowledge for the formulation of intervention measures to encourage the elderly to maintain Taijiquan exercise. This aspect of the elderly has not been studied.

2. The contribution of this study to knowledge is to validate TECS-CE and develop a TEP-CE based on the SCM, Research and Development as the main research method, and according to the Community Empowerment knowledge and Yang styles of Taijiquan. This study will be a behavioral intervention research, that is, using several factors of the TECS-CE to formulate some measures to intervene the elderly Taijiquan exercisers and increase their motivation for Taijiquan exercise, reduce their Taijiquan exercise fatigue, reduce their Taijiquan exercise withdrawal, so that promote their health. The results of this study will explain which factors can best promote the Taijiquan exercise behavior of the elderly. These findings will help to

know about the physical activity knowledge of the elderly and guide future research for research, especially in providing intervention strategies to encourage the elderly to maintain appropriate Taijiquan exercise. It is of practical significance to actively deal with a series of problems brought about by aging.

Definitions of Terms and Rationales

1. Sport Commitment Model

The SCM is defined as a theoretical framework to examine the rationale for continued involvement in a sport (Scanlan, Carpenter, Lobel, et al., 1993). The model postulates five predictors and two dimensions that determine whether an athlete would increase or decrease commitment to their sport. They include sport enjoyment (satisfaction), involvement opportunities, personal investments, social constraints, and involvement alternatives (Scanlan, Carpenter, Simons, et al., 1993b). These five factors were defined which are thought to impact sport commitment and to reflect a range of causal conditions (Kelly et al., 1983). Among them, Sport enjoyment, social constraints, personal investments, and involvement opportunities were predicted to show a positive relationship to commitment, while involvement alternatives would show a negative relationship.

Exercise Commitment: A psychological construct representing the desire and resolve to continue exercise participation. This conception come from Scanlan's sport commitment that is defined as a psychological state representing the desire or resolve to continue sport participation (Scanlan, Carpenter, Simons, et al., 1993b).

The demographic characteristics questionnaire of Taijiquan exercise for the Chinese elderly: It was developed in this study, including the age, gender, physical condition, education level and so on (See Appendix B).

Taijiquan Exercise Behavior Scale for the elderly: In this study, the Taijiquan exercise behavior of the elderly was measured by three indexes of the sports population (exercise times per week, exercise time and exercise intensity) and exercise persistence. Namely: exercise duration, exercise frequency, exercise intensity and exercise persistence. (See Appendix B)

TECS-CE: An initial item pool ($n = 34$) was compiled for this study based on the work of Scanlan and her colleagues (Wilson et al., 2004). The initial pool (see Appendix C) included modified items representing both dimensions and determinants of exercise commitment that have been used in previous commitment

research.

Sport enjoyment: a positive affective response to the sport experience that reflects generalized feelings such as pleasure, liking, and fun (Scanlan et al., 2009). This concept is also named as “satisfaction” in some researches, such as *The Relationship between Commitment and Exercise Behavior* (Wilson et al., 2004).

Involvement opportunities: the degree reflected to which continued exercise involvement provided social and health related benefits (Wilson et al., 2004).

Personal investment: that personal resources such as time, effort, and energy that would be lost if participation did not continue (Scanlan et al., 2009).

Social constraints: the social expectations or norms that create feelings of obligation to remain in the activity (Scanlan et al., 2009).

Social Support: Social support is “the support and encouragement the athlete perceives significant others provide for their involvement in sport” (Scanlan et al., 2009).

Involvement alternatives: the reflection of how attractive or beneficial other activities or behaviors appeared compared to exercise (Wilson et al., 2004).

2. Taijiquan Exercise

Taijiquan (also known as Tai Chi) is one of the traditional Chinese sports. It is a kind of physical activity originated from combat and fighting. It includes many kind of styles such as Chen, Yang, Wu, Sun, He etc. In traditional Chinese society, it is used for self-defense, entertainment, physical art, and physical fitness. At present, it is used more mind-body exercise that involves whole body movements, breathing techniques, postural control, and internal awareness (Chan et al., 2010). The people more pay attention to the fitness, entertainment, and medical effects of Taijiquan. In this study, we regard TEP-CE as a kind of physical activity that can promote the health, entertainment, health care and medical efficacy of the elderly, which need the altogether participation of community managers and Taijiquan instructors.

3. Taijiquan Exercise Program for Chinese Elderly

In this study, the TEP-CE from the perspective of SCM takes the antecedent variable of SCM as the environmental or atmosphere factor to intervene elderly Taijiquan exercisers. According to these six factors, sport enjoyment or satisfaction, social constraints, social support, personal investments, and involvement opportunities, involvement alternatives, some means are designed to intervene the external environment and internal feelings of elderly Taijiquan practitioners. For example, by using the words of praise to increase the exercise enjoyment of the

elderly Taijiquan exercisers; by formulating rules to increase the social constraints for the elderly to maintain Taijiquan exercise; by setting up convenient Taijiquan exercise facilities to increase their involvement opportunities; by providing free teaching to reduce their personal investment; by publicizing the benefits of Taijiquan exercise to increase practice diversity and decrease their involvement alternatives.

This study is conducted in the form of randomized controlled trial. Using the concealed allocation method and blinding of assessors' method, 40 elderly Taijiquan exercisers who meet the requirements of this study will be recruited in the community (with 3-12 month of practice experience of Taijiquan, aged between 60 and 75, and can normally participate in physical activities), 1 leader with resource Taijiquan teaching experience. Based on the demographic characteristics such as the age, practice time, physical exercise ability and health level, the participants will be divided into intervention group or control group in this study. The program is expected to take three months to complete. It is planned to practice Taijiquan three to five times a week, about one hour each time, with a rest of 5-10 minutes. Blind assessors will assess the two groups at weeks 12th, respectively.

4. Chinese Elderly

Old age is the last stage of life. There are different standards for the definition of the elderly in the world. People generally take age as the standard to distinguish different stages. For example, according to the U.S. Census Bureau (2018), the term elderly refers to persons who are greater than or equal to 65 years old. In most western developed countries, the elderly is set between 60 and 65 years old. Although there are differences in age indicators, all regions regard whether people retire or not as a benchmark of whether people are regarded as the elderly. Therefore, based on article 2 of chapter 1 general provisions of *the law of the people's Republic of China on the protection of the rights and interests of the elderly* (amended for the third time on December 29, 2018) stipulates that the elderly refer to citizens over the age of 60. According to this definition, this study chooses 60 as the starting age of old age, and defines the elderly as the population aged 60 and over.

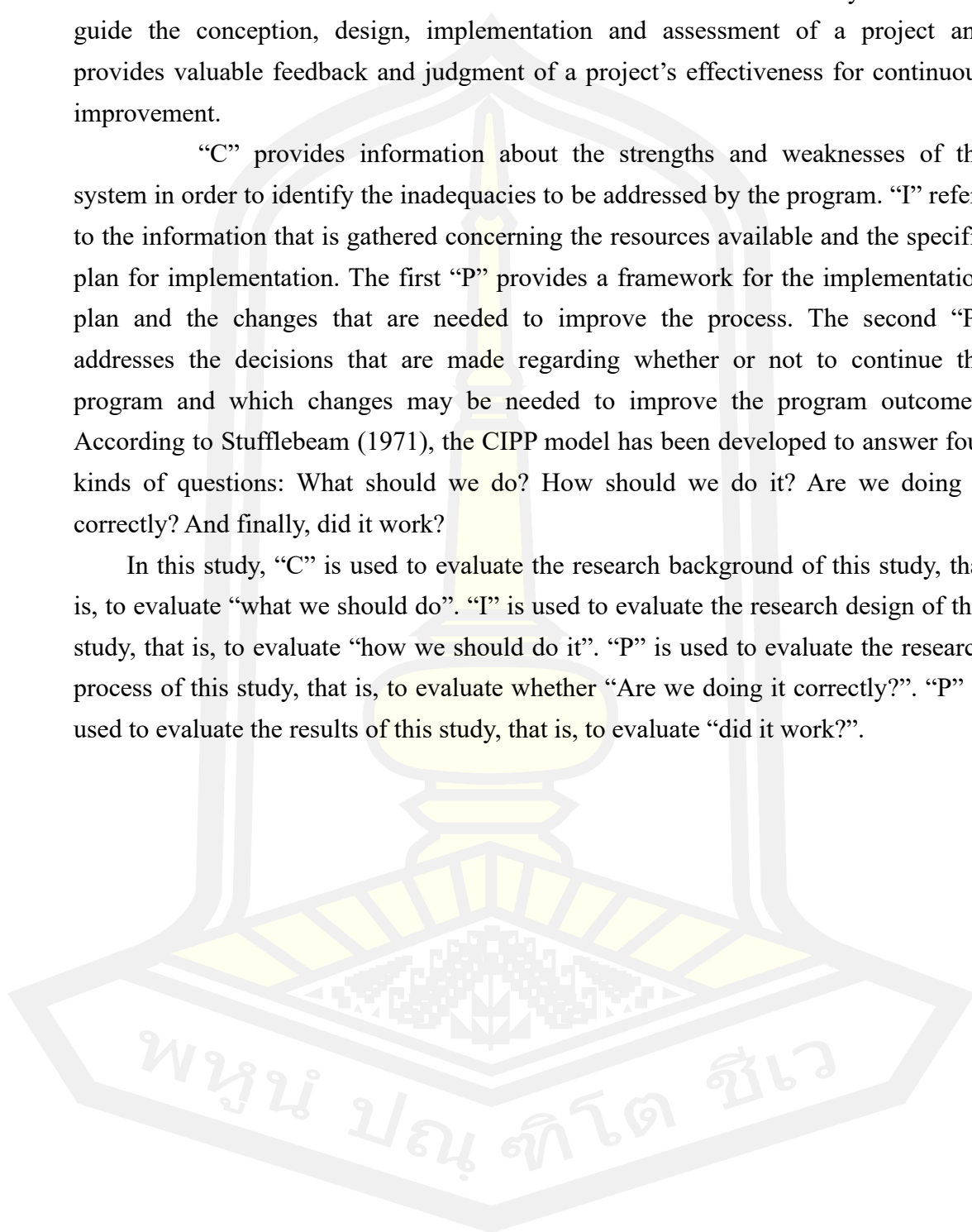
Based on the demographic characteristics such as the age, gender, exercise duration, physical exercise ability and health level, in this program, we will recruit the participants whose age are between more than 60 years and less than 75 years, and who have the practice experience of Taijiquan exercise at least three months and can normally participate in physical activities.

5. CIPP (Context, Input, Process, Product)

CIPP is an evaluation model that offers a framework to systematically guide the conception, design, implementation and assessment of a project and provides valuable feedback and judgment of a project's effectiveness for continuous improvement.

“C” provides information about the strengths and weaknesses of the system in order to identify the inadequacies to be addressed by the program. “I” refers to the information that is gathered concerning the resources available and the specific plan for implementation. The first “P” provides a framework for the implementation plan and the changes that are needed to improve the process. The second “P” addresses the decisions that are made regarding whether or not to continue the program and which changes may be needed to improve the program outcomes. According to Stufflebeam (1971), the CIPP model has been developed to answer four kinds of questions: What should we do? How should we do it? Are we doing it correctly? And finally, did it work?

In this study, “C” is used to evaluate the research background of this study, that is, to evaluate “what we should do”. “I” is used to evaluate the research design of this study, that is, to evaluate “how we should do it”. “P” is used to evaluate the research process of this study, that is, to evaluate whether “Are we doing it correctly?”. “P” is used to evaluate the results of this study, that is, to evaluate “did it work?”.



CHAPTER II

REVIEW OF RELATED LITERATURE

In order to better understand the relevant theories and establish a new TEP-CE for the elderly, this chapter discusses several important issues. The review of related literature is divided into several main parts, Aging Population and Exercise, Sport Commitment Theory, the Community Empowerment. This study uses aging, physical activity, Taijiquan exercise, Taijiquan exercise and aging, sport commitment, SCM, physical exercise and sport commitment and other keywords to search in ProQuest, Google Scholar, Web of Science, CNKI (China National Knowledge Infrastructure) and Elsevier SD (Science Direct).

Aging Population and Exercise

1. The Aging Population in China

As a country highest number population in the world, China has a huge aging population. According to the data of China's National Bureau of Statistics, "by the end of 2019, there were 176.03 million people whose aged more than 65, accounting for 12.6% of the total population." (*China Statistical Yearbook—2020*). In view of China's population trend, as early as 2015, WHO issued the China Country Assessment Report on Ageing and Health, pointed out that "From 2010 to 2040, it is predicted that the proportion of people aged 60 years plus in China will increase from 12.4% (168 million) to 28% (402 million)" (World Health Organization, 2015). With the trend of population aging, some researchers pointed out that "There is a progressive shift in the burden of disease to chronic Non-Communicable Diseases (NCDs), the reason including sedentary behavior, smoking, alcohol consumption and poor dietary etc. (R. Thomas et al., 2020). "Almost 80% of deaths in China in people aged 60 years are from chronic NCDs" ("Rapid Health Transition in China, 1990–2010," 2013). Thus, we can get the serious problem from this report that the physical health, mental health, entertainment, medical and care of the elderly have become significant social problems in China. Therefore, it will be a very meaningful topic to take some measures to reduce these problems caused by aging.

In order to cope with the aging population and improve the quality of life

of the elderly, some research pointed out that beginning a new exercise regimen in old age leads to significant improvements to health (Hamer et al., 2014) and cognition (Lautenschlager et al., 2008). Craig (2004) has argued that in a gradually aging society, regular physical activity has benefits for both individuals and society (Craig et al., 2004). For individuals, physical activity can increase the blood flow, cardiac output, maximal oxygen uptake, metabolic rate, self-confidence and self-esteem, and quality of life of older adults. For society, physical activity allows the body to exercise, which prevents chronic diseases, reduces the morbidity of the older adults, and reduces the occurrence of illness, leading to lower medical expenses and social costs. Therefore, physical activity is an important and effective way to deal with the aging of the population.

2. The Problems of the Aging Population

Since the beginning of 21st century, the aging of the world population has become more and more serious. According to the World Health Organization (WHO), the proportion of the population over the age of 60 will increase from 11% in 2006 to 22% in 2050. “An aging population is now a global trend” (Babulal et al., 2018). “People are living longer lives, and both the share and the number of older persons in the total population are growing rapidly. Globally, there were 727 million persons aged 65 years or over in 2020.” and “Globally, the population aged 65 and over is growing faster than all other age groups.” were pointed out by Department of Economic and Social Affairs and Population Division from United Nations in the report “World Population Aging 2020 Highlights ---- Living arrangements of older persons”. (United Nations, 2020). The means that the world’s population is trended to the ageing society.

Meanwhile, with greater age, mobility declines while body weight steadily increases; in particular, older adults with mainly sedentary lifestyles have significantly higher body weight, fat ratio, and fat weight (Wilmore et al., 2004). Because, “these conditions (such as elderly disease, medical care, pension, entertainment, social security) constitute an increased burden on healthcare systems as well as an enormous human cost in the suffering they cause.” was argued by Peter (Peter, 2018). For example, some researchers pointed out “There is a progressive shift in the burden of disease to chronic Non-Communicable Diseases (NCDs), the reason including sedentary behavior, smoking, alcohol consumption and poor dietary etc. (Thomas et al., 2020b). In view of the development trend of global population aging, in fact as early as 2011, the World Health Organization (WHO) launched a reported

about Global Health and Ageing, said “Population aging is a powerful and transforming demographic force. Thereby, we need prepare for a new demographic reality, and then action based on evidence-based policies.”

According to the physical status of the elderly, the researcher pointed out that complementary alternative medicine such as Taijiquan should be seriously encouraged for self-management of various emotional and physical symptoms (McClure, 2017). In addition, Taijiquan practice incorporated into treatment plans contribute to social change by reducing medicinal use, symptoms exacerbation and financial cost for treating symptoms.

3. The Significance and Problem of Exercise in Elderly

Physical activity is any bodily movement that results in increased energy expenditure and can be achieved by a variety of leisure-time, work or transportation-related activities. Exercise refers to physical activities that are planned, structured, repetitive, and intended to improve or maintain fitness, function, and health (Caspersen, & Powell, 1985). It is a truth universally acknowledged that proper physical activity (PA) is beneficial to people’s health. As proposed by the CDC (2021) from US “Regular physical activity is vital for healthy aging because helps delay, prevent, or manage many costly, chronic diseases. Physical activity can also reduce the risk of premature death.” (US. Centers for Disease Control and Prevention., 2021).The researcher, Sun et al (2013) argued, “PA in older people is critically important in the prevention of disease, maintenance of independence and improvement of quality of life.” “Increasing the PA will help minimize the burden on health and social care through enabling healthy ageing”(Sun et al., 2013). Aside from a series of physiological changes and adaptations, physical activity increases self-esteem and reduces anxiety and depression, producing a positive effect on stress relief (Mavilidi et al., 2020).

However, although people have realized that physical exercise has many benefits, there are still many elderly people who do not have the commitment to exercise or do not participate in physical exercise. “Physical activity levels globally are low and not rising” (Hallal et al., 2012).For example, WHO (2013) have stressed “around 3.2 million deaths each year are attributable to physical inactivity.” McPhee et al (2016) have also pointed out that “The sedentary lifestyles that predominate in older age results in premature onset of ill health, disease and frailty.” (McPhee et al., 2016)The reason is that due to the decline in physiological functions and reduced mobility, older adults have more difficulty in participating in sports than young people

do (Ouweland et al., 2015). For instance, Curtis et al. (1999) pointed out that participation in sports and physical activity tends to significantly decline with greater age, and half of the individuals who participate in fitness activities will withdraw in a short period of time (Curtis et al., 1999).

Ample evidence now exists that regular physical activity is key to preventing and managing major chronic diseases common to older people. Physical activity is also important for preserving physical function and mobility, which can then delay the onset of major disability (Trombetti et al., 2018). Current physical activity guidelines for older people recommend at least 150 min·wk⁻¹ of moderate-intensity aerobic activity, with muscle-strengthening activity performed on two or more days per week (Dugan et al., 2018). Despite the known benefits of physical activity to health and physical function in aging, however, the proportion of older adults meeting recommended physical activity guidelines for aerobic activity remains low (27%), based on data from the 2011–2012 US Health and Nutrition Examination Survey (Keadle et al., 2017). In view of the above problems, some studies pointed out “the sources of individual sport behavior and ongoing participation are closely related to the strength of individual motivation. Therefore, understanding the psychological structure of participation in physical activities and individual commitment, determination, motivation and behavior is necessary to avoid interruption to physical activity and to ensure regular participation” (Jeng, Yeh & Pai, 2020).

Summary. The population structure of Chinese society is rapidly aging, which will make Chinese society face huge challenges in the future. Physical activity is of positive significance to the aging of the population. However, the proportion of the elderly participating in physical activity is still low due to the modern lifestyle. Therefore, how to increase the amount of physical activity of the elderly is a research field that needs to be explored. This study attempts to study this issue from the perspective of the theory of sports commitment.

The Relationship of Taijiquan Exercise with Elderly

1. Taijiquan as a Physical Activity

Taijiquan, also known as Tai Chi, is one of the traditional Chinese sports. Its development has over a history of more than 300 years, and in this process its evolution has led to the existence of five classic styles, as we known, they are Chen, Yang, and Sun. Since the 1950s, in response to the needs of modern society, under the sponsorship of the National Sports Commission of China, Taijiquan not only evolved

into more forms, but also began to be widely promoted in China and the international community. Among them, Yang Style Taijiquan is the most used routine in public competitions and public health publicity (Guo et al., 2014). Its original purpose was to be used improving fighting skills. In the later evolution of Taijiquan, practitioners gradually added the theories of traditional Chinese medicine, health preservation, physical education and body art. Such as, the researcher, Wang Zongyue who wrote the *Taijiquan Theory*, from the perspective of Taiji philosophy, studies the connotation of Taijiquan technology through the theory of Yin and Yang (Shi & Huang, 2008). “Taijiquan has absorbed theories of traditional Chinese medicine, including the theory of Earth Meridian Ebb-Flowing and the meridian theory, to enrich its own integrated system, and the traditional Chinese medicine theory also learns from the gems of the Taiji theory to make it broader.” (Shen, 2014). *Chen’s Taijiquan Regimen* is a monograph written by Chen’s Taijiquan master. This book systematically explains the relationship between Chen Style Taijiquan and traditional Chinese medicine, health preservation and Taiji philosophy (Chen, 2012).

Due to the explanation of Taijiquan exercise from a variety of theoretical perspectives, Taijiquan exercise in traditional Chinese society can be used for self-defense, entertainment, sports art and fitness and other aspects (Guo et al., 2014). With the advent of modern society, people pay more and more attention to the health, entertainment, health care and medical functions of Taijiquan exercise. Taijiquan is confirmed the effective and valuable by many scientific researches. With Taijiquan and Tai Chi as the key words, we searched the Full-text Database of ProQuest Doctoral and Daster’s Dissertations, and found out several ten thousand research papers about Taijiquan are there. The research field involves many aspects, the results on the medical effects of Taijiquan include: Taijiquan for chronic pain conditions (Kong, et al., 2016), Taijiquan in Psychotherapy (Black, et al., 2014), stress reduction with Taijiquan for elderly with diabetes (Castillo, et al., 2011), Taijiquan in Breast cancer and self-esteem (Mustian, 2003), for Seniors with Dementia (Iordanova, 2015), the therapeutic effects of arthritis (Bailey, Rudolph, 2015), reduce cardiovascular risk (Christianson, 2012) et. Some studies even pointed out that Taijiquan has the potential to offer an independent method for managing various symptoms (McClure, 2017).

2. The Benefit of Taijiquan Exercise for Elderly

Taijiquan, as a slow and gentle way of exercise, is especially suitable for the aging body function, and can provide many benefits for the life of the elderly, such as delaying aging, keeping healthy, preventing diseases, providing entertainment

etc. The development of Taijiquan has become a kind of “fitness symbol”. Strengthening the body and prolonging life have become the main color and melody of Taijiquan, which are highly respected among the middle-aged and elderly people (Zhao, 2012). As a result, Taijiquan has attracted many elderly people to practice. The survey has found that Taijiquan has become one of the most popular sports for middle-aged and elderly women in the city Shanghai (Yuting, et al., 2007). By 2021, more than 120 cities for the elderly to practice Taijiquan have been built in China (China Association of the Elderly, 2021).

A large number of scientific researchers have confirmed the benefits of Taijiquan exercise for the elderly. Such as, the public health benefits of Taijiquan (Li, 2016b), psychological (Wang et al., 2014), the effective of Taijiquan in memory of the elderly (Tao et al., 2016), the health of the elderly exercising Taijiquan (Jahnke et al., 2010), the balance of older adults exercising Taijiquan (Mahaprom et al., 2017), the effective of Taijiquan for the older adults’ osteoarthritis (Cho et al., 2007), Taijiquan to improve cognitive performance for elderly (Kim et al., 2013), using Taijiquan to improve fall prevention exercise for elderly, (Bartimole & Fristad, 2017), the effects of Taijiquan on the Berg Balance Scale in older adults (Taylor et al., 2012), the effective of Taijiquan to body composition, sleep quality and emotional eating of older adults (Shen et al., 2008), etc. Therefore, some researcher concluded by literature review that Tai chi has a number of health and physical benefits including improved strength especially lower limb strength, improved flexibility and balance, aerobic capacity, improvements in sleep, anxiety, and depressive symptoms, increases in overall well-being, and preliminary evidence suggests that Taijiquan may improve immune system function (Huston & McFarlane, 2016).

At present, Taijiquan has been promoted as a major physical exercise program for the elderly in China. In the “Healthy China 2030” Planning Outline issued by the Chinese government in 2016, it is pointed out that “the national fitness system should be enriched and improved; Taijiquan, Fitness Qigong and other projects should be supported and promoted” (The Chinese Gov, 2016). Vigorously popularize the knowledge of traditional Chinese medicine and health care, Taijiquan, fitness qigong and other health care methods (The Chinese Gov, 2019).

Outside China, many public health organizations have promoted Taijiquan as an important exercise program. For example: the WHO recommends community-based programs that link Taijiquan-based exercises with an educational component. (WHO, 2013). The CDC has published the CDC compendium of effective fall

interventions that includes 10 exercise-based interventions, three of these are Tai Ji Quan programs (Stevens et al., 2014). In 2015, the ministry of health of the Australian government took Taijiquan as one of the 17 alternative therapies and included it in the alternative therapy of health insurance. In the US, Taijiquan has been recommended by the National Arthritis Association, the National Osteoporosis Foundation, the National Fibromyalgia Association, the American Heart Association, the American Lung Association, the National Multiple Sclerosis Society, the Parkinson's Foundation, the American Diabetes Association, the National Institutes of Health, the NIA, and other health related organizations as a best practices intervention for older adults that can improve the quality of life and have a positive effect on health related outcomes (NIH, National Center for Complementary and Integrative Health, 2018). Additionally, the US administration for community living includes Taijiquan programs among those that. (Administration on Aging, 2013).

3. Problems of Taijiquan Exercise for Elderly

However, in despite, there are still some problems in Taijiquan exercise for the elderly, such as, the proportion of the elderly who participate in Taijiquan exercise is still not high, and some of the elderly dropout from Taijiquan exercise, or turned out of Taijiquan exercise. Some researchers have pointed out that “he patient later revealed a dissatisfaction with the teaching method of the Taijiquan instructor and low overall enjoyment of the interventions.” (Matsuura, 2019) “We should improve the elderly Taijiquan association or community Taijiquan organization construction at all levels; Taijiquan should be further popularized in the elderly fitness groups. It is necessary to strengthen the scientific and normative publicity of Taijiquan's healthy thoughts, sports characteristics and technical essentials” (Wang & Zhang, 2020). “Although the government organizes and teaches the elderly Taijiquan exercise for free every year, it has not achieved good results. Most of the elderly will quit Taijiquan after free teaching, or cannot adhere to Taijiquan for a long time.” (Longwei, 2017 & Chengpeng, 2021).

In addition, some researcher also pointed out that the elderly to exercise Taijiquan using a single mode (Yunjun, 2015 & Jing, 2019), lack of continuity (Haonan, 2020), lack of systematisms, interest in inheritance and exercise (Gaixiu, 2020), and some elderly often dropout from Taijiquan exercise (Dailiang, 2017). Thus, it is a worth studying project that what is their inner psychological tendency, motivation, or admiration, and how to develop a TEP-CE makes more elderly having a commitment to exercise Taijiquan continually.

Summary. As a way of physical activity, Taijiquan has a therapeutic effect on promoting the physical health and disease recovery of the elderly. Research on the relationship between Taijiquan and the health of the elderly has been published in various journals by researchers. However, the old people's Taijiquan exercise still has the problems that the beginners are difficult to adhere to the exercise, easy to withdraw from the Taijiquan exercise, and the exercise method is single.

Sport Commitment Theory

1. The Concept of Sport Commitment and Its Model

Commitment is a difficult concept to define and can be internalized by individuals in different ways. Choosakul (2009) pointed out that the meaning of “commitment” are used at its roots in two senses which means “to connect”(closer to our modern “commitment”) and “to entrust”(more akin to “obligation”) in a Latin word (Choosakul et al., 2009). McCloskey(1987) define commitment as “whatever it is that makes a person engage or continue in a course of action when difficulties or positive alternatives influence the person to abandon the action”(McCloskey & McCain, 1987). Brickman (2013) viewed commitment as a state of obligation (‘have to commit’) and as a functional resolve (‘want to commit’)(Brickman et al., 2013). Iwasaki and Havitz (2004) showed that commitment is key to increasing participation and loyalty behavior (Iwasaki & Havitz, 2004). Social psychologists have used the concept of commitment to illustrate a set of factors that can explain why people stay in relationships or continue involvement in activities (Rusbult & Caryl, 1983).

According to the concept and content of commitment, some scholars began to apply commitment to the field of sports research. After decades of development, the concept of sport commitment has formed the following views. Some research has defined commitment as a global psychological construct reflecting a person's pledge or obligation towards continued exercise involvement (Corbin, Nielson, Borsdorf & Laurie, 1987; Martin & Hausenblaus, 1998). Sport commitment refers to an individual's psychological state of desire and determination to continue to participate in sports (Scanlan, Carpenter, Simons, et al., 1993b). Casper et al., (2007) defined sport commitment as “a psychological state representing the desire and resolve to continue sport participation in a particular program, specific sport, or sport in general.” (Casper, 2007)

In 2016, Scanlan defined sport commitment in another study as “the psychological state to persist in a sport over time.” (Scanlan et al., 2016). This time he

especially emphasized the persistence. Sport commitment represents a psychological state reflecting an athlete's desire and resolve to continue his or her sport participation (Weiss, 2021). Sport commitment is an important variable to explain the motivation of individual participation or withdrawal. Sport commitment is a state of mind and mode of behavior, where objectives are the most important factors in decision making, meaning that achieving actual health objectives directly determines the sport behavior of an individual (Rhodes et.al., 2006). From the definition of the above concept, we can get that sport commitment is a psychological state, which can reflect a person's desire and motivation to continue or adhere to participate in sports, and affect the sports behavior of continue their participation, those who drop out, and those who burn out.

The discussion of concepts is for the convenience of understanding problems. In order to reveal people's sport commitment more comprehensively, scholars have constructed a SCM according to the connotation of sport commitment. Schmidt and his colleague (1991) have proposed a model of sport commitment that focuses on the positive and no positive factors, which are satisfaction, alternatives, and investments, that act over time to hold the athlete in a chosen sport. Moreover, the model can distinguish between athletes who continue their participation, those who drop out, and those who burn out (Schmidt & Stein, 2010). According to this study, Scanlan and her colleagues (1993) published a series of research results on SCM, pointed out in these study "SCM is to examine the motivation underlying persistence in organized sports." (Scanlan, Carpenter, Simons, et al., 1993b). The model proposes that commitment to sport participation is a function of an athlete's sport enjoyment, the attractiveness of involvement alternatives, personal investments in participation, the involvement opportunities afforded by continued participation, and social constraints to continue participating". As a mark, SCM has been widely used in sport, and has been continuously expanded based on the five factors.

2. Factors Development of Sport Commitment Model

Since Scanlan built the five elements commitment model in 1993, after decades of development, based on the original model, the various extended model has been spread to many countries and regions, applied in many fields and achieved continuous development. For example, Scanlan and her colleagues (2003) further expanded SCM to include social support into the antecedent variables that determine sport commitment (Scanlan et al., 2009). In 2016, Scanlan and her colleagues further

expanded SCM including seven factors, which include Desire to excel and those six antecedent variables on 2003. The new model included a seventh predictor, Desire to Excel. Desire to Excel comprises two sub-categories: Mastery Achievement and Social Achievement. Mastery Achievement is defined by striving for improvement and achieving mastery of the skills, and Social Achievement is defined by establishing superiority and winning, including the desire to outperform one's opponents (Scanlan et al., 2009, 2016)

Since the first version of SCM released, many studies have validated and verified the model as a relevant model. Nowadays, SCM have been applied many fields, such as: sports training, sports persistence, sports consumption, exercise and other aspects related to sports behavior. Various circumstances and a variety of different settings have been used to test the SCM in the youth domain including baseball and softball participants, participants in football, volleyball, and soccer (Scanlan, Carpenter, Simons, et al., 1993b), soccer players (Wilson et al., 2004), and gymnasts (Weiss et al., 2010).

For example, The Relationship Between Commitment and Exercise Behavior (Wilson et al., 2004); The Sport Commitment Model's Relationship with the Participation Frequency and Purchase Behavior of Golfers (Rubel, 2018), Relationship between sport commitment and sport consumer behavior (Fernandes et al., 2013), Sport commitment and adherence (Lukwu & Luján, 2011), Applying the Sport Commitment Model to Strength and Conditioning (Waldron et al., 2008). In addition, the reliability and validity of sport commitment scale were verified and revised in many countries, such as Thailand (Choosakul et al., 2009), Greece (Alexandris, 2002), Japan (Goichi, 2017), US (Arianne, 2013; Matthew, 2012), Canada (Nikola, 2007; Roy, 2005), Malaysian (Arthur, 2019) and China (Chen, 2007; Zhu, 2019).

The first SCM and their elements are introduced as follows:

The first one is from Scanlan and her colleagues on 1993. They introduced a sport-specific theoretical model of commitment that suggests sport commitment occurs as a result of five different categories. Four of the five categories that make up sport commitment are sport enjoyment, involvement opportunities, personal investments, and social constraints, and they are hypothesized to have a positive relationship (+) to sport commitment although involvement alternatives (the fifth category) possess a negative relationship (-) to sport commitment (Figure 3).

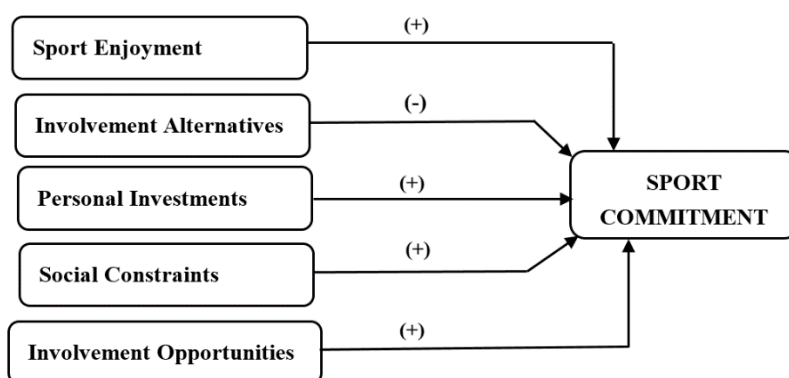


Figure 3 The Sport Commitment Model from Scanlan et.al (1993).

The first category of the SCM, sport enjoyment, is defined as “a positive affective response to the sport experience that reflects generalized feelings such as pleasure, liking and fun” (Scanlan, Carpenter, Simons, et al., 1993b). There has been a positive association between enjoyment and the desire to exert effort and persist in a selected sport (Scanlan, & Ravizza, 1998). Another factor of the SCM is involvement opportunities where valued opportunities are perceived to remain if involvement continues (Scanlan et al., 1993). These opportunities can be perceived as participating to stay fit or continuing to participate because it offers a chance to be with sport friends, as “involvement opportunities support a sense of attachment and, therefore, commitment to the activity” (Scanlan et al., 1993). Sport involvement offers an aspect of the sport that cannot be transferred to a different environment or sport, making an individual stay committed.

The third component in the model is personal investments, which includes personal resources invested in an activity that could not be recovered if participation were discontinued (Scanlan et al., 1993). Some common examples include effort, time, and money. The fourth construct is social constraints and is defined as “social expectations or norms which create feelings of obligation to remain in the activity” (Scanlan et al., 1993). With this component, there is a sense of social pressure to participate from parents, coaches, peers, and teammates. It is predicted that greater sport commitment is related to higher ratings of these four determinants in the model. The final construct of the SCM is involvement alternatives, which occur when alternatives are perceived to be more attractive than the current sport pursuit (Scanlan, et al., 1993). The assumption is that individuals consider alternative choices between the current activity and others. Having more attractive alternatives negatively

influences commitment as it is predicted to lower sport commitment.

According to the need of this study, to select the most basic and common antecedent variables that determine sport commitment, so as to select the antecedent variables to be used in this study. The representative results of SCM related to this study in recent 30 years are listed as follows (Table 1). In order to intuitively understand the information of these literatures, we listed the dimensions of research objects, samples, sports types, age, and variables.

Table 1 Researches on the Relationship Between Sport Commitment and Its Determinants

N	Author (Publish Time)	Subjects	Samples (Male/ Female)	Sport Types	Age (M)	Variables	Title
1	Scanlan et al (1993)	Teenager athletes	178 (83/95)	Competitive	(11.64)	1,2-- ,5	An introduction to the SCM
2	Scanlan et al (2003)	Elite Athlete	15	Competitive		1,2-- 5,6	Project on Elite Athlete Commitment (PEAK): II. A Direct Test and Expansion of the SCM With Elite Amateur Sportsmen
3	Philip M. Wilson et al(2004)	Collegiate students	428	aerobics, cross training	18--69	1,2-- 6,7	The relationship between commitment and exercise behavior
4	Jennifer	Athletes	All	Strength and conditioning	No	1,2-- 5,6	Applying the SCM to Strength and Conditioning
5	Choosakul et al (2009)	Adolescent athletes	460 (212/ 248)	Competitive (several)	12—18 (16.06)	1,2-- 9,10	The SCM: An Investigation of Structural Relationships with Thai Youth Athlete Populations
6	Boyst (2009)	Collegiate student- athletes	101 (59/42)	Competitive (soccer)	18--25 (19.79)	1,2-- 7,8	An Examination of Sport Commitment in Collegiate Athletes.

Table 1 (continued)

N	Author (Publish Time)	Subjects	Samples (Male/ Female)	Sport Types	Age (M)	Variables	Title
7	Gabriele et al (2011)	Adults	267(99/168)	Exercise (running,health)	18-79 (26.34)	1,2,3	The Roles of Want to Commitment and Have to Commitment in Explaining Physical Activity Behavior
8	Davis (2012)	Teenager Junior players	50 (21/29)	Competitive (tennis)	13-18 (15.08)	1,2-- ,5	An Examination of Motivational, Goal Achievement, and Sport Commitment Differences in Youth Team and Individual Tennis Populations.
9	Scanlan et al (2016)	Athletes	Phase1:753 (295/458) Phase2:982 (339/643)	Competitive (soccer,volleyball, baseball,soft ball)	13—19 (15.01)	1,2,-- ,10	The development of the Sport Commitment Questionnaire-2 (English version)
10	Rubel (2018)	Adults exercisers	30 (24/6)	Exercise (golf)	20-over 60(about 40)	1,2— 6,7	The SCM's relationship with the participation frequency and purchase behavior of Golfers

Notes:

Article 1, there are five variables, which include: Sport Enjoyment, Involvement Alternatives, Personal Investments, Social Constraints, Involvement Opportunities.

Article 2, there are six variables that include Sport Enjoyment, Involvement Alternatives, Involvement Opportunities, Personal Investments, Social Constraints, Social Support.

Article 3, there are five variables and two dimensions, the five variables include: Personal Investments, Social support, Satisfaction, Social Constraints, and Involvement Alternatives; the two dimensions include: “Want to” and “Have to”.

Article 4, there are six variables that include Sport Enjoyment, Involvement Alternatives, Personal Investment, Social Constraints, Involvement Opportunities, and Social Support.

Article 5, there are ten variables, which include Perceived Ability, Sport Commitment, Sport Enjoyment, Negative Affect, Involvement Alternatives, Personal Investments, Social Opportunities, Recognition Opportunities, Social Support, Social Constraints.

Article 6, there are six variables and two dimensions, the six variables include: Satisfaction, Social Constraints, Involvement Alternatives, Personal Investments, Social Support, and Involvement Opportunities; the two dimensions include: “Want to” and “Have to”.

Article 7, there are three variables and two dimensions, the three variables include: Satisfaction,

Investments, and Alternatives; the two dimensions include: “Want to” and “Have to”.

Article 8, there are five variables, which include: Sport Commitment, Sport Enjoyment, Social Constraints, Personal Investments, and Involvement Opportunities.

Article 9, there are ten variables and two dimensions, which include Enthusiastic Commitment (want to), Constrained Commitment (have to), Sport Enjoyment, Valuable Opportunities, Other Priorities, Personal Investments-Loss, Personal Investments-Quantity, Social Constraints, Social Support-Emotional, Social Support-informational, Desire to Excel-Mastery Achievement, Desire to Excel-Social Achievement.

Article 10, there are seven variables, which include: Sport Enjoyment, Personal Investment, Other Priorities, Valuable Opportunities, Social Constraints, Social Support, and Desire to Excel.

From the above antecedent variables related to the SCM, we can get the conclusion as following. Firstly, the antecedent variables of the sport commitment model are constantly expanded. Secondly, there are some differences in the sport commitment models used or constructed by researchers. Finally, all the authors' studies are based on the five antecedent variables of the 1993 sport commitment model, or all include these five antecedent variables. They are sport enjoyment, involvement alternatives, personal investments, social constraints, involvement opportunities. It also includes two dimensions “have to” and “want to”.

3. The Application of Sport Commitment Model in Exercise

The research on exercises commitment comes from sport commitment, which is first proposed by Scanlan and her colleagues. In its early phase, the SCM was applied in competitive youth sport domains such as soccer (Carpenter & Scanlan, 1998), cricket (Carpenter et.al., 1998), and tennis (Wilson et.al., 2001), softball and baseball, football and volleyball (Wilson et al., 2004), swimmer (Santi et al., 2014), basketball (Baghurst et al., 2014). Gradually, the SCM has also been used in the fields of fitness and exercise. In order to better reflect in the field of physical activity, some researchers have applied the model of sport commitment to the field of exercise commitment. For example, the exercise and fitness industry, like youth sport leaders, are interested in the retention of its participants. Dropout rates and sedentary life-styles provide similar concerns for the two industries. In an exploratory study, Zahariadis et al. (2006) used enjoyment, personal investment, social constraints, and involvement opportunities/valuable opportunities from the SCM as predictors of commitment to exercise and fitness participation (Zahariadis et al., 2006). Using the theoretical antecedents found in the SCM, Smith (2007) used demographic predictors (e.g., age, sex, income and skill level) to better understand membership in a community tennis association (Smith et al., 2007).

A study by Alexandris et al. in Greece found that the commitment model for participants in physical exercise and fitness is both valid and applicable. The research subjects were 210 members from three health clubs (68% female, average

age 33.6 years), and results showed that enjoyment, personal investment, social constraints, and involvement opportunities are significantly associated with sport commitment, demonstrating that the SCM can be used to predict a member's commitment to a fitness program and his or her ongoing loyalty. Related research also includes the following aspects (Alexandris et al., 2002). They are exercise commitment and health (NJ Pender et al., 2011; G hall et al., 2011), exercise commitment and behavior (Wilson et al., 2004), exercise commitment and adherence (Choi,Kang,2018; Bum,2018), exercise commitment and college students taking cultural new sports (Lee et al., 2020), exercise commitment and sport self-confidence (Soon-Young,2018), exercise commitment and identity (Anderson, 1998; Lu, 2012), exercise commitment and motivation (Dawson et al., 2004).

It is worth mentioning that SCM is the first model developed for the sport commitment of professional athletes, and all sub variables are verified by professional athletes as the survey subject. Therefore, in order to verify whether SCM is suitable for the physical exercise domain. Some researchers apply the SCM and its measurement methods to the field of sport exercise and physical fitness to verify whether the model can reflect the participants' exercise commitment, and also to explore the ECM and measurement tools of exercise crowd. For example, Wilson et al., (2004) took the SCM as the guiding conceptual framework (see the Figure 4) and adopted a cross-sectional survey design to explore the relationship between sport commitment and sports behavior. The study had participants from two universities (N 1 = 205; 83.4% female; N 2 = 223; 73.1% female) provided demographic information and completed measures of exercise commitment and frequency of exercise behavior. The results show that exploratory and confirmatory factor analyses supported the presence of 5 determinants (personal investments, social support, satisfaction, social constraints, and involvement alternatives) and 2 dimensions ('want' and 'have') of commitment. Structural equation modeling analyses supported the predictive utility of the SCM. These results render some support for the psychometric properties of the measures used to assess commitment constructs in the exercise domain and provide partial support for the application of the SCM to the study of exercise motivation issues.

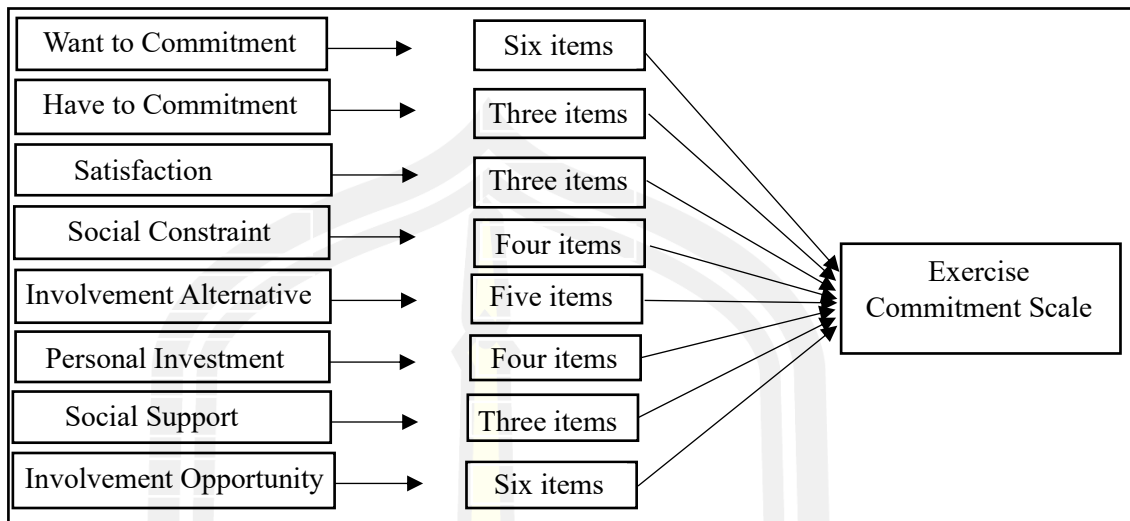


Figure 4 Two Dimensions and Six Factors of Exercise Commitment Scale

In addition, SCM is also used in the field of health care for the elderly. For example, Yuan Jeng et.al., (2020) based on the digital devices are being increasingly adopted for healthcare purposes. They investigate the continuous intention of older adults in virtual reality leisure activities by using a SCM and the theory of planned behavior to develop a new planned behavior model, and by testing the model using a sample of 388 older adults following three months of firsthand experience. The results show that sport commitment has a positive influence on continuance intention, and subjective norms and perceived behavioral control are the strongest predictors of continuous intention in virtual reality leisure activities. Further, the participation of the older adults in virtual reality leisure activities requires strong support from society as well as friends and family in order to produce continued participation. Perceived behavioral control shows that when individuals have more resources and opportunities, they face fewer expected obstacles and have greater continuance intention. In addition, the present study demonstrates that attitude influences behavioral intentions.

Moreover, Weiss & Halupnik (2013) applied sport commitment structure to the field of Strength and conditioning (Weiss & Halupnik, 2013). Based on prior research in the sport domain, it was predicted that higher enjoyment, investments, benefits, and social support and lower perceived costs and attractive alternatives would predict higher commitment to strength and conditioning. With a sample of 191 intercollegiate male and female athletes, a pilot study was conducted to examine the predictors of commitment to strength and conditioning. Multiple regression analysis

revealed that the strongest predictors of strength and conditioning commitment were perceived investments, benefits, enjoyment, costs, and attractive alternatives. The SCM may provide an avenue to gain a further insight into strength and conditioning motivation, and providing practical strategies for increasing athletes' commitment: increasing enjoyment and perceived benefits, and decreasing perceived downsides and attractive alternatives.

Furthermore, Waldron and Troupe (2018) pointed out that many strength and fitness coaches have difficulty in promoting their athletes' commitment to the program of strength and conditioning (Waldron et al., 2008). According to the previous studies pointed out that SCM is a theoretical model, which can help coaches understand the commitment level of athletes. Therefore, the author emphasizes the six antecedents of sport commitment: sports enjoyment, participation choice, personal investment, social constraints, involvement opportunities and social support. Then, it discusses how to apply these antecedent variables to the field of strength and conditioning.

Summary. Based on the points discussed above, we may reasonably draw the conclusion that on the one hand, some scholars apply the SCM to the field of sport and exercise, and point out that SCM is in line with the application in the field of exercise and fitness. On the other hand, some scholars also applied the antecedent variables of the SCM to how to promote the exerciser's strength training commitment, which has been verified. Therefore, it is not difficult to draw the conclusion that the antecedent variables of the SCM can be applied to the Taijiquan Exercise Program for Chinese Elderly, so as to promote the Taijiquan exercise commitment and improve exercise behavior for Chinese elderly Taijiquan exerciser.

The Community Empowerment

The theory of community empowerment is a middle-range theory that explains that one of the most effective ways to encourage health in a community is to give the stakeholders (community members) the tools to improve their community (Persily, 2004 & Hildebrandt, 2008). The theoretical model believes that community empowerment can be realized through eight steps to realize the health promotion of community residents. Those steps are: (a) gathering information, (b) building coalition in the community, (c) creating a team to form goals and plans, (d) define roles and responsibilities, (e) create timelines, (f) encourage growth and support the

program, (g) evaluate, and (h) maintain the program (Persily & Hildebrant, 2008). These steps were followed and utilized in the creation, implementation, and maintenance of the CPS program. At present, community empowerment theory has been widely used in many fields, such as: Persily & Hildebrant (2008) applied community empowerment theory to low-income communities, Gopichandran et al. (2012) applied community empowerment theory to low income and populations of American Indians (Gopichandran et al., 2012). Elness (2015) applied community empowerment theory to the child passenger safety program. And Partington & Totten (2012) applied the community empowerment to the sport program of community for promoting health.

These studies use community members to carry out sustained health promotion activities or other activities in their communities. A review of the literature shows that other studies and community-based interventions have successfully applied community empowerment theory. Persly & Hildebrant (2008) explains that health change may be most effective if it is brought about by the community itself rather than external institutions. This is achieved by providing community members with tools, knowledge and ability to identify and solve health problems. It is worth mentioning that community empowerment has been successfully applied to the health promotion of community residents. For example, Partington & Totten (2012) conducted research on sports community empowerment theory in Rochdale community, UK. The research proved that it is effective to enhance community capacity by formulating sports plans. Sports effectively create community empowerment, which effectively brings positive changes and endows the community with the ability to identify and solve problems. They demonstrated that community empowerment can be successful. The sports program was an example of the effectiveness of community. This program demonstrated that community members can bring about change in their community once empowered. To sum up, as a health promotion project, Taijiquan can be promoted in the community by using the community empowerment theory, so as to promote the fitness level of community residents.

Context Input Process and Product (CIPP) Evaluation

Stufflebeam (1971) developed the CIPP evaluation model. He meaningfully points out in his 1971 paper, that evaluation always includes three steps: delineating the information to be collected, obtaining the information, and providing the information to decision makers. He emphasizes that the CIPP model is intended to facilitate educational improvement through a proactive approach to evaluation, but also can be used as a post hoc accounting for decisions and actions (Stufflebeam, 1971). Since evaluation assists in decision-making, it is important to determine which kinds of decisions are supported. CIPP Model includes the four kinds of decisions that are planning, structuring, implementing, and recycling. These decisions account for context, input, process, and product evaluation. The CIPP model offers a framework to systematically guide the conception, design, implementation and assessment of a project and provides valuable feedback and judgment of a project's effectiveness for continuous improvement.

Context evaluation or the “C” in the CIPP model provides information about the strengths and weaknesses of the system in order to identify the inadequacies to be addressed by the program. The input evaluation, or “I” in the approach, refers to the information that is gathered concerning the resources available and the specific plan for implementation. The next stage in the CIPP models outlines the process evaluation, or “P”, which provides a framework for the implementation plan and the changes that are needed to improve the process. The second “P” in CIPP stands for product evaluation, which addresses the decisions that are made regarding whether or not to continue the program and which changes may be needed to improve the program outcomes. According to Stufflebeam (1971), the CIPP model has been developed to answer four kinds of questions: What should we do? How should we do it? Are we doing it correctly? And finally, did it work?

One of the strengths of CIPP model is, especially, that it is a useful and simple tool for helping evaluators produce questions of vital importance to be asked in an evaluation process. Evaluators can determine lots of questions for each component of the CIPP model. Harrison (1993) emphasizes that the CIPP model enables evaluators to intervene the evaluation process when needed, both before and during the program and it also gives the possibility of evaluation for only one component.

CHAPTER III

METHODS

This chapter describes the overall design of the study, including sampling, the development and pilot testing of a TECS-CE, data collection procedures, and statistical analyses. This study will employ Research & Development Methods (R&D) and a cross-sectional correlation design with survey data collected from the samples of elderly Taijiquan exercisers at the city of Jiaozuo in China.

This chapter is designed dividing four phases.

The first phase is to validate the TECS-CE for the elderly by using SCM, and to test the relationship between the scale and exercise behavior for elderly Taijiquan exerciser. The second phase is to develop the TEP-CE. The third phase is to experiment the TEP-CE for the elderly in China, that is, experimental research. The fourth phase is to evaluate the TEP-CE by using the CIPP evaluation model.

This research is divided into 4 phase of R and D as follows (Figure 5).

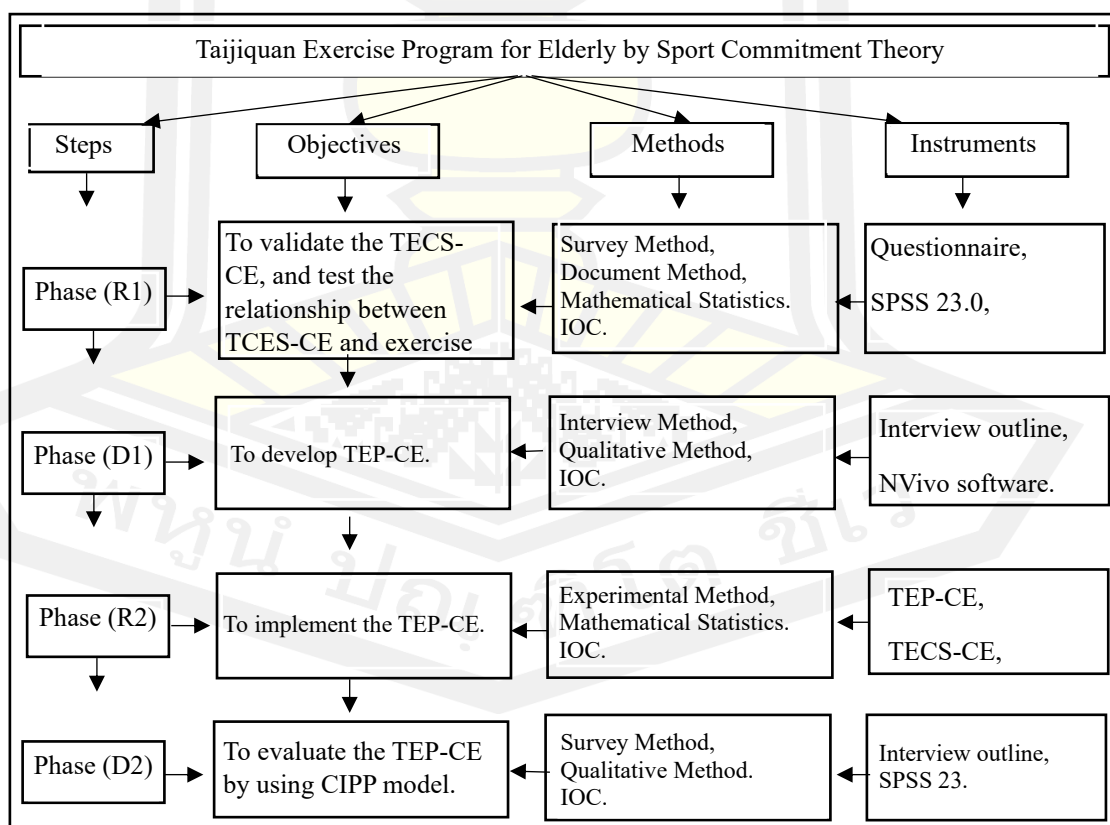


Figure 5 The Research Framework

Phase 1

1. Objective

R1: To validate TECS-CE, to test the relationship between TCES-CE and exercise behavior.

2. Research Questions

Is the Exercise Commitment Scale suitable for Chinese elderly Taijiquan exercisers, that can the TECS-CE be validated?

What is the relationship between Taijiquan exercise commitment and exercise behavior for Chinese elderly?

3. Participants

In order to determine the consistency between the demography questionnaire and the research objectives, this study select two Taijiquan research experts, two senior Taijiquan instructors and one community sport manager for Indexes of Item-Objective Congruence (IOC) test.

In order to determine the consistency between the TECS-CE and the research objectives, this study select two Taijiquan research experts, one senior Taijiquan instructor, one community sport manager and one sport psychology research expert for IOC test.

In order to developing the TECS-CE questionnaire for elderly Taijiquan exerciser, this study conduct a survey in Jiaozuo Taijiquan club or association.

The research is to recruit a group of elderly who are more than 60 and has practice Taijiquan over 3 years (For most elderly people, after three years of Taijiquan exercise, their Taijiquan exercise habits have been formed).

The first recruitment is mainly used to test the rationality, namely validity and reliability of the scale, of the elderly's exercise commitment scale, exercise behavior and demographic characteristics questionnaire.

The second recruitment is used to test the exercise commitment, exercise behavior and demographic characteristics of Taijiquan exerciser for elderly. The purpose is to implement EFA and ECF, and to analyze the relationship between TECS-CE and Taijiquan exercise behavior of the elderly.

In this study, convenient sampling in non-probabilistic sampling was used to conduct the survey. Non-Probability Sampling is useful for collecting information, especially for exploratory purposes and in qualitative investigation (Turner, 2019). Before conducting this survey, Ethics Review Committee of Mahasarakham

University has approved (mention to the ID of MSU ethic approve officially litter) the survey design of this study.

3.1 Sample Size

453 people are recruited in two times for testing TECS-CE, Exercise behavior and demographic questionnaire of Taijiquan exerciser for elderly.

3.2 Sampling Procedure

The ICO test objects of the questionnaire and scale are selected according to the experts' academic level, guidance level, management level and working years.

The first recruitment used the stratified random sampling method, 105 elderly Taijiquan exercisers are selected from Jiaozuo Taijiquan Association for the elderly at Jiefang, Zhongzhan and Macun District, including 30 people aged 60-65, 30 people aged 65-70, 30 people aged 70-75, 15 people aged over 75. The scale is distributed by researcher and filled in by each exerciser. Before the scale is distributed, researchers explain the reasons for the survey, filling requirements and precautions, to ensure that the respondents fill in the scale correctly and take back the scale on site. The time is about 5-10 minutes. General demographic data (such as gender, age, etc.) will be obtained during the survey.

The second recruitment adopt the method of stratified random sampling, in Jiaozuo City four administrative districts. Among them, 203 people are sampled from Shanyang District, 145 people are sampled from Zhongzhan District, Macun District, and Jiefang District. The total number is 348. They are from Taijiquan Association, clubs and personal. The scale is distributed by researchers and filled in by each practitioner. Before the scale is distributed, researchers explain the reasons for the investigation, filling requirements and precautions, to ensure that the respondents fill in the scale correctly and take back the scale on site. The time is about 5-10 minutes. General population data (such as gender, age, etc.) is obtained during the survey.

4. Instrument

4.1 Exercise Commitment Scale.

According to the analysis of academic history, the author believes that the most basic, important and typical physical Exercise Commitment Scale is the SCM compiled by Scanlan etc. in 1993. In 2004, Wilson et al., examined the relationship between commitment and exercise behavior using the SCM. The results from Wilson and her colleagues partially support the factorial composition and

structure of the ECS subscales in two separate samples, and support certain structural relationships among commitment constructs outlined by the SCM in the exercise domain (Wilson et al., 2004). In 2012, Qui Fen and her colleagues, some Chinese academic, tested and revised the model by applying it to the sport situation of Chinese college students. Therefore, in this study the scale is adapted according to the Exercise Commitment Scale translated by Chinese researcher Professor Qui Fen and her colleagues (Qiu & Cui, 2012). After that, five experts are invited to conduct IOC test on the scale. After the test, the scale is modified and improved according to the test results.

The questionnaire is compiled according to the literature review and the actual situation of Taijiquan exercise for the elderly in China. After the preparation, five experts are invited to test the questionnaire for IOC. After the test, the questions will be modified and improved according to the test results. We decided whether to modify the scale and questionnaire according to the statistical results after the pilot test of reliability and validity.

4.2 Demographic Characteristics Questionnaire

The second instrument is Demographic Characteristics Questionnaire that include age, gender, income, education level, health condition, living area, reasons and expenses for Taijiquan exercise, exercise places and obstacles for Taijiquan exercise, and which kind of Taijiquan do you exercise.

4.3 Exercise Behavior Index

The criterion validity of TECS-CE is the exercise behavior index for the elderly. The measurement of exercise behavior uses three indexes of sports population (weekly exercise times or also called exercise frequency, how long each exercise or also called duration and exercise intensity) and the index of exercise persistence. The test topic of exercise behavior is as follow: (1) How many times do you exercise Taijiquan every week? A 1-3 times; B 3-5 times; C 5-7 times; D over 7 times. (2) How long do you exercise Taijiquan each time? A about 30 min; B about 1 hour; C 1-1.5 hour; D over 1.5 hour. (3) How does your body change after each Taijiquan exercise? A No feeling; B Slight fever; C Almost no sweating; D Some sweating; E A lot of sweating. (4) How long have you involved Taijiquan? A three months-1 year; B 1-3 years; C 3-5 years; D more than 5 years.

5. Data Collection Procedure

The research protocols submitted to the Mahasarakham University Graduate School Advisory Committee for approval.

Prior to the study, the researchers make preliminary contact with the elderly who meet the requirements of this study to obtain data collection permission. A specific time will be set for data collection after permission is granted. The researcher and his auxiliary personnel completed the survey. On the day of the survey, participants are given a brief explanation on the purpose of the study, the notes for filling in the questionnaire, and they are informed that participation in the study is voluntary. The protocol is used throughout the investigation management process. The subjects who agreed to participate and sign the informed consent form completed the survey, which take about 5 to 10 minutes.

6. Data Analysis

This study used SPSS 23.0 data statistical software to analyze the answers of the elderly Taijiquan exercisers who provide complete survey results. The data is imported into SPSS 23.0 statistical software. (1) After screening, the reserved valid data is calculated by reverse questions and related latent variable scores. (2) Descriptive statistical and CFA will be used to test the reliability and validity of the measurement tools, and to analysis the exercise commitment and behavior situation of Taijiquan exerciser for Chinese elderly.

Phase 2

1. Objective

D1: To develop the TEP-CE.

2. Research Questions

How to use TECS-CE to develop TEP-CE?

3. Subjects

The main subjects of this stage are the managers, researchers, leaders and exercisers of Taijiquan for the elderly.

Managers have many years of Taijiquan management experience, and analyze and develop a new program of Taijiquan exercise for the elderly from the perspective of managers. Scientific researchers have been engaged in the research of Taijiquan exercise for a long time and have a comprehensive understanding of this field. Leaders have been teaching Taijiquan for a long time, and their views need to be

paid attention. As participants of Taijiquan, the views of the elderly come from their own personal experience.

Managers must have more than 5 years of Taijiquan management experience, leaders must have more than 5 years of leading practice experience, scientific research personnel must have a deputy senior title or above and authoritative research results published in this field, and elderly exerciser must be over 60 and less 75 years old.

3.1 Sample Size

At this phase, the interviewees are divided into four groups, including 4 managers, 4 leaders, 4 professors and 4 practitioners. The purpose of in-depth interview is not the number of samples, but whether the samples can answer the research questions relatively accurately and completely (Xiao, 2012). Scholar believe that 5 to 25 participants can be well studied (Creswell, 1998). Therefore, in this stage, a total of 16 relevant personnel are selected as the samples.

3.2 Sampling Procedure

In this stage, purposive sampling method is used (Berg et al., 2011). Objective sampling ensure that those who can provide the most information is interviewed (Creswell, 2013). First, managers directly select officials from Jiaozuo Municipal government departments. Second, leaders select personnel recognized by Jiaozuo Municipal government. Third, researchers select according to their published research results. Finally, exercisers visit Jiaozuo Taijiquan Association and Taijiquan enthusiasts gathering place to select qualified practitioners for in-depth interviews.

4. Instrument

4.1 The interview outline is designed according to the research purpose, TECS-CE, TEP-CE, sport commitment theory, and the survey result from phase one.

4.2 Five experts tested IOC of the designed interview outline. The evaluation content includes the content design, structure design and overall design of the interview outline. The evaluation is divided into -1,0,1. (Sanduvete-Chaves et al., 2014).

4.3 Base on the results of expert evaluation, the interview outline is revised.

4.4 Further improve the interview outline, ask for the interviewee's opinions after each interview, and adjust the interview outline according to the interview effect, to make the subsequent interview more effective. The interview is face to face, or online interview.

5. Data Collection Procedure

Administrator:

1. According to the purposive sampling method (Creswell, 2013), the qualified administrators are selected.

2. We get in touch with the interviewee through the introduction of my friends, and the interview time and place are agreed with the interviewee after obtaining consent. First, the interviewees are asked whether they have been responsible for Taijiquan management for more than five years. If the answer is “yes”, further interviews will be held. The interviewee’s consent is obtained, and the background and purpose of this study are explained, so that the interviewee can fully understand the intention of this study, to better answer the questions. Respondents can withdraw from the study at any time and their information is kept confidential.

3. It is expected that each participant has at least one face-to-face conversation through face-to-face conversation or teleconference. The interview time is 20-60 minutes. With the consent of the interviewee, the interview process is recorded by video and audio recording for subsequent data analysis.

Leader:

1. According to the purposive sampling method (Creswell, 2013), the qualified leaders are selected.

2. The leader are contacted through the introduction of colleagues, and the interview time and place are agreed with the interviewer after obtaining approval. First, ask the respondents if they have been teaching for more than five years. If the answer is “yes”, further interviews will be held. With the consent of the interviewees, the background and purpose of this study are explained, so that the interviewees can fully understand the intention of this study, to better answer the questions. Respondents can withdraw from the study at any time and their information is kept confidential.

3. It is expected that each participant has at least one face-to-face conversation through face-to-face conversation or teleconference. The interview time is 20-60 minutes. With the consent of the interviewee, the interview process is recorded by video and audio recording for subsequent data analysis.

Scientific researchers

According to the purposive sampling method (Creswell, 2013), qualified researchers will be selected.

1. We get in touch with the researchers, and the interview time and

place are agreed with the interviewers after obtaining consent. With the consent of the interviewees, the background and purpose of this study are explained, so that the interviewees can fully understand the intention of this study, to better answer the questions. Respondents can withdraw from the study at any time and their information is kept confidential.

2. It is expected that each participant has at least one face-to-face conversation through face-to-face conversation or teleconference. The interview time is 20-60 minutes. With the consent of the interviewee, the interview process is recorded by video and audio recording for subsequent data analysis.

Elderly participants:

1. According to the purposive sampling method (Creswell, 2013), we select qualified elderly interviewees through Jiaozuo Taijiquan Association.

2. After obtaining the consent of the interviewees, explain the background and purpose of this study, so that the interviewees can fully understand the intention of this study and better answer the questions. Respondents can withdraw from the study at any time and their information is kept confidential.

The interview is implemented by face to face. The interview time is 20-60 minutes. With the consent of the interviewee, the interview process is recorded by video and audio recording for subsequent data analysis.

After all interviews, the interview content is sorted and coded.

According to the content and viewpoint of the interview, sport commitment theory and literature review, this paper analyzes and summarizes the TEP-CE.

6. Data Analysis

According to the characteristics of qualitative research, data analysis should run through the whole process of data collection (Patton et al., 2002). This stage will mainly use the method of content analysis. After each interview, the interview content will be transcribed and the interview content will be conceptualized (Schwandt, 2001). Through combing the interview content, the data is divided into manageable segments, the data is coded by naming different segments (Schwandt, 2001), and the data is analyzed in a coded manner. This stage will be based on TECS-CE and Scanlan's Sport Commitment theory, using NVivo software to code the interview content.

7. Result

The TEP-CE will be developed.

Phase 3

1. Objective

R2: Using the experimental method, through a 12-week control experiment, to verify the effect of TEP-CE.

In order to achieve this research objective, the researchers conducted the TEP-CE intervention experiment from May 31, 2022 to August 19, 2022, to finish a 12-week control experiment.

To implement the program by this follows (Figure 6):

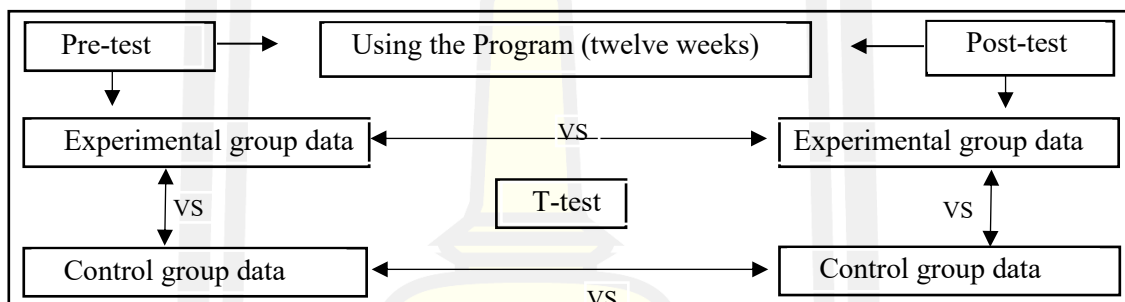


Figure 6 The Experimental Idea to Implement TEP-CE

2. Research Questions

Does TEP-CE has any effect for the Chinese elderly's Taijiquan exercise commitment and behavior?

3. Subjects

In order to test the TEP-CE developed in this study, this study Implement an experiment in Jiaozuo Taijiquan community. Based on the demographic characteristics such as the age, gender, exercise duration, education and health level. In this phase, this study recruits the elderly whose age are between more than 60 years and less than 75 years, and who have the practice experience of Taijiquan exercise during 3 months to 1 years, and who can normally participate in physical activities. They are assigned to control group and intervention group by stratified random sampling.

3.1 Sample Size

Forty elderly people are recruited and divided into control group and intervention group. Each group includes 6 men and 14 women, who have participated in Taijiquan exercise for more than 3 months and less than 1 years. One Taijiquan leader is in the experimental group (intervention group). The TEP-CE developed in this study is used to guide the first group (intervention group). The normal exercise way of Taijiquan is used to guide the second group (control group).

3.2 Sample Criteria

The study subject for this experiment must meet the following criteria:

(1) The subject must be able to answer questions independently. (2) The age of the subject must be between 60 and 75 years old. (3) The subject must be able to participate in physical activities normally. (4) The subject must be able to participate in and complete the completely experimental process. (5) The subject's Taijiquan exercise experience should be between 3-12 months. (6) The exercise place of the subject should be in the park or stadium in Shanyang District or Jiefang area.

The study subject for leader must meet the following criteria:

(1) The leader in this study must have the qualification of social sport instructor and Taijiquan master certificate. (2) The leader must have more than 5 years of Taijiquan guidance experience. (3) The leader must have high organizational and interpersonal communication skills to ensure the smooth development of this experiment. (4) The leader must be able to participate in and complete the completely experimental process. (5) The Taijiquan exercise station where the leader is located shall not be less than 10 people.

Shedding standard and treatment

(1) Those who are absent for two or more consecutive times during the intervention period are considered as dropped out. (2) The participants whose total intervention times are less than 15 times are considered as dropped out. (3) Those who had adverse physical reactions during the intervention process were regarded as dropped out after observation. (4) The participants who voluntarily withdrew and did not complete the intervention experiment were deemed to have dropped out.

During the experiment, those who fall out due to personal reasons will no longer participate in the later exercise of Taijiquan, and the earlier data will be regarded as invalid.

3.3 Sampling Procedure and Allocation

This recruitment adopts the convenient sampling method of non-probability sampling, and 20 elderly people aged 60 to 75 with similar demographic characteristics are recruited from the Elderly Association in Jiaozuo Jiefang Area and Shanyang District respectively. For the convenience participants' centralized exercise, they were assigned to the control group and the experimental group respectively

The recruitment is allowed by Jiaozuo elderly association, and the researchers participate in the recruitment. Before the recruitment, the researchers will explain the reasons for recruitment, requirements for participation and precautions, to ensure that the volunteers can complete the experiment.

Sampling is designed according to the first six steps of community empowerment, as shown in Figure 7

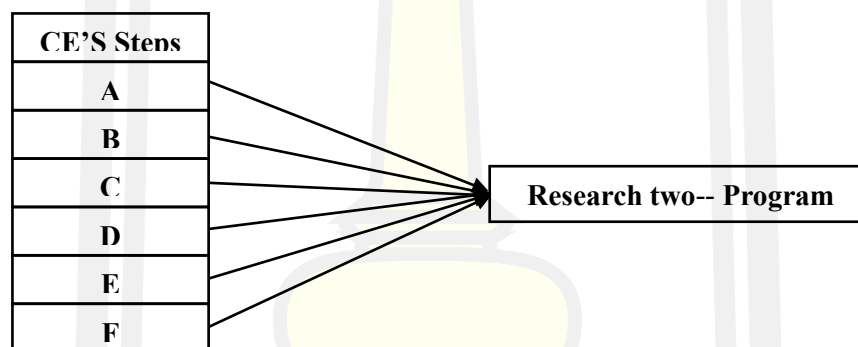


Figure 7 The Steps of Program Trail in Research 2

Note: CE is community empowerment. Letters represent eight steps. A = gathering information, B = building alliances in the community, C = creating teams to form goals and plans, D = defining roles and responsibilities, E = setting a timetable, F = encouraging growth and supporting the project.

4. Instrument

4.1 Demographic Characteristics Questionnaire

The first instrument is demographic characteristics questionnaire completed in the first phase of this study. The subject is measured by the questionnaire before and after the experiment, and the measurement data will be put into SPSS 23.0 to implement T-test.

4.2 Exercise Behavior Index

The second instrument is Exercise Behavior Index completed in the first phase of this study. The measurement of exercise behavior uses three indexes of sports population (exercise frequency, exercise duration and exercise intensity) and the index of exercise persistence. It should be noted that, as the subject of the experiment are required to be as consistent as possible, the elderly Taijiquan exercisers may have the same years of exercise, that is, the exercise persistence is the same. Therefore, at this phase, we change this item to the follows. Which choice is Your regular Taijiquan exercise in the last three months. (1) More than three times a week, about an hour each time. (2) More than three times a week, one to two hours each time. (3) More than five times a week, about an hour each time. (4) More than five times a week, one to two hours each time.

4.3 TEP-CE

The third instrument is the TEP-CE completed in the second phase of this study.

4.4 TECS-CE

The fourth instrument is the TECS-CE completed in the first phase of this study.

5. Research Technology Roadmap at This Phase (See: figure 8)

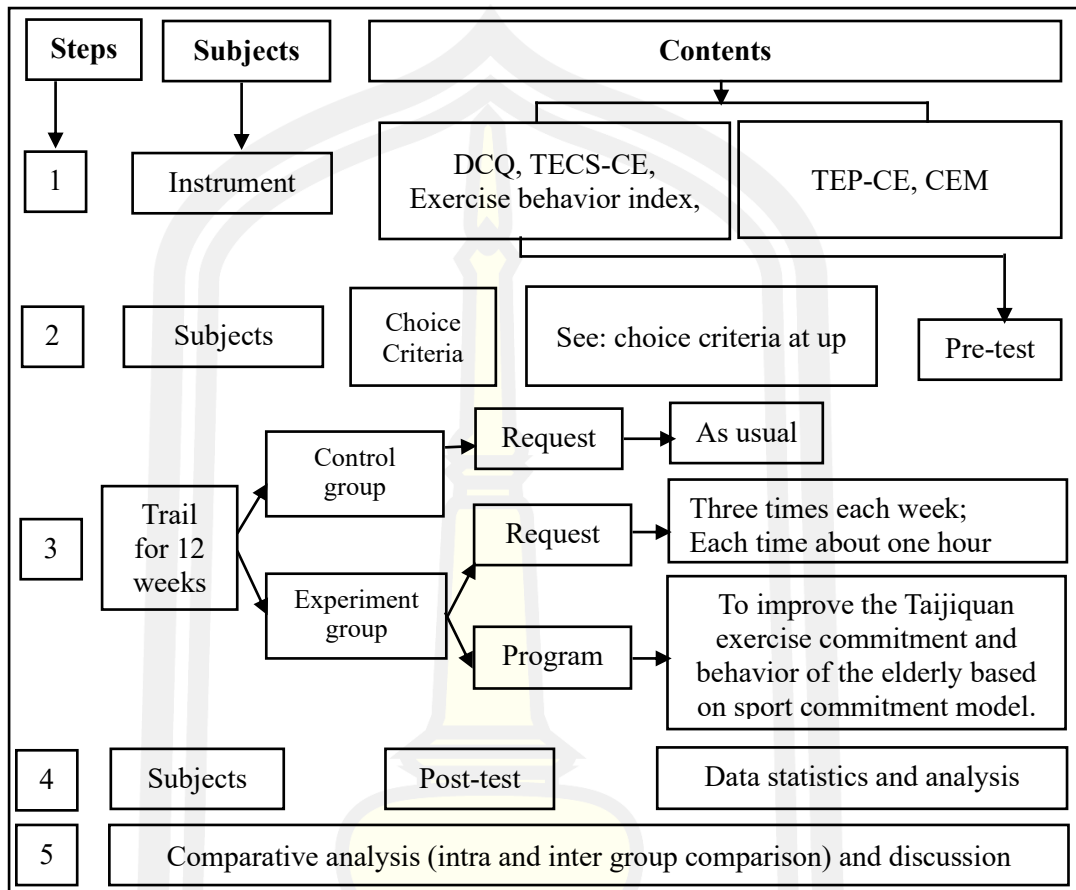


Figure 8 Schematic diagram of Taijiquan exercise commitment intervention experimental scheme for the elderly in China

6. Control of Participants and Data Collection Procedure

6.1 Control of Participants

The researcher wants to make sure that it is the manipulation of the independent variable that has changed the changes in the dependent variable. Hence, all the other variables that could affect the dependent variable to change must be controlled (McLeod, S. A. (2019)). In this study, the following methods were used to control participants.

(1) Leader monitoring. The leader of the experimental group supervises the experiment of the experimental participants to ensure that the experimenters complete the controlled experiment according to the experimental requirements.

(2) Self-monitoring record table of experimental participants. The participants used tables to record the details of their daily performance of the experiment. The monitoring record table includes leaders and participants.

(3) On site supervision. The researcher supervises the participants by asking, observing and talking at the experimental site to ask them to implement the experimental process according to the experimental requirements.

(4) Return visit supervision. The researcher communicates with the experimental participants through telephone prompts and private interviews to ask them to implement the experimental process according to the experimental requirements.

6.2 Data Collection Procedure

The first data collection is collected before the start of the experimental study. The second data collection is collected separately after the completion of TEP-CE experiment at 12th weeks (no less than three times a week, no less than 1 hour each time). It is assumed that before the experiment, the two groups volunteer have the same commitment and behavior to Taijiquan exercise. After 12 weeks of experiment, if the commitment and behavior to Taijiquan exercise of the intervention group is higher than that of the control group, it shows that the TEP-CE constructed in this study is effective.

The researcher contacts the elderly who meet the requirements of this study, introduce the purpose and requirements of participating in the experiment, and obtain data collection permission. After the researcher is granted to collect data, a specific time will be set for data collection. The researchers will conduct the data collection himself. On the day of the survey and experimental, participants are briefed on the purpose of the study, the precautions for filling in the scale, and told that they are completely voluntary to participate in the study. The agreement is used throughout the investigation management process. The subject who agreed to participate and signed the informed consent completed the investigation, which take about 5 to 10 minutes each filling in the scale.

7. Data Analysis

This study use SPSS 23.0 data statistical software to analyze the answers of the elderly Taijiquan exercisers who provide complete survey results. The data is imported into SPSS 23.0 statistical software. (1) After screening, the reserved valid data is calculated by reverse questions and related latent variable scores. (2) Descriptive statistical is used to analysis the commitment and behavior of Taijiquan exerciser for elderly who would have participated the trial. (3) The demographic characteristics of the experimental group and the control group before the experiment were analyzed by t-test. T-test was used to analyze the exercise commitment and behavior of the experimental and control group before and after the experiment.

Phase 4

1. Objective

D2: To evaluate the rationality developed TEP-CE (from R1 – D1 – R2) by CIPP Model, to improve the TEP-CE after getting the result of the evaluating from R1 – D1 – R2.

2. Research Questions

How to evaluate the TEP-CE using CIPP model base on the results?

3. Subjects

The main subjects of this phase are the participants, leaders, and experts.

As participants in the TEP-CE, their views come from their own personal experience. Leaders participate in the whole implement process of TEP-CE, and their evaluation needs to be paid attention. Experts have long paid attention to the field of Taijiquan exercise and have rich research practice and experience. Experts must have the title of associate professor and the related research results. Their evaluation is very valuable.

3.1 Sample Size

At this phase, the interviewees will be divided into three groups, including 1 leader and 20 participants in the experimental group, 5 experts.

3.2 Sampling Procedure

In this phase, a purposeful sampling method is used (Creswell, 2013). Objective sampling ensure that those who can provide the most information are interviewed (Creswell, 2013). Therefore, the participants and the leader are in the experimental group. The expert is from the institute of Taijiquan research.

4. Instrument

CIPP is the model of Context-Input-Process-Product evaluation. Stufflebeam first described it in 1971. The CIPP model focuses on program improvement through careful evaluation, and then linking the evaluation with program decision making (Stufflebeam & Shinkfield, 2007). The CIPP model provides a cycle of development, configuration, enactment and review to provide feedback on the program's effectiveness. This model has been used around the world in both short and long-term investigations, spanning various disciplines (Stufflebeam, 2003).

In this phase, the research steps of TEP-CE are promoted according to the steps of community empowerment model (Figure 9).

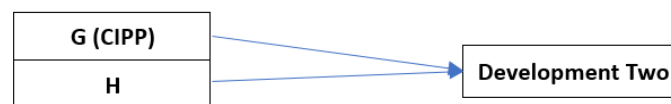


Figure 9 The Steps of Program Trail in Development Two

Note: G is evaluating; H is maintaining the program. CIPP is the model of Context-Input-Process-Product evaluation.

Based on the CIPP evaluation model and the TEP-CE, an expert interview method was used to compile a semi-structured questionnaire to evaluate the rationality developed TEP-CE in this study. The evaluation content is based on context, input, process and product. According to the contents and objectives of this study, the semi-structure questionnaire for experimental subjects, the semi-structure questionnaire for leader and the semi-structure questionnaire for experts are formulated.

5. Data Collection Procedure

According to purposive sampling method (Creswell, 2013), the qualified elderly, leader, experts are selected.

Elderly: The elderly who participate in the experimental group of TEP-CE is directly selected as the survey objects.

Leader: The leader who participate in the experimental group of TEP-CE is directly selected as the survey objects.

Experts: Get in touch with experts through the institute of Taijiqian

research from Henan province, China.

They are negotiated the interview time and place with them after getting approval. The survey is conducted by the researcher himself. On the day of the survey, participants are briefed on the purpose of the study, the precautions for filling in the questionnaire, and told that they are completely voluntary to participate in the study. The agreement is used throughout the investigation management process. The subjects who agreed to participate and signed the informed consent completed the investigation, which take about 5 to 10 minutes.

6. Data Analysis

This study use SPSS 23.0 data statistical software to analyze the answers of the participants, experts and leader who provide complete survey results. The data is imported into SPSS 23.0 statistical software. (1) After screening, the reserved valid data will be calculated by reverse questions and related latent variable scores. (2) Descriptive statistical is used to analysis the results of participants, leader, and experts.

CHAPTER IV

RESULTS

The overall objective of this study is to develop TEP-CE. In order to achieve this goal, this chapter is divided into four different phase to carry out research. The first phase (Researching R1) is to validate the TECS-CE, and to study the relationship between exercise commitment and behavior. The second phase (Developing D1) is to develop the TEP-CE. The third phase (Researching R2) is the implementation experiment of the developed TEP-CE. The fourth phase (Developing D2) is to evaluate the first three phase of this chapter in order to improve the TEP-CE.

Table 2 List of main tasks of this chapter

Phase	The mainly research content
Phase 1	To validate TECS-CE, and the relationship between the scale and behavior
Phase 2	To develop the TEP-CE.
Phase 3	To implement experiment of the TEP-CE.
Phase 4	To evaluate and improve the TEP-CE based on phase 1-2-3.

Phase 1

1. The Results from Pilot Study

1.1 The Results from Pilot Study

A pilot study was carried out on November 2021 before the actual thesis, in order to improve the quality and efficiency of the instrument. The respondents for this pilot study were 105 subjects, including 30 people aged 60-65, 30 people aged 65-70, 30 people aged 70-75, 15 people aged over 75, at Jiefang, Macun and Zhongzhan districts. This pilot study was done as part of the research strategy and it was done not only for checking the validity and reliability of the instrument, but for also checking for wording sequence before the actual data collection.

1.2 Test of Validity

The pilot study for testing validity of instrument before the actual data collection was implemented in two ways. First, the validity of survey questionnaire was examined by experts. The first section is the demographic characteristics and exercise behavior of the elderly. The second section is the exercise commitment scale translated by Chinese Professor Qiufen was used in this study.

Moreover, there were seven experts to check and confirm the validity of general contents in this questionnaire using the Index of Item Objective Congruence (Appendix D) or IOC (Rovinelli & Hambleton, 1977). This was done before using this instrument in pilot study and the real data collection. Associate Prof. Dr. Wang Baili, Dr. Hu Jingchao, Sir Wang Yongsheng, Sir Liu Yajie, they are lecturer from Henan Polytechnic University and Associate Prof. Dr. Li Qiaoling and Sir Ding Xiaofeng, they are lecturer from Henan University. Mr. Zhang Zhiyuan, a chairman of Jiaozuo city Wushu Association. They confirmed the suitability of the general contents of the questionnaire in term of elderly Taijiquan exercise commitment. These experts had evaluated by giving a rating in each item based on the degree of measurement from 1 to -1, with 1 (for clearly measuring), 0 (degree to which it measures the content area is unclear), and -1 (clearly not measuring) (Rovinelli & Hambleton, 1977). The results of the content experts agree that most of questionnaire items were clearly measuring the objective (Appendix D). Therefore, the instrument validity in this study was confirmed by seven experts (five of seven for elderly demographic characteristics and exercise behavior, and five of seven for elderly's exercise commitment scale).

1.3 Test of Reliability

The reliability of instrument, TECS-CE, was also evaluated in this pilot study. The question items for 2 dimensions (Want to and Have to), and 6 determinants (Satisfaction, Social Constraints, Involvement Alternatives, Personal Investment, Social Support, Involvement Opportunities) of TECS-CE were examined by computing Cronbach's Alpha reliability coefficients for all question items.

Table 3 Cronbach's Alpha Reliability Coefficients of ECM's Dimensions and Determinants

Items		Cronbach's Alpha
Want to Commitment	(WC)	0.874
Have to Commitment	(HC)	0.880
Social Support	(SS)	0.920
Involvement Alternatives	(IA)	0.887
Involvement Opportunities	(IO)	0.922
Satisfaction	(Sat)	0.870
Social Constraints	(SC)	0.847
Personal Investment	(PI)	0.758

As can be seen from Table 3, question items for the dimensions and factors of TECS-CE had good Cronbach's Alpha reliability coefficients scores. The Cronbach's Alpha reliability coefficients scores of WC and HC were above 0.80, and each factor was ranged from 1.000 to 0.758. All factors accepted because they were above 0.70 of Cronbach's Alpha reliability coefficients scores. Therefore, it was concluded that the question items for the dimension of TECS-CE were reliable.

2. Results from the Main Study

2.1 Descriptive statistics of demographic characteristics of respondents

Descriptive statistics were made on the demographic characteristics of the selected elderly Taijiquan exercisers. The results are shown in Table 4. The scores of gender, age, living place, Taijiquan exercise cost, health status, education level, exercise place, and the number of people who exercise together are as the follow. The valid data of this survey is 453 people, including 246 males, accounting for 54.30%; female 207, accounting for 45.70%; 163 people aged 60-65%, accounting for 36.00%; 138 people between 65 and 70, accounting for 30.50%; 115 people from 70 to 75, accounting for 25.40%; 37 people in Over75, accounting for 8.20%. In terms of living place, 150 people live in Jiangang District, accounting for 33.10%; 203 people live in Shan Yang District, accounting for 44.80%; 50 people live in Zhongzhan District, accounting for 11.00%; 50 people live in Macun District, accounting for 11.00%. In terms of Taijiquan exercise spend, 390 people were from RMB 0-200, accounting for 86.10%; 53 people with RMB 200-500, accounting for 11.70%; 8 people with 500-1000 yuan, accounting for 1.80%; 2 people of 1000-1500 yuan, accounting for 0.40%.

In terms of health status, 337 people were healthy, accounting for 74.40%; 76 people were sub healthy, accounting for 16.80%; 35 people with chronic diseases, accounting for 7.70%; 5 patients, accounting for 1.00%. In terms of education level, 113 people were junior high school students, 24.90%; 164 people were senior high school students, accounting for 36.20%; 119 were college students, accounting for 26.30%; 52 were undergraduates, accounting for 11.50%; 5 people were above graduate level, accounting for 1.00%. In terms of where exercise, 292 people were at park, 64.40%; 43 people were at sport club, accounting for 9.50%; 46 were at stadium, accounting for 10.20%; 72 people were at playground, accounting for 15.90%. In terms of how many people exercise together, 60 people were 3-5 people

together, accounting for 13.20%;191 people were 5-10 people together, accounting for 42.20%; 168 were 10-20 people together, accounting for 37.10%; 34 people were over 20 people together, accounting for 7.50%.

Table 4 Descriptive statistics of demographic characteristics of the respondents.
N=453

Name	Option	Frequency	Percentage (%)	Cumulative Percentage (%)
Gender	Male	246	54.30	54.30
	Female	207	45.70	100.00
Age	60-65	163	36.00	36.00
	65-70	138	30.50	66.40
	70-75	115	25.40	91.80
	over 75	37	8.20	100.00
	Jiefang District	150	33.10	33.10
Living place	Shan Yang District	203	44.80	77.90
	Zhongzhan District	50	11.00	89.00
	Macun District	50	11.00	100.00
	0-200 yuan	390	86.10	86.10
Spend	200-500 yuan	53	11.70	97.80
	500-1000 yuan	8	1.80	99.60
	1000-1500 yuan	2	0.40	100.00
	2000 yuan and above	0	0.00	100.00
	Health	337	74.40	74.40
Health	Sub-health	76	16.80	91.20
	Chronic disease	35	7.70	98.90
	Patient	5	1.00	100.00
Education level	Junior high school	113	24.90	24.90
	Senior high school	164	36.20	61.10
	Junior college	119	26.30	87.40
	Bachelor degree	52	11.50	98.90

Table 4 (continued)

Name	Option	Frequency	Percentage (%)	Cumulative Percentage (%)
Education level	Graduate or above	5	1.00	100.00
Where exercise	Park	292	64.40	64.50
	Sport club	43	9.50	74.00
	Stadium	46	10.20	84.10
	Playground	72	15.90	100.00
How many people together	3-5	60	13.20	13.20
	5-10	191	42.20	55.40
	10-20	168	37.10	92.50
	Over 20	34	7.50	100.00
Total		453	100.0	100.000

2.2 Descriptive Statistics of Exercise Behavior of Subjects

Descriptive statistics are made on various indicators of Taijiquan exercise behavior of the selected elderly. The results are shown in Table 5. From the scores of exercise time, exercise frequency, exercise intensity and exercise persistence, the average time for the elderly to participate in Taijiquan exercise activities is over an hour each time, and the average number of Taijiquan exercise activities per week is over three times. The intensity of each Taijiquan exercise is slightly to moderately sweating. Most elderly people have formed a habit of Taijiquan exercise and are in a state of long-term exercise.

Table 5 Descriptive Statistics of Subjects' Taijiquan Exercise Behavior

	How Long Each Time	Exercise Frequency	Exercise Intensity	Years of Exercise
M	2.636	3.130	3.267	2.611
SD	0.7827	0.7973	0.5658	1.1802
N	453	453	453	453

2.3 Validating TECS-CE

2.3.1 Descriptive Statistics of Basic Characteristics of Data

Before starting an analysis, the researcher analyzed the statistic values (means, standard deviations, skewness, and kurtosis) that are necessary to use in the structural equation modeling testing by using the SPSS.23.0. Table 6 and Table 7 present descriptive statistics for all the observed variables by group status (i.e., the elderly Taijiquan exercisers) for validating samples and calibration samples in this study. As shown in Table 6, means and standard deviations, from 203 of the validation samples, were 1.916 to 4.690 and 0.4743 to 0.8646 respectively. Table 7 shows that means and standard deviations for the number of 250 of the calibration samples were 1.916 to 4.690 and 0.4743 to 0.8646 respectively. The values of skewness and kurtosis of all observed variables in both the validation and calibration samples were lower than 3.75 which is accepted for the assumption of multivariate normality (Tabachnick & Fidell, n.d.). Therefore, this data is suitable to analysis in this research.

Table 6 Descriptive Statistics for all the Observed Variables for the EFA Sample Elderly Taijiquan Exercisers

Items	Elderly Taijiquan Exercisers (N=203)					
	Min	Max	M	SD	Skewness	Kurtosis
WC1	3.0	5.0	4.448	0.5725	-0.435	-0.755
WC2	3.0	5.0	4.291	0.5622	-0.047	-0.538
WC3	3.0	5.0	4.207	0.5942	-0.097	-0.399
WC4	3.0	5.0	4.044	0.6395	-0.038	-0.533
WC5	3.0	5.0	4.374	0.5520	-0.112	-0.853
WC6	3.0	5.0	4.089	0.5904	-0.021	-0.149
HC1	2.0	5.0	4.084	0.7021	-0.378	-0.074
HC2	2.0	5.0	4.330	0.6558	-0.573	-0.165
HC3	3.0	5.0	4.187	0.6483	-0.202	-0.673
Sat1	3.0	5.0	4.404	0.6006	-0.454	-0.652
Sat2	3.0	5.0	4.404	0.6088	-0.490	-0.632
Sat3	3.0	5.0	4.483	0.5999	-0.697	-0.466
SC1	1.0	5.0	2.719	0.8646	0.299	0.184
SC2	1.0	5.0	2.433	0.8321	0.031	-0.035
SC3	1.0	4.0	1.916	0.7885	0.211	-1.189
SC4	1.0	5.0	2.433	0.8321	-0.021	-0.307
IA1	1.0	4.0	2.394	0.6233	0.223	-0.107
IA2	1.0	5.0	2.409	0.6489	0.563	0.799

Table 6 (continued)

Items	Elderly Taijiquan Exercisers (N=203)					
	Min	Max	M	SD	Skewness	Kurtosis
IA3	1.0	4.0	2.335	0.6419	0.354	0.149
IA4	1.0	5.0	2.340	0.6583	0.241	0.672
IA5	1.0	4.0	2.138	0.7111	0.211	-0.135
PI1	3.0	5.0	4.158	0.6252	-0.125	-0.509
PI2	3.0	5.0	4.172	0.6252	-0.141	-0.526
PI3	3.0	5.0	4.187	0.6406	-0.188	-0.630
PI4	2.0	5.0	3.557	0.8148	-0.184	-0.446
SS1	3.0	5.0	4.606	0.5380	-0.913	-0.259
SS2	3.0	5.0	4.690	0.4743	-0.966	-0.702
SS3	3.0	5.0	4.685	0.4763	-0.939	-0.759
IO1	3.0	5.0	4.227	0.6117	-0.169	-0.524
IO2	3.0	5.0	4.212	0.6129	-0.155	-0.508
IO3	3.0	5.0	4.389	0.5370	-0.032	-1.026
IO4	3.0	5.0	4.429	0.5157	0.071	-1.487
IO5	4.0	5.0	4.458	0.4995	0.169	-1.991
IO6	3.0	5.0	4.296	0.5552	-0.013	-0.557

Table 7 Descriptive Statistics for all the Observed Variables for the CFA Sample Elderly Taijiquan Exercisers

Items	Elderly Taijiquan Exercisers (N=250)					
	Min	Max	M	SD	Skewness	Kurtosis
WC1	1.0	5.0	3.925	1.0884	-1.164	0.918
WC2	1.0	5.0	3.797	1.0573	-1.042	0.783
WC3	1.0	5.0	3.795	1.0828	-1.066	0.735
WC4	1.0	5.0	3.700	1.0318	-0.927	0.627
WC5	1.0	5.0	3.863	1.0824	-1.051	0.636
WC6	1.0	5.0	3.728	1.0701	-1.009	0.638
HC1	1.0	5.0	3.731	1.0424	-0.821	0.332
HC2	1.0	5.0	3.837	1.1150	-1.011	0.513
HC3	1.0	5.0	3.788	1.0429	-0.966	0.657
Sat1	1.0	5.0	3.843	1.0807	-0.974	0.521
Sat2	1.0	5.0	3.850	1.0928	-0.966	0.401
Sat3	1.0	5.0	3.894	1.1337	-1.035	0.394
SC1	1.0	5.0	2.660	1.0323	0.451	-0.190
SC2	1.0	5.0	2.492	1.0275	0.439	-0.058
SC3	1.0	5.0	2.260	1.0759	0.698	0.017

Table 7 (continued)

Items	Elderly Taijiquan Exercisers (N=250)					
	Min	Max	M	SD	Skewness	Kurtosis
SC4	1.0	5.0	2.481	1.0613	0.529	-0.082
IA1	1.0	5.0	2.499	0.9992	0.625	0.243
IA2	1.0	5.0	2.510	0.9880	0.774	0.412
IA3	1.0	5.0	2.450	1.0328	0.733	0.216
IA4	1.0	5.0	2.450	0.9935	0.648	0.297
IA5	1.0	5.0	2.353	1.0126	0.687	0.205
PI1	1.0	5.0	3.715	1.0687	-0.898	0.363
PI2	1.0	5.0	3.735	1.1173	-0.955	0.378
PI3	1.0	5.0	3.744	1.1213	-0.901	0.218
PI4	1.0	5.0	3.035	1.0082	-0.240	-0.459
SS1	1.0	5.0	3.949	1.1462	-1.105	0.474
SS2	1.0	5.0	3.980	1.1548	-1.121	0.504
SS3	1.0	5.0	3.971	1.1661	-1.172	0.603
IO1	1.0	5.0	3.804	1.0596	-0.991	0.675
IO2	1.0	5.0	3.819	1.0339	-0.923	0.532
IO3	1.0	5.0	3.857	1.0784	-1.062	0.669
IO4	1.0	5.0	3.912	1.0648	-1.137	0.869
IO5	1.0	5.0	3.885	1.0664	-1.023	0.612
IO6	1.0	5.0	3.821	1.0565	-0.995	0.687

2.3.2 Exploratory Factor Analysis

Based on the recommendations of Dzubian and Shirkey (1974), several indicators were examined to determine the suitability of the TECS-CE inter-item correlation matrix for EFA procedures (Dziuban & Shirkey, 1974). In this study, the principal component orthogonal rotation was used to conduct EFA on 34 reserved items. The TECS-CE of commitment dimensions and commitment determinants were analyzed respectively to test their content and construct validity. As shown in Table 8, the results show that KMO = 0.804 and 0.755, Bartlett's test of sphericity $P < 0.0001$, indicating that there are common factors among the observed variables, which is suitable for factor analysis.

Table 8 Two dimensions' and six determinants' KMO and Bartlett test

	KMO sampling suitability quantity	P
Two dimensions' KMO and Bartlett test	0.804	<0.0001
Six determinants' KMO and Bartlett test	0.775	<0.0001

The principal component method was used for preliminary exploratory factor analysis. The scale of commitment dimensions obtained two factors with eigenvalues greater than one, which explained 65.005% of the total variance. Combined with the gravel map, it is found that the questionnaire structure and item distribution are the most reasonable when two factors are selected. The two factors of commitment dimensions obtained by EFA are consistent with the original ECS.

TECS-CE of commitment determinants obtained six factors with eigenvalues greater than one, which explained 75.378% of the total variance. From the scree plot, there is an inflection point at the sixth factor, indicating that it is most appropriate to extract six factors. Delete the questions with load lower than 0.40, and delete question 25 accordingly. See Table 9 and Table 10 for load value of each project, characteristic value of each factor and variance contribution rate.

Table 9 EFA of Taijiquan Exercise Commitment Dimension Scale

Items	Dimensions	
	Want to	Have to
WC1	0.706	
WC2	0.742	
WC3	0.764	
WC4	0.682	
WC5	0.776	
WC6	0.741	
HC1		0.905
HC2		0.862
HC3		0.928
Dimension value	3.808	2.042
Explained variance (%)	42.312	22.692
Cumulative explained variation (%)	42.312	65.005

Table 10 EFA and Reliability Analysis of Exercise Commitment Determination Scale

Items	Determinations					
	IA	IO	PI	SC	Sat	SS
IA2	0.926					
IA3	0.912					
IA1	0.878					
IA4	0.867					
IA5	0.788					
IO3		0.842				
IO1		0.829				
IO2		0.783				
IO4		0.778				
IO5		0.753				
IO6		0.693				
PI2			0.979			
PI3			0.969			
PI1			0.958			
PI4			0.333			
SC4				0.917		
SC2				0.912		
SC1				0.794		
SC3				0.711		
Sat1					0.925	
Sat2					0.922	
Sat3					0.918	
SS2						0.906
SS3						0.888
SS1						0.864
Determination value	5.236	3.413	3.027	2.765	2.322	2.082
Explained variance (%)	20.942	13.652	12.106	11.061	9.289	8.328
Cumulative explained variation (%)	20.942	34.594	46.700	57.761	67.050	75.378

Note: IA = Involvement Alternatives, IO = Involvement Opportunities, PI = Personal Investment, SC = Social Constraints, Sat = Satisfaction, SS = Social Support

Finally, the TECS-CE is composed of 8 factors and 33 items, which is one item less than the original questionnaire. The principal component analysis of commitment dimension and commitment determinants was carried out for these 33 items. Two dimensions and six determinations could explain 65.005% and 75.378% of the total variance, respectively. The commitment dimension consists of 2 factors

and 9 items (the want to commitment includes 6 items and the have to commitment includes 3 items). The determinants of commitment are composed of 6 factors and 24 items (3 items of satisfaction, 4 items of social constraints, 5 items of involvement alternative, 3 items of personal investment, 3 items of social support and 6 items of involvement opportunities).

2.3.3 Confirmatory Factor Analysis

In order to verify the rationality of the commitment dimension model and the commitment determinant model, Amos 6.0 were used for the data of another 250 elderly Taijiquan exercisers for confirmatory factor analysis. There are two hypothetical models of Exercise Commitment Dimension Model: Model (M1) is a first-order two factor model, and the “Want to Commitment” and “Have to Commitment” of the first-order factor constitute two related factors; Model (M2) is a second-order three factor model. The first-order factors “Want to Commitment” and “Have to Commitment” constitute a potential exercise commitment factor, and the second-order factor is exercise commitment. The goodness-of-fit result of model M1 is: $X^2/df = 2.15$, $P = 0.046$, which meet the goodness of fit standard within 2 or 3 proposed by some researchers (Carmines & Mciver, 1981). The Root Mean Square Error of Approximation (RMSEA) = 0.045, which is lower than the fitting standard of 0.08 (Steiger, 1990). Adjusted Goodness-of-fit Index (AGFI) = 0.942, Goodness-of-fit Index (GFI) = 0.966, Non-Normed Fit Index (NNFI) = 0.993, Comparative Fit Index (CFI) = 0.995, reaching the fitting standard of 0.90 (J. Stevens, 2002). These index values show that the model fits well with the observed data. The selection of several possible (competitive) models is completed by comparing their fitting with the data (QIU & CUI, 2012). Comparing the hypothetical models M1 and M2, model M1 has better model fitting, so model M1 is selected (See Table 11). The dimension model of exercise commitment for Chinese elderly is a two factors model. The path diagram of the dimension structure model of exercise commitment obtained from EFA is shown in Figure 10-11.

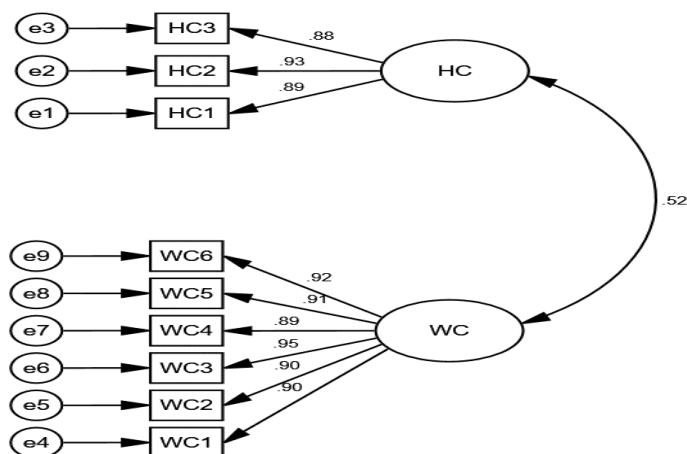


Figure 10 Model Diagram of dimension of Taijiquan Exercise Commitment

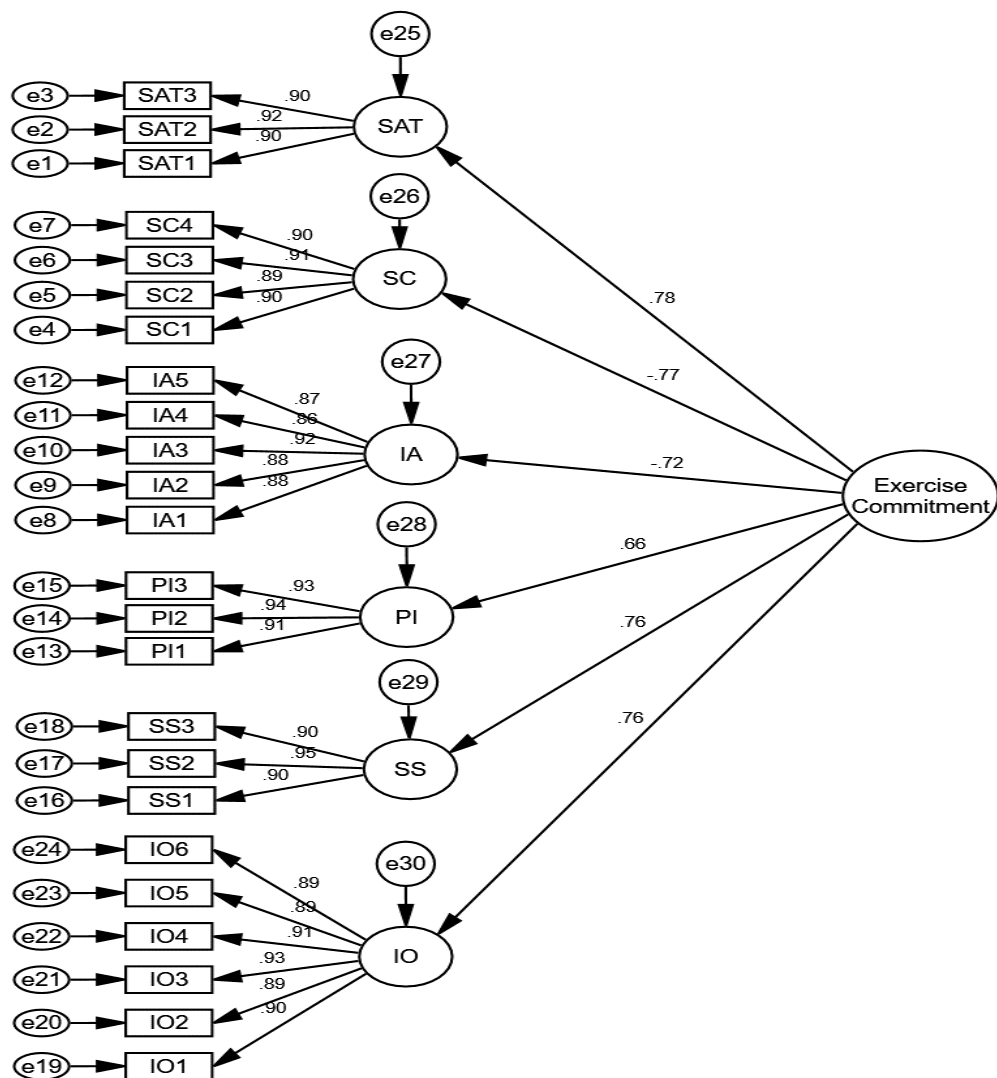


Figure 11 Model Diagram of Determinants of Taijiquan Exercise Commitment

Table 11 CFA Results of Two Hypothetical Models

Model	χ^2/df	p	NNFI	GFI	AGFI	CFI	RMR	RMSEA
MI	1.509	0.046	0.993	0.966	0.942	0.995	0.028	0.045
M2	1.371	0.000	0.984	0.903	0.882	0.986	0.072	0.039

According to Scanlan's Sport commitment theory - satisfaction, personal investment, social constraints, social support and involvement opportunities are the antecedent variables of sport commitment (Scanlan, Carpenter, Simons, et al., 1993a). In this study, Taijiquan Exercise Commitment was taken as Endogenous Latent Variable and six determinants factors as Exogenous Latent Variable. The path diagram of the structural model obtained from the CFA is shown in Figure 15. The goodness of fit results of the model is: $X^2/df = 1.371$, $P = 0.000$, $RMSEA = 0.039$, $AGFI = 0.882$, $GFI = 0.903$, $NNFI = 0.984$, $CFI = 0.986$. The analysis results show that each goodness-of-fit index reaches the acceptable standard, indicating that the model and data fit well. The six antecedent variables of the model can explain 75.378% (See Table 10) of the variance variation of Taijiquan exercise commitment (the interpretation rate of cumulative variance after rotation is greater than 50%, indicating that the data information can be extracted effectively). It shows that the pre dependent variables assumed in the model can well explain and predict the endogenous latent variables, that is, the six determinants can well predict Taijiquan exercise commitment. Correlation analysis was made for the six factors that determine commitment. There is a medium or weak correlation between each factor, and the absolute value of the correlation coefficient is between 0.374-0.596, (See the attachment) (the correlation coefficient between some factors is negative, such as the negative correlation between social constraints and satisfaction and social support), indicating that there is a good independence between each factor.

Based on the above indicators, the dimensional model and determinant model of Taijiquan exercise commitment for Chinese elderly obtained in this study are reliable.

2.3.4 Reliability

The reliability of the questionnaire was tested with the test data of 30 out of 250 elderly Taijiquan exercisers. Thirty elderly Taijiquan exercisers filled in TECS-CE again after an interval of 3 weeks to obtain the test-retest reliability of each dimension. Internal consistency of the scale (Cronbach α Coefficient) and test-retest

reliability results are shown in Table 12. Research on the dimensions and determinants of Taijiquan exercise commitment α the coefficient is between 0.932 -0.984, reaching over 0.80. They are considered acceptable and meet the requirements of psychometrics. The test-retest reliability ranged from 0.824 to 0.938, reaching a strong correlation level, indicating that the scale has good cross time stability.

Table 12 Internal Consistency Coefficient and Test-retest Reliability Results of Taijiquan Exercise Commitment Scale

	WC	HC	Sat	SC	IA	PI	SS	IO
α	0.949	0.942	0.984	0.956	0.932	0.969	0.950	0.941
R	0.914	0.896	0.824	0.884	0.884	0.938	0.923	0.918

2.3.5 Criterion Related Validity: The Relationship between Exercise Commitment and Exercise Behavior

The research shows that maintaining and improving the individual's commitment to exercise is one of the main factors to promote exercise participation (Wilson et al., 2004). It is more reliable to predict and explain exercise behavior through exercise commitment (CHEN & LI, 2005). Therefore, there should be a correlation between exercise commitment and exercise behavior. Within a certain range, the higher the exercise commitment of elderly Taijiquan exercisers, the more eager and determined they are to continue to exercise Taijiquan, the higher the frequency of exercise, the longer the time and intensity of each exercise, and the longer the time they adhere to exercise. In order to test whether the results measured by TECS-CE are in line with the theoretical assumptions, the correlation analysis between commitment dimensions, determinants and exercise behavior indicators is carried out. The results are shown in Table 13. Overall, the scores measured by most subscales are positively correlated with the frequency, duration, exercise intensity and exercise adherence of exercise behavior, while social constraints and participation choices are negatively correlated with exercise behavior.

Table 13 Correlation Analysis Between Exercise Commitment and Exercise Behavior

	Want to	Have to	Sat	SC	IA	PI	SS	IO
Exercise Adherence	0.611**	0.610**	0.729**	-0.723**	-0.718**	0.630**	0.731**	0.747**
Exercise Frequency	0.395**	0.520**	0.553**	-0.479**	-0.481**	0.536**	0.507**	0.551**
Exercise Duration	0.534**	0.507**	0.390**	-0.503**	-0.638**	0.429**	0.565**	0.548**
Exercise Intensity	0.486**	0.379**	0.530**	-0.463**	-0.570**	0.453**	0.498**	0.472**

Note: The detailed values of correlation analysis between exercise commitment and exercise behavior are shown in Appendix E.

In order to further explore the predictive power of Taijiquan exercise commitment on exercise behavior, on the basis of correlation analysis, regression analysis was carried out with the dimension of Taijiquan exercise commitment and the determinants of Taijiquan exercise commitment as independent variables and exercise behavior as dependent variables. Taijiquan exercise behavior is reflected by the total amount of exercise and exercise adherence. Calculation of total physical exercise according to the measurement method of physical exercise by Chinese scholar Liang Deqing (LIANG, 1992), the Taijiquan exercise behavior of the elderly is measured through the intensity, duration and frequency of physical exercise, that is, Exercise Volume = Exercise duration × Exercise frequency × Exercise intensity. In this way, the Taijiquan exercise behavior score of each elderly person is calculated, mainly to measure the total amount of participating Taijiquan exercise for subjects in a week. The results regression analysis is shown in Table 14. The “Want to commitment and Have to commitment” can positively predict the total amount of Taijiquan exercise and Taijiquan exercise adherence. Satisfaction, personal investment, social support and involvement opportunities can positively predict the total amount of Taijiquan exercise and Taijiquan exercise adherence. The prediction of social constraints and involvement alternatives on the total amount of Taijiquan exercise and Taijiquan exercise adherence is negative. It can be seen that the dimension and determinants of Taijiquan exercise commitment have significant predictive power on Taijiquan exercise behavior.

Table 14 Regression Analysis of Exercise Commitment and Exercise Behavior

variables	Total exercise		Exercise adherence	
	b	β	b	β
Want to Commitment	7.982	0.402	0.413	0.412
Have to Commitment	7.780	0.388	0.414	0.409
	$R^2 = 0.465$		$R^2 = 0.501$	
Satisfaction	2.393	0.119	0.194	0.192
Social Constraints	-2.449	-0.119	-0.195	-0.187
Involvement Alternatives	-6.225	-0.302	-0.229	-0.220
Personal Investment	3.242	0.173	0.123	0.131
Social support	2.772	0.143	0.199	0.203
Involvement Opportunities	4.181	0.204	0.253	0.244
	$R^2 = 0.684$		$R^2 = 0.846$	

Note: The detailed values of regression analysis between exercise commitment and exercise behavior are shown in Appendix E.

2.4 Summary

The primary purpose of this phase is to determine the items and factors of the scale through exploratory and confirmatory factor analysis, and to test the reliability and validity of the scale. In order to achieve this target, in this phase of research, we recruited 453 elderly Taijiquan exercisers as subjects. Based on the research result from Chinese scholar Professor Qiu Fen, we tested the reliability and validity of Wilson's theoretical model of Exercise Commitment. 203 of the subjects were used for EFA, 250 for CFA and 30 out of 250 for test-retest reliability test. Through the structural test of the theoretical model, the TECS-CE is composed of 8 factors and 33 items: The Taijiquan exercise commitment dimension is composed of 2 factors and 9 items, and the Taijiquan exercise commitment determinant is composed of 6 factors and 24 items. The item load in each factor was between 0.682- 0.979. The internal consistency coefficient in each reliability was between 0.923-0.984. Retested reliability was between 0.824-0.938. The psychometric results of internal consistency reliability, test-retest reliability, structural validity and criterion related validity reached the acceptable standard. Therefore, it can be used as a test tool for the follow-

up study of this study, and also provide a theoretical and empirical basis for the future application of the scale in Chinese elderly Taijiquan exercise group.

Phase 2

1. Outline of expert interview

According to TECS-CE, the theory of sport commitment and the purpose of this study, and based on the characteristics of Taijiquan exercise of the elderly, we formulated the first draft of the outline of expert interviews. As follows:

(1) In terms of the want to commitment and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(2) In terms of the have to commitment and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(3) In terms of sport satisfaction and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(4) In terms of social constraint and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(5) In terms of involvement alternative and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(6) In terms of personal investment and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(7) In terms of social support and its items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(8) In terms of involvement opportunity and items, how do you think to formulate a TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China?

(9) I hope you can put forward more suggestions on how to formulate a scientific and reasonable TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China, to make this study more scientific and reasonable.

2. The Results of Test of Validity for Interview Outline

In order to make the interview questions consistent with the objectives and hypothesis of this study, before the actual data collection was implemented, we conducted IOC test on the expert interview questions. There were five experts to check and confirm the validity of general contents in this questions using the Index of Item Objective Congruence or IOC (Rovinelli & Hambleton, 1977). Associate Prof. Dr. Wang Baili, Dr. Hu Jingchao, Sir Liu Yajie, they are lecturer from Henan Polytechnic University and Associate Prof. Associate Prof. Sir Ding Xiaofeng, he is a lecturer from Henan University. Mr. Zhang Zhiyuan, a chair of Jiaozuo city Wushu Association.

They confirmed the suitability of the general contents of the questions in term of elderly Taijiquan exercise commitment (Questions for expert interviews are shown in Table 15). These experts had evaluated by giving a rating in each item based on the degree of measurement from 1 to -1, with 1 (for clearly measuring), 0 (degree to which it measures the content area is unclear), and -1 (clearly not measuring) (Rovinelli & Hambleton, 1977). The results of IOC survey show that experts agree that the interview questions were clearly measuring the objective (Appendix F). Therefore, the instrument validity confirmed by five experts was acceptable in this study.

3. The Results of Expert Interview

At this phase, combined with the theory of SCM and the basic objectives of this study, through in-depth interviews with 4 managers, 4 leaders, 4 professors and 4 exercisers. On this basis, NVivo 12.0 software is used to collate and code the collected data, analyze the tree shaped core nodes and key information, and finally sort out the core recommendations of expert interviews, that is, to formulate the outline of TEP-CE. The outline is used the guideline of developing TEP-CE to intervene Taijiquan exercise commitment and behavior for the elderly in China.

3.1 Data coding and analysis

First, directly open 16 interview materials in NVivo 12.0 software and recheck the data to correctly process the data. Secondly, NVivo 12.0 software is used to fully read the data, and then the data obtained are coded. The coding is divided into open coding, spindle coding and selective coding (Xue, 2012). Among them, the integrated category of open coding is three-level nodes. The nodes formed by connecting the three level nodes of spindle coding analysis are the second level nodes. Selective coding selects core categories, systematically connects with other

categories, and neatly complements the conceptualized categories that have not yet been fully developed. This is a primary node that classifies similar word frequencies. The nodes at all levels formed by coding are subordinate relationships, and the original material information is the third level node, which is located at the bottom of the subordinate relationship (Rui, 2015). All encoded data will be divided into free nodes and tree nodes by using the “node function” in the analysis software (Guangding, et al, 2019). Finally, during qualitative research and analysis, if it is not possible to determine which tree node this part of content belongs to, it will be classified according to the actual situation, and will be adjusted during the second and third level coding.

After data coding and analysis, 80 free nodes of the elderly Taijiquan exercise program were created in the open coding stage, which were arranged as Table 15 according to their frequency, reflecting the relationship between interview elements and the TEP-CE. According to the factors of the SCM model, vocabulary is included in the possible relevant factors. Finally, the research results are obtained according to the qualitative analysis of the interview content and process.

Table 15 Ranking List of Core Words in Expert Interview of TEP-CE

No.	Core words	F	No.	Core words	F	No.	Core words	F	No.	Core words	F
1	Taijiquan	995	21	Participant	75	41	Process	47	61	Inherited	31
2	Exercise	785	22	Develop	71	42	Group	46	62	Scientific	31
3	Elderly	496	23	Project	67	43	Opportunity	46	63	Communicate	30
4	Program	222	24	Practice	66	44	Formulate	44	64	Behavior	30
5	Society	181	25	Want to	64	45	Promote	43	65	Reasonable	30
6	Formulate	177	26	Culture	64	46	Adherence	41	66	Reduce	29
7	Entry	170	27	Personal	63	47	Content	41	67	Energy	29
8	Feel	164	28	Substitute	61	48	Healthy	40	68	Guide	29
9	Commitment	154	29	Should	58	49	Fitness	39	69	Share	28
10	Participate	140	30	Question	52	50	Improve	37	70	Have	28
11	Conduct	133	31	Factor	52	51	Consider	35	71	Explain	27

3.2 Developing an outline of the intervention trial of TEP-CE

Through sorting out the interview content, we summarized five aspects of TEP-CE intervention. First, the intervention arrangement of Taijiquan exercise content. The second is the content of audio language intervention for Taijiquan practitioners. The third is the intervention content of leaders to participants in Taijiquan exercise. Fourth, the content of mutual intervention of Taijiquan participants in exercise. The fifth is the monitoring record form of Taijiquan exercise intervention program.

The specific contents of each question are summarized as follows:

For want to commitment, the expert interview results are summarized as the following main contents.

(1) The leader must join the want to commitment items and use verbal suggestion to affect the subjects' Taijiquan exercise commitment in the experimental group.

(2) Combine the "I want to do, I am determined to do, etc" in the item with the participant's Taijiquan exercise daily to transform the sentence into audio, and then let the participants listen to it at least once a day.

(3) Participants are advised to read the items in the want to commitment dimension at least once a day.

(4) There are too many six items and the similarity of each sentence is high. It is suggested to combine similar sentences.

(5) Clause 6 of these items has a negative impact and is not recommended to be included in language intervention.

For the have to commitment, the expert interview results are summarized as the following main contents.

(1) The leader should discuss the fitness value and social significance of Taijiquan exercise at least once a week from the perspectives of Taijiquan health promotion, national fitness participation, cultural heritage protection etc, to influence the Taijiquan exercise commitment of the subjects in the experimental group.

(2) The leader should give real examples and transform "have to commitment" into visible content with daily value. For example, "In order to improve my health, reduce the incidence of illness and reduce the burden on my children, I think it is necessary to adhere to Taijiquan exercise."

(3) The preparation of the intervention content of this item should not be too hard to avoid psychological and emotional discomfort of participants.

(4) The content of these items are too abstract. In addition to the intervention of the item, it is necessary to make more specific and intuitive intervention content. For example, “Jiaozuo City is building a ‘famous city of Taijiquan’. As a citizen of Jiaozuo City, I feel obliged to practice Taijiquan.”

For the factor of satisfaction, the expert interview results are summarized as the following main contents.

(1) The leader should improve the service so that the participants are satisfied with the group, which is a very important condition.

(2) The leader should try their best to improve the sense of gain and happiness of participants, for example, they should often praise participants in the evaluation of exercise effect.

(3) It is suggested that participants communicate with each other in positive language, such as mutual encouragement, mutual praise and mutual care, to improve their satisfaction.

(4) To publicize the benefits of Taijiquan exercise, and pay attention to the sharing of participants’ exercise experience, such as changes in health status, mentality and mood, to make participants feel the benefits of Taijiquan exercise.

For the factor of social constraints, the expert interview results are summarized as the following main contents.

(1) In order to reduce the subjects’ aversion to social constraints in the experiment, the leader formulated the constraint content in a gentler way during the experiment, so that the participants can unconsciously feel the external social constraints, thereby improving the exercise commitment to Taijiquan.

(2) The factors of social constraints should not be too direct as the contents in the items, but should be made into some regulation, such as the formulation of attendance form (no mandatory provisions), the full attendance encouragement certificate, the fixed exercise position, the absence reminder and other methods.

(3) It is better not to use the language of “for others, because of others” for social constraints. When a person is old, he is more likely to live for himself.

(4) It is suggested to merge similar items in this factor to simplify the intervention content.

For the factor of involvement alternative, the expert interview results are summarized as the following main contents.

(1) The leader shall keep the participants away from the exercise venues of alternative sports as far as possible, reduce the participant's exposure to alternative sports, and selectively tell the participants the disadvantages of alternative sports.

(2) The leader shall select the pictures, slogans and sculptures related to Taijiquan as the exercise place for the participants, and influence the commitment of the participants through the external environment.

(3) The leader shall tell the participants about the uniqueness, value and significance of Taijiquan exercise, and the advantages and specific performance of Taijiquan compared with other sports.

(4) It is suggested that leader and participants often share the benefits of Taijiquan exercise, share the happy things in Taijiquan exercise, and explain the traditional cultural connotation of Taijiquan project.

For the factor of personal investment, the expert interview results are summarized as the following main contents.

(1) In addition to the exercise time of the experiment, the leader encouraged the participants to regularly participate in Taijiquan exercise, participate in Taijiquan activities as much as possible, and pay attention to the information and development dynamics related to Taijiquan, to improve their efforts, energy and time input level in Taijiquan Exercise.

(2) Leaders should recommend Taijiquan related newspapers, magazines, books and videos to participants, to improve their energy and time investment in Taijiquan in daily life.

(3) Leaders should explain the theory and methods of Taijiquan and the high-level technical characteristics to participants, so that participants can feel the rich connotation of Taijiquan exercise and constantly pursue higher-level Taijiquan technology, to enhance their efforts, energy and time investment in Taijiquan exercise.

(4) Leaders should encourage participants to participate in relevant events, performances and talent qualification recognition of Taijiquan, to improve their energy and time input in Taijiquan exercise by using Taijiquan content other than only exercise.

For the factor of social support, the expert interview results are summarized as the following main contents.

(1) The leader shall teach the participants the support given by the policy in Taijiquan exercise, explain the current social public's attention to national fitness, and the recognition that Taijiquan exercise can promote physical health.

(2) The leader should encourage the participants' Taijiquan exercise behavior, pay attention to their exercise effect, and support their Taijiquan exercise, to increase the participants' sense of social support.

(3) The leader should encourage the participants to share the results of Taijiquan exercise with their relatives and friends in order to obtain the support of their families and friends.

(4) The leader should recommend mutual encouragement and support among participants and share the gains in Taijiquan exercise.

For the factor of involvement opportunity, the expert interview results are summarized as the following main contents.

(1) The leader shall adopt the methods of group technical communication, exhibition and sharing of feelings to improve the excitement of participants participating in Taijiquan exercise, divert their attention and reduce their feeling pressure.

(2) The leader should encourage participants to strengthen contact and increase the emotion and friendship of participants in addition to Taijiquan exercise.

(3) The leader publicizes the research results of Taijiquan promoting health to the participants to improve their understanding of Taijiquan promoting physical health and sports skills. For example, in addition to Taijiquan practice, the leader should give them some free time or hold some entertainment activities during the practice period.

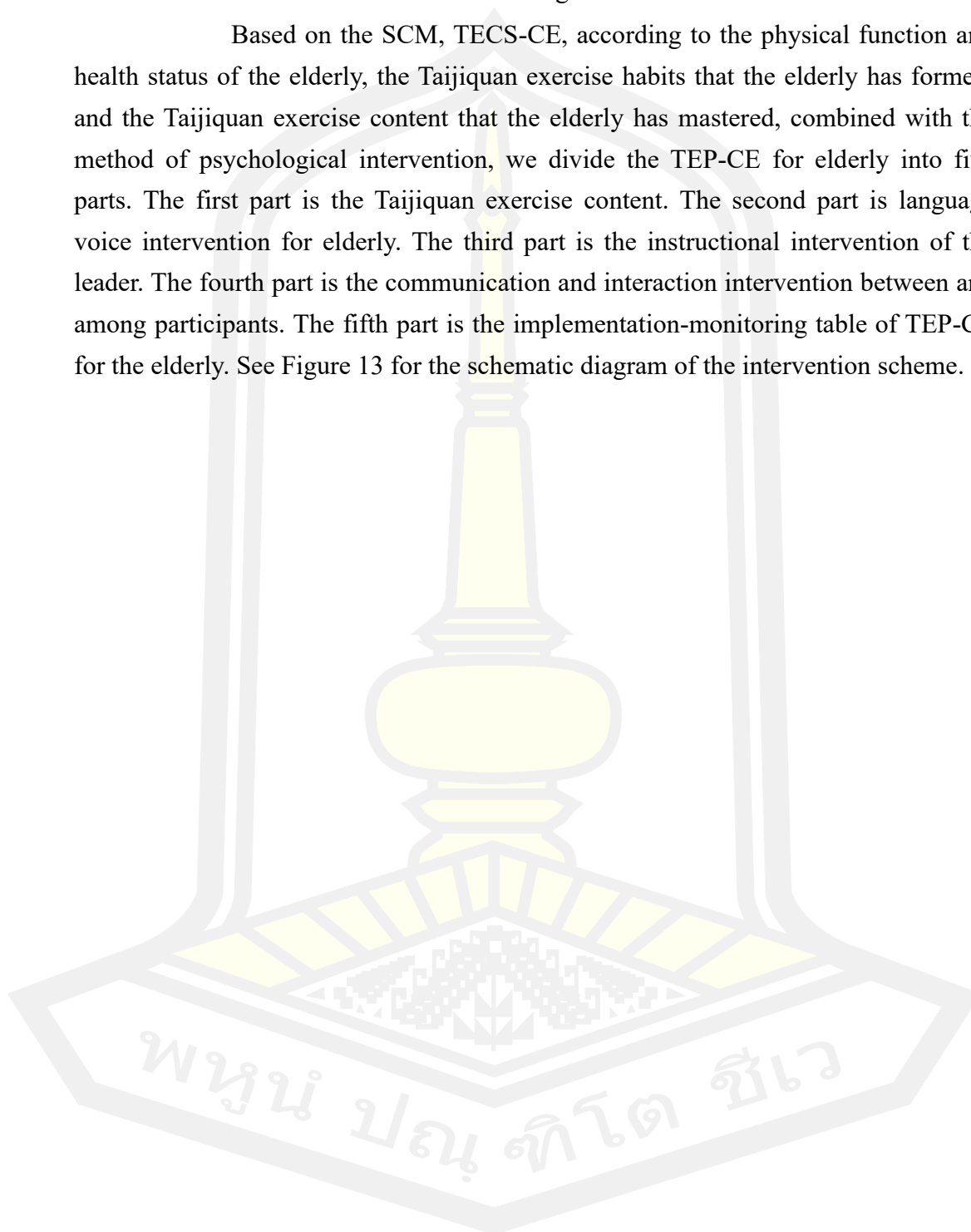
(4) The leader shall encourage the participants to regularly measure the changes of blood pressure and heart rate, so that the participants can record the changes of physical function and motor skills before and after participating in Taijiquan exercise.

(5) There are many items in this factor and there are similarities. It is suggested to merge similar contents in the intervention program.

4. Experimental Protocol

4.1 Definition and Schematic Diagram of Intervention Scheme

Based on the SCM, TECS-CE, according to the physical function and health status of the elderly, the Taijiquan exercise habits that the elderly has formed, and the Taijiquan exercise content that the elderly has mastered, combined with the method of psychological intervention, we divide the TEP-CE for elderly into five parts. The first part is the Taijiquan exercise content. The second part is language voice intervention for elderly. The third part is the instructional intervention of the leader. The fourth part is the communication and interaction intervention between and among participants. The fifth part is the implementation-monitoring table of TEP-CE for the elderly. See Figure 13 for the schematic diagram of the intervention scheme.



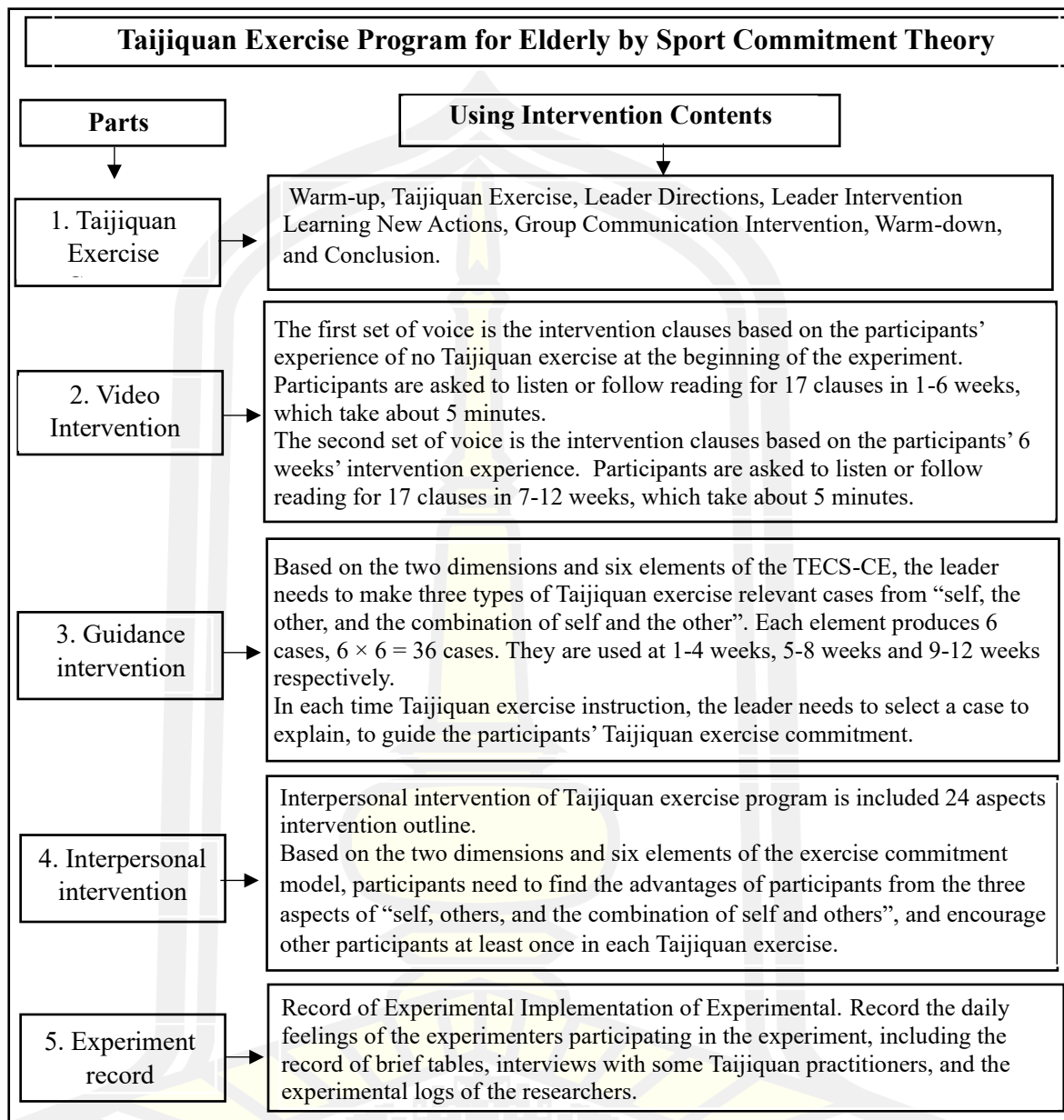


Figure 13 The Framework of TEP-CE

4.2 The Outline and Some details of Taijiquan Exercise Program for elderly

4.2.1 Experts' evaluation of Taijiquan exercise program

We invited five experts to verify the IOC of the TEP-CE. The five experts are Wang Baili, an expert in Taijiquan research at Henan Polytechnic University, is an associate professor. Liu Yajie, an expert in Taijiquan research of Henan Polytechnic University, is an associate professor. Professor Shen Guoqing, an expert on Taijiquan at Zhengzhou University. Associate Professor Ding Xiaofeng, an expert in sports psychology of Henan University. Professor Qu Tianmin, an expert in sports guidance of Henan University.

Finally, we established four aspects of intervention, which are (1) the Taijiquan exercise content, (2) language voice intervention for elderly, (3) the instructional intervention of the leader, (4) the communication and interaction intervention between and among participants, (5) the implementation-monitoring table. The Outline and Some details of TEP-CE for elderly are these follow.

4.2.2 The main content of each Taijiquan exercise for Chinese elderly

Table 16 List of each exercise content of TEP-CE for experimental group

No.	Steps	About Duration	Contents
1	Warm-up	5 min	Setting-up exercises to radio music.
2	Exercise	25 min	Taijiquan style 103 is main.
3	Leader Directions	2 min	To evaluate and guide the technical action standard of each Taijiquan exercise.
4	Leader Intervention	3 min	Leader makes language intervention according to the two dimensions and six elements of the TECS-CE. Each factor cooperates with six cases, with a total of $6 \times 6 = 36$ cases. See 4.3 below for the explanation outline of each case.
5	Learning New Actions or Exercise	10 min	26 Style Taijiquan, 24 Style Taijiquan, 42 Style Taijiquan, eight methods five steps Taijiquan, Taijiquan fan routine, etc.
6	Group Communication	10 min	Participants show each other, exchange experience, encourage each other, guide and evaluate each other.
7	Warm-down	3 min	Fitness Qigong.
8	Conclusion	2 min	Leader issues relevant notices and announces relevant contents or plans of the next exercise.

4.2.2 Participants will be required to listen and follow reading an audio at least once before each Taijiquan exercise

4.2.2.1 The First Set of Audio for Intervention

The first set of audio required participants to listen at least once before each exercise in the first six weeks of the experiment. Its contents are as follows:

Want to commitment includes two clauses, (1) In the love of Taijiquan culture, the exploration of Taijiquan cultural phenomenon, from now on, I will engage in Taijiquan exercise. (2) In order to improve my Taijiquan technique and make beautiful Taijiquan movements, from now on, I make up my mind to keep doing Taijiquan exercise. (3) In order to form good Taijiquan exercise habits and gain good Taijiquan exercise effects, from now on, I would like to do anything to keep Taijiquan exercise.

Have to commitment includes two clauses, (1) In order to maintain my health, do not bring pain to myself, do not cause trouble for my children, do not need to spend money on treatment, I think it is necessary to practice Taijiquan, from now on, I must insist on Taijiquan exercise. (2) In order to inherit the Taijiquan culture, respond to the national fitness movement, build a "Jiaozuo Taijiquan culture city", and reduce the social burden of the elderly, I feel it is my responsibility and obligation to persist in Taijiquan exercise.

Satisfaction includes two clauses, (1) I am very interested in Taijiquan exercise because of its slow and gentle movement style, the cultural and technical connotations contained in Taijiquan movements, and the interpersonal communication in Taijiquan exercise. From all aspects, I am very satisfied with Taijiquan exercise. (2) Some studies have shown that Taijiquan exercise is effective in preventing falls, improving the elderly's balance ability, improving their health and preventing chronic diseases, which makes me think Taijiquan exercise is very beneficial.

Social Constraint includes two clauses, (1) No matter what people around me think of my Taijiquan exercise, what kind of evaluation and grade they give, I feel that Taijiquan exercise is my own business, and has nothing to do with others, so I will continue to exercise. (2) No matter whether people around me are engaged in Taijiquan exercise or not, their Taijiquan exercise is good or bad, what evaluation they have on Taijiquan exercise and me, which has nothing to do with me, I am for my own better, so I keep doing exercise.

Involvement Alternative includes two clauses, (1) Compared with other forms of exercise, Tajjiquan exercise is more interesting and valuable because of its skills, performance, art, fitness and medical functions. Therefore, I want to engage in Tajjiquan exercise, rather than other forms of exercise. (2) Compared with other forms of exercise, the organizational form, interpersonal communication mode, guidance mode, venue, equipment, music and clothing of Tajjiquan exercise make me feel happier and happier. Therefore, I want to engage in Tajjiquan exercise, rather than other forms of exercise.

Personal Investment includes two clauses, (1) From now on, in order to get a better Tajjiquan technique level and master more Tajjiquan practice methods, I should invest more time and energy in Tajjiquan exercise. (2) From now on, in order to better benefit from Tajjiquan exercise, improve my cognition of Tajjiquan exercise, understand Tajjiquan exercise knowledge, I will invest more time and energy in Tajjiquan exercise.

Social Support includes two clauses, (1) In order to improve my health, prevent falls and reduce the incidence of modern civilization diseases, my family, my friends, my old colleagues and the management personnel of the community support me to take part in Tajjiquan exercise. (2) In order to keep enough exercise, slow down the decline of muscle strength and maintain a regular life, my family, my friends, my old colleagues and the management staff in the community encourage me to take part in Tajjiquan exercise.

Involvement Opportunity includes two clauses, (1) Tajjiquan exercise gives me a chance to get to know friends from different positions and give me a chance to have fun with my friends. I can feel happy and excited in Tajjiquan exercise. (2) The slow and gentle movement of Tajjiquan combined with the melodious music not only reduces my inner impetuosity, reduces the life pressure I feel, but also reduces the sub-health state I feel, and increases my motor skills.

4.2.2.2 The Second Set of Audio for Intervention

The second set of audio required participants to listen at least once before each exercise in the second six weeks of the experiment. Its contents are as follows:

Want to commitment includes three clauses, (1) Taijiquan exercise has a long history, rich connotation, fitness and medical value, and is an interesting physical activity. Therefore, from now on, I want to engage in Taijiquan exercise. (2) Adhere to Taijiquan exercise for a long time, and can obtain a high technical level of Taijiquan

and make beautiful Taijiquan movements. Therefore, from now on, I am determined to stick to Taijiquan exercise. (3) Maintain good Taijiquan exercise habits, and can gain a high level of Taijiquan exercise effect. Therefore, from now on, I am willing to do anything to keep Taijiquan exercise.

Have to commitment includes two clauses, (1) Taijiquan exercise can maintain my health, reduce physical pain, reduce my children's troubles, and reduce medical expenses. Therefore, from now on, I must stick to Taijiquan exercise. (2) Engaged in Taijiquan exercise can be a way to inherit the Taijiquan culture, respond to the national fitness movement, and build the "Jiaozuo City Taijiquan Cultural City", which can reduce the social burden of the elderly. Therefore, I feel that I have the responsibility and obligation to adhere to the Taijiquan exercise.

Satisfaction includes two clauses, (1) Considering the slow and soft exercise mode of Taijiquan and the cultural connotation of Taijiquan movements, I am very interested in the Taijiquan exercise. I chose to stick to Taijiquan exercise, and gained a good fitness effect, which made me very satisfied and strongly recommend it. (2) Many research results of Taijiquan exercise and the elderly show that Taijiquan exercise has the role of preventing falls in the elderly, improving our balance ability, improving the health level of the elderly, and preventing chronic diseases. I strongly recommend for you to keep exercising.

Social Constraint includes two clauses, (1) Taijiquan exercise is good for my health. It is my own thing and has nothing to do with others. Therefore, I do not care what people around me say about my Taijiquan exercise. Considering the benefits and interests of my Taijiquan exercise, I will continue to practice Taijiquan. (2) Whether my friends and family practice Taijiquan has nothing to do with me, and the exercise level of people around me who are practicing Taijiquan has nothing to do with me. I practice Taijiquan only because I want to practice it, and I do not need to end up being constrained by others.

Involvement Alternative includes two clauses, (1) Since I have been practicing Taijiquan for a long time, the movements, performance functions, fitness functions and medical functions make me think that Taijiquan exercise is more interesting and more valuable. Therefore, I want to engage in Taijiquan exercise, not in other ways of exercise. (2) Since I insist on Taijiquan exercise, I have mastered the Taijiquan technology, knowledge, fitness and other benefits, and gained a sense of achievement, which makes me feel that any physical exercise cannot replace Taijiquan exercise.

Personal Investment includes two clauses, (1) In order to improve my Taijiquan skills and master effective exercise methods, I spent a lot of time and energy in Taijiquan exercise, such as consulting coaches, consulting peers, watching videos, and participating in competitions, so that I can achieve better results. (2) In order to better benefit from Taijiquan, improve my cognition of Taijiquan exercise, and understand Taijiquan exercise knowledge, I have invested more time and energy into Taijiquan exercise, such as reading, thinking and communication, and achieved good results.

Social Support includes two clauses, (1) Health is the basic prerequisite for social stability, happy life, family and self-happiness. Research shows that Taijiquan exercise can improve my health. Therefore, my family, friends, colleagues and community managers support and encourage me to participate in Taijiquan exercise. (2) Reasonable exercise can slow down aging and effectively prevent various diseases of the elderly, which is the basis of a happy life. Taijiquan is a kind of exercise for the elderly. Therefore, people around me who are important to me encourage me to continue to participate in Taijiquan exercise.

Involvement Opportunity includes two clauses, (1) In the process of practicing Taijiquan, I met many Taijiquan enthusiasts. I feel very happy to exercise with them. They give me the expectation of practicing Taijiquan. Taijiquan exercise provides me with an opportunity to communicate with my friends. Therefore, I will insist on practicing Taijiquan. (2) There are many beautiful technical movements in the process of Taijiquan exercise, and there is many pleasant gentle music in the process of Taijiquan exercise. The shaping and appreciation of body art can reduce my attention to unhappy things in life, which makes me very happy. In addition, Taijiquan exercise also improved my sports skills. Therefore, I will continue to practice Taijiquan.

4.2.3 Intervention Program Taken by the Leader during Each Exercise

The intervention program of the leader consists of 36 specific Taijiquan exercise cases. Based on the two dimensions and six elements of the SCM, the leader needs to make three types of relevant cases from “self, the other, and the combination of self and the other”. Each element produces 6 cases, $6 \times 6 = 36$ cases. Among them, the first type involves 12 cases from self-perspective, which will be used in 1 to 4 weeks. The second type involves 12 cases from the other perspective, which will be used in 5 to 8 weeks. The third type involves 12 cases from the combination of self and other perspective, which will be used in 9 to 12 weeks.

In each time Taijiquan exercise instruction, the leader needs to select a case to explain, to guide the participants' Taijiquan exercise commitment.

4.2.3.1 Type I (1 to 4 weeks)

Based on self-perspective and according to the following outline, the leader makes the language intervention of Taijiquan exercise commitment of the elderly, and tell the actual feelings of Taijiquan exercise or related cases to participants.

The explanation outline is as follows:

Satisfaction includes two clauses, (1) Considering the slow and gentle movement of Taijiquan and the cultural connotation contained in the movements of Taijiquan, I am very interested in Taijiquan exercise. Therefore, I chose to stick to Taijiquan exercise and gained good fitness results, which makes me very satisfied. I strongly recommend that you stick to exercise. (2) I have read many research results on Taijiquan exercise and the health of the elderly. It shows that Taijiquan exercise is effective in preventing the elderly from falling, improving the balance ability, improving the health level, and preventing chronic diseases. I strongly recommend that you keep exercising.

Social Constraint includes two clauses, (1) When I was engaged in Taijiquan exercise in the early years, I always cared about the evaluation of people around me. Later, I thought that Taijiquan exercise was my own business and had nothing to do with others. Therefore, no matter what the people around us say, we just need to keep exercising. (2) When I first started practicing Taijiquan, I always cared about whether people around me were practicing Taijiquan and what their level of exercise is. Later, I thought that these had nothing to do with me. I was for my own better, so I insisted on exercising.

Involvement Alternative includes two clauses, (1) In the past, I have been engaged in many physical exercises, but since I have been practicing Taijiquan for a long time, the functions of Taijiquan, such as fighting, performance, art, fitness and medical treatment, make me feel that Taijiquan exercise is more interesting and valuable. Therefore, I want to engage in Taijiquan exercise instead of other exercise methods. (2) 9. In the past, I always liked to engage in a variety of physical exercises, but I lacked long-term persistence and did not gain a sense of achievement in Taijiquan Exercises. However, since I insisted on practicing Taijiquan, I have mastered the benefits of Taijiquan technology, knowledge and fitness, which makes me feel that no physical exercise can replace Taijiquan.

Personal Investment includes two clauses, (1) In order to improve my technical level of Taijiquan and master effective exercise methods, I used to spend a lot of time and energy in Taijiquan exercise, such as reading, thinking and communication. We will also get good results by doing so. (2) In order to benefit better from Taijiquan, improve your understanding of Taijiquan exercise and understand Taijiquan exercise knowledge. In the past, I invested a lot of time and energy in Taijiquan exercise, such as reading, thinking and communication. We will also get good results by doing so.

Social Support includes two clauses, (1) In order to improve my health level, prevent falls and reduce the incidence of modern civilized diseases, my family, my friends, my colleagues and the management personnel of the community support me to participate in Taijiquan Exercises. I believe that people who are important to us will support Taijiquan exercise of mine. (2) In order to maintain enough exercise, slow down the decline of muscle strength and maintain a regular life, my family, friends and colleagues encouraged me to participate in Taijiquan exercises. I believe that people who are important to us will support our Taijiquan exercise.

Involvement Opportunity includes two clauses, (1) Taijiquan exercise gives me the opportunity to meet friends in different positions, and gives me an opportunity to have fun with friends and communicate with Taijiquan lovers in different regions. Therefore, it is also an opportunity for us to feel happy and excited if we stick to exercise Taijiquan. (2) The slow and gentle movement of Taijiquan, combined with the pleasant music melody, not only reduces my inner impetuosity, reduces the life pressure I feel, but also reduces the sub-health state I feel, and increases my sports skills. I believe everyone will feel the same way.

4.2.3.2 Type II (5 to 8 weeks)

Based on others perspective and according to the following outline, the leader makes the language intervention of Taijiquan exercise commitment of the elderly, and tells about the experience of Taijiquan exercise in relevant cases. Others can be Taijiquan teachers, Taijiquan researchers, doctors, experts, professors, senior participants, etc. Leader can freely choose the identity of others in Taijiquan instruction.

The explanation outline is as follows:

Satisfaction includes two clauses, (1) Others said that the slow and gentle movement of Taijiquan and the cultural connotation contained in the movements of Taijiquan make Taijiquan exercise very interesting. If you stick to Taijiquan for a long time, you can not only explore the mystery, but also get good

fitness effect, which will make you satisfied. (2) Others said that from the perspective of Taijiquan exercise and the balance ability, memory, health level and exercise ability of the elderly, as well as its scientific research results in preventing falls and chronic diseases of the elderly, Taijiquan exercise has a significant role, which indicates that Taijiquan exercise is very beneficial.

Social Constraint includes two clauses, (1) Others say, love what you love; think what you think. Therefore, Taijiquan exercise is your own business. No matter how people around you look at your Taijiquan exercise, what kind of evaluation and grade you give; it has nothing to do with you. Just do your own Taijiquan exercise is ok. (2) Others said that whether people around are engaged in Taijiquan exercise or not, their level of Taijiquan exercise and their evaluation of Taijiquan exercise and you have nothing to do with you. You are engaged in Taijiquan because you like it and for your better, so you exercise.

Involvement Alternative includes two clauses, (1) Others said that they had engaged in many types of physical exercises when they were young, but they began to adhere to Taijiquan Exercises for a long time after they were old, and they experienced a lot of fun and gained value from the cultural connotation, fitness function and medical function of Taijiquan. Therefore, they suggested that everyone should engage in Taijiquan exercises. (2) Others said that the organizational form, venue, equipment, music and clothing used in Taijiquan exercise made them feel happy and satisfied with Taijiquan exercise. Therefore, others suggest that we engage in Taijiquan exercise.

Personal Investment includes two clauses, (1) Others said that only by investing more time and energy in Taijiquan exercise and seriously studying and practicing, can we master scientific Taijiquan exercise methods, and then obtain better Taijiquan technical level and exercise effect. (2) Others said that only by investing more time and energy in Taijiquan exercise and seriously studying and practicing, can we better master Taijiquan technology, deeply understand the movement connotation of Taijiquan, and better benefit from Taijiquan exercise.

Social Support includes two clauses, (1) Others said that in order to improve the health level of the elderly, prevent falls, and reduce the incidence of modern civilized diseases, such as family members, friends, colleagues, community managers and other surrounding people support the elderly to participate in Taijiquan exercises. (2) Others said that in order to improve the health level of the elderly, prevent falls and reduce the incidence of geriatric diseases, such as family members,

friends, colleagues, community managers and other people around support the elderly to participate in Taijiquan exercise.

Involvement Opportunity includes two clauses, (1) Others said that Taijiquan exercise gives you the opportunity to meet friends in different positions, and gives you an opportunity to have fun with your friends. In Taijiquan exercise, you can feel happy and excited. (2) Others say that the slow and gentle movement of Taijiquan, combined with the pleasant music melody, will not only reduce everyone's inner anxiety and reduce the life pressure they feel, but also reduce their sub-health state and increase their sports skills.

4.2.3.3 Type III (9 to 12 weeks)

Based on "self and others" perspective and according to the following outline, the leader makes the language intervention of Taijiquan exercise commitment of the elderly, and tells about the experience of Taijiquan exercise in relevant cases. The leader can mainly use the language expression of "on the one hand, on the other hand; I suggest, experts suggest, the latest view is that we should believe, we should insist on" to intervene.

The explanation outline is as follows:

Satisfaction includes two clauses, (1) On the one hand, some people say that the slow and gentle movement of Taijiquan and the cultural and technical connotation contained in the movements of Taijiquan make Taijiquan exercise full of fun; On the other hand, I am very satisfied with the good exercise atmosphere in Taijiquan. Therefore, I recommend that you stick to practicing Taijiquan. (2) Some studies show that Taijiquan exercise is effective in preventing the elderly from falling, improving the balance ability of the elderly, improving the health level of the elderly, and preventing chronic diseases. Therefore, I believe that Taijiquan exercise is a good exercise, and I strongly recommend that you join in Taijiquan exercise.

Social Constraint includes two clauses, (1) I think that no matter how people around look at Taijiquan exercise and what kind of evaluation and grade they give, we should believe that Taijiquan exercise is our own business and has nothing to do with others. Therefore, some experts suggest that we should not care about external constraints, just stick to exercise. (2) Experts suggest that the exercise of Taijiquan is our own business, which has nothing to do with whether people around us are engaged in Taijiquan exercise, whether they are good or bad in Taijiquan exercise, and whether they evaluate my Taijiquan exercise. Therefore, I think Taijiquan exercise is my own thing, for my own better. I suggest that you keep exercising.

Involvement Alternative includes two clauses, (1) I think that Taijiquan

is a very interesting physical activity with the functions of fitness, medical treatment and fighting. Experts also pointed out that Taijiquan exercise can promote health, avoid suffering from illness and reduce medical expenses. Therefore, I suggest that it is necessary to engage in Taijiquan exercise. (2) Some people pointed out that the organizational form, interpersonal communication mode, guidance mode, venue, equipment, music and clothing of Taijiquan exercise enable the reference to be happy and satisfied in Taijiquan exercise. This is why I have been practicing Taijiquan for a long time. Therefore, I also recommend that you stick to Taijiquan necessarily.

Personal Investment includes two clauses, (1) The proverb says “No pains, no gains”. Therefore, in order to obtain a better technical level of Taijiquan and master more Taijiquan practice methods, we must invest time and energy in Taijiquan exercise. (2) The proverb says, “Practice is the only criterion for testing truth”. Therefore, we should believe that as long as we invest time and energy, we could feel the benefits that Taijiquan exercise will bring to us and improve our cognition and technical level of Taijiquan exercise.

Social Support includes two clauses, (1) Important people around me, such as my family and colleagues, all suggest us to engage in Taijiquan exercise because it can improve our health level, prevent falls and reduce the risk of getting senile diseases. Therefore, we should stick to Taijiquan for a long time. (2) Important people around me, such as my family and colleagues, all suggest that we engage in Taijiquan exercise, because it can help us maintain enough exercise, slow down the decline of muscle strength and maintain a regular life. Therefore, it is necessary for everyone to adhere to Taijiquan for a long time.

Involvement Opportunity includes two clauses, (1) Some studies have pointed out that Taijiquan exercise gives us the opportunity to meet friends in different positions, gives us the opportunity to have fun with friends, and adds fun to our old life. Therefore, I suggest that you should stick to Taijiquan for a long time. (2) Some experts pointed out that the slow and gentle movement of Taijiquan, combined with the pleasant music melody, not only reduced the inner impetuosity of the reference, but also reduced the life pressure felt by the participants and improved their sports skills. Therefore, I suggest that it is necessary for everyone to stick to Taijiquan for a long time.

4.2.4 Language Intervention between Participants during Experimental

Based on “want to” and “have to” dimensions and six elements, the participants are required to implement frequently language intervention to other participants. The outline and examples of language intervention to be adopted by

participants are as follows:

Want to commitment includes three clauses, (1) Participants often tell other participants that I “want to” participate in Taijiquan exercise. For example, I promise to adhere to Taijiquan exercise. (2) Participants often tell other participants that some people “want to” participate in Taijiquan exercise. For example, some long-lived people adhere to Taijiquan exercise every day. (3) Participants often encourage other participants to participate in Taijiquan exercise. For example, if you persist in Taijiquan exercise, you will get a good result.

Have to commitment includes three clauses, (1) Participants often tell other participants that I “have to” participate in Taijiquan Exercise. For example, based on the consideration of health, I think it is necessary to adhere to Taijiquan Exercise. (2) Participants often tell other participants that some people “have to” participate in Taijiquan exercise. For example, based on the consideration of health, experts think it is necessary to adhere to Taijiquan Exercise. (3) Participants often encourage other participants to participate in Taijiquan exercise. For example, based on the consideration of health, I support that you must adhere to Taijiquan exercise.

Satisfaction includes three clauses, (1) Participants often tell other participants about my satisfactions for participating in Taijiquan exercise. For example, I am very satisfied with Taijiquan exercise. (2) Participants often tell other participants about the satisfactions of some people participating in Taijiquan exercise. For example, they think that Taijiquan exercise are very beneficial. (3) Participants often help other participants find their satisfactions in Taijiquan exercise. For example, Taijiquan exercise promote your health, and you should feel satisfied.

Social Constraint includes three clauses, (1) Participants often tell other participants about the positive impact of “social constraint” on my participation in Taijiquan exercise. For example, the exercise of Taijiquan is my own business. It doesn’t matter whether there is a “social constraint”. (2) Participants often tell other participants about the positive impact of “social constraint” on some people participating in Taijiquan exercise. For example, experts pointed out that Taijiquan exercise is beneficial to participants, and it does not matter whether there is a “social constraint”. (3) Participants often lead other participants to believe that “social constraint” has a positive impact on their participation in Taijiquan exercise. For example, Taijiquan exercise is your own business, and it does not matter whether there is a “social constraint”.

Involvement Alternative includes three clauses, (1) Participants often

tell other participants about the irreplaceable nature of Taijiquan exercise. For example, I think that for the elderly, the slow and overall movement of Taijiquan exercise is irreplaceable. (2) Participants often tell other participants about the irreplaceable nature of some people guiding Taijiquan exercise. For example, experts believe that for the elderly, the slow and overall movement of Taijiquan exercise is irreplaceable. (3) Participants often help other participants find the uniqueness and irreplaceable of Taijiquan exercise. For example, you may find that for the elderly, the slow and overall movement of Taijiquan exercise is irreplaceable.

Personal Investment includes three clauses, (1) Participants often tell other participants about my investment in participating in Taijiquan exercise. For example, I have invested a lot of energy in Taijiquan exercise. (2) Participants often tell other participants about other people's investment in participating in Taijiquan exercise. For example, they have invested a lot of energy in Taijiquan exercise. (3) Participants often encourage other participants to invest in participating in Taijiquan exercise. For example, you should invest time and energy in Taijiquan exercise.

Social Support includes three clauses, (1) Participants often tell other participants about the social support I have gained in participating in Taijiquan exercise, such as: people who are important to me support me to participate in Taijiquan exercise. (2) Participants often tell other participants about the social support gained by others in participating in Taijiquan exercise, for example, the government supports the elderly to participate in Taijiquan exercise. (3) Participants often encourage other participants to find social support for the elderly to participate in Taijiquan exercise. For example, you can go to the fitness counseling station to seek guidance and support for Taijiquan exercise.

Involvement Opportunity includes three clauses, (1) Participants often tell other participants about the "involvement opportunity" I gained in participating in Taijiquan exercise, such as, Taijiquan exercise can improve my health. (2) Participants often tell other participants about the "involvement opportunity" gained by others in participating in Taijiquan exercise. For example, experts believe that Taijiquan exercise can improve our sleep quality. (3) Participants often encourage other participants to find "involvement opportunities" that can be obtained by participating in Taijiquan exercise. For example, I found that you had a good time with your friends in Taijiquan exercise.

4.3 Record of Experimental Implementation of Experimental Group

4.3.1 Record of Implementation of TEP-CE in the Experimental Group

In order to urge the participants of the experimental group to complete the experimental contents as required, the study developed the record form of experimental implementation according to the four aspects of TEP-CE. It was used to record the implementation of the TEP-CE of the instructors and participants in the experimental group. Each aspect includes three levels of evaluation. In addition to the evaluation of the implementation of the exercise content, the evaluation levels of “A, B, C” in other aspects respectively represent deep impression, a little impression and no impression.

The participants in the experimental group fill in this record form.

Table 17 Record of Implementation of TEP-CE for Participants in the Experimental Group

No.	Date	Implementation of Exercise Content			Implementation of Self Intervention Content			Implementation of Mutual Intervention Content			Implementation of Leader Intervention Content		
		A	B	C	A	B	C	A	B	C	A	B	C
1	2022.05												
2													
.....													
36													

4.3.2 Implementation Record of Leader in the Experimental Group of TEP-CE

In order to urge the leader of the experimental group to complete the experimental contents as required, the study developed the record form of experimental implementation according to the four aspects of TEP-CE. It was used to record the implementation of the TEP-CE of the instructors and participants in the experimental group. Each aspect includes three levels of evaluation. In addition to the evaluation of the implementation of the exercise content, the evaluation levels of “A, B, C” in other aspects respectively represent deep impression, a little impression and no impression.

The leader in the experimental group filled the record form.

Table 18 Record of Implementation of TEP-CE for leader in the Experimental Group

No.	Date	Implementation of Exercise Content			Implementation of Self Intervention Content			Implementation of Mutual Intervention Content			Implementation of Leader Intervention Content		
		A	B	C	A	B	C	A	B	C	A	B	C
1	2022.05												
2													
.....													
36													

Phase 3

1. Brief Introduction to the Recruited Subjects and Leader

1.1 Demographic characteristics, screening criteria and commitment questionnaire of subjects

In order to select qualified experimental participants, the demographic characteristics, screening criteria and Taijiquan exercise commitment questionnaire were developed or used. See Appendix G. We distributed questionnaires to 70 elderly Taijiquan exercisers, and finally selected 40 as the subjects of this study. The descriptive statistics of their basic information are as follows.

SPSS 23.0 was used to conduct descriptive statistical analysis on the demographic characteristics of the recruiters selected as the experimental subjects (as shown in table 18). A total of 40 people were selected as the subjects of this experiment. There were 40 subjects in the experimental group, including 10 males and 30 females, accounting for 25% and 75% respectively; 16 people aged 60-65, accounting for 40%; 20 people aged 65-70, accounting for 50%; 4 people aged 70-75, accounting for 10%. The exercise places are all in the Jiefang area of Jiaozuo City. 38 people spent between 0 and 200 yuan per month, accounting for 95%; 2 people spend 200-500 yuan per month, accounting for 5%.

Table 19 Descriptive Statistical Analysis of Demographic Characteristics of the Experimental Group before the Experiment N=40

Name	Option	Frequency	Percentage (%)
Gender	Male	10	25.000
	Female	30	75.000
Age	60-65	16	40.000
	65-70	20	50.000
	70-75	4	10.000
Place	Jiefang District	40	100.000
Spend	0-200 yuan	38	95.000
	200-500 yuan	2	5.000
	Total	40	100.0

1.2 Leader's Resumes of Recruited for Experiment

In the recruitment of Taijiquan exercise leaders, the five leaders we talked about together finally determined Mr. A as the leader of the experimental group. His resume is as follows. Mr. A, male, 65 years old, has been practicing Taijiquan for 25 years. He is good at Yang's Taijiquan and Chen's Taijiquan. He is a national level social sports instructor. He has participated in the Taijiquan exercise guidance for the elderly for more than 10 years. His association has more than 500 practitioners. He has strong organizational and interpersonal skills.

2. Data of Experimental Group and Control Group before Experiment

Before the experiment, we collected the demographic characteristics, Taijiquan exercise behavior and Taijiquan exercise commitment of the Experimental Group and the Control Group respectively. The descriptive statistics of the obtained data are as follows:

2.1 Descriptive Statistical Analysis of the Demographic Characteristics of the Experimental Group before the Experiment

SPSS 23.0 was used to carry out descriptive statistical analysis on the demographic characteristics of the selected experimental group (as shown in table 19). There were 40 people in the experimental group, including 10 men and 30 women, each accounting for 25% and 75%; 16 persons aged 60-65, accounting for 40%, 20 persons aged 65-70, accounting for 50%, and 4 person aged 70-75, accounting for 10%. The exercise places are all in the Jiefang district of Jiaozuo City. There are 38 persons spent between 0-200 yuan per month, accounting for 95%, and 2 persons spent between 200-500 yuan per month, accounting for 5%.

2.2 Descriptive Statistical Analysis of the Demographic Characteristics of the Control Group before the Experiment

SPSS 23.0 was used to carry out descriptive statistical analysis on the demographic characteristics of the selected control group (as shown in table 19). There were 20 people in the control group, including 5 men and 15 women, each accounting for 25% and 75%; 7 persons aged 60-65, accounting for 35%, 10 persons aged 65-70, accounting for 50%, and 3 person aged 70-75, accounting for 15%. The exercise places are all in the Jiefang district of Jiaozuo City. There are 20 persons spent between 0-200 yuan per month, accounting for 100%.

Table 20 Descriptive Statistical Analysis of Demographic Characteristics of the Experiment and Control Group before the Experiment N=40

Name	Experiment Group			Control Group	
	Option	Frequency	Percentage (%)	Frequency	Percentage (%)
Gender	Male	5	25.000	5	25.000
	Female	15	75.000	15	75.000
Age	60-65	8	45.000	7	35.000
	65-70	10	50.000	10	50.000
	70-75	2	5.000	3	15.000
Place	Jiefang or Sanyang District	20	100.000	20	100.000
Spend	0-200 yuan	18	90.000	20	100.000
	200-500 yuan	2	10.000	20	100.0
	Total	20	100.0	20	100.0

2.3 Descriptive Statistical Analysis of the Taijiquan Exercise Behavior of the Experimental and Control Group before the Experiment

SPSS 23.0 was used to make descriptive statistics on various indicators of Taijiquan exercise behavior of the selected elderly Taijiquan exercisers in Experiment Group. The results are shown in table 20. From the scores of exercise duration, exercise frequency, exercise intensity and exercise adherence. The average time the elderly take part in Taijiquan exercise each time is about 1 hour. The average number of times they take part in Taijiquan exercise every week is 3 ~ 5. The intensity of each Taijiquan exercise is from slight sweating to moderate sweating. In the last three

months before experiment, the average behavior of regularly adhering to Taijiquan exercise is more than 3 times a week, more or less 1 hour each time.

SPSS 23.0 was used to make descriptive statistics on various indicators of Taijiquan exercise behavior of the selected elderly Taijiquan exercisers in Control Group. The results are shown in table 20. From the scores of exercise duration, exercise frequency, exercise intensity and exercise adherence. The average time the elderly take part in Taijiquan exercise each time is about 1 hour. The average number of times they take part in Taijiquan exercise every week is 3 ~ 5 times. The intensity of each Taijiquan exercise is from slight sweating to moderate sweating. In the last three months before experiment, the average behavior of regularly adhering to Taijiquan exercise is more than 3 times a week, more or less 1 hour each time.

Table 21 Descriptive Statistical Analysis of the Taijiquan Exercise Behavior of the Experiment and Control Group before the Experiment N=20

	Options	Exercise Duration (H)	Exercise Frequency (T)	Exercise Intensity	Exercise Adherence
Experiment Group	M	2.300	2.350	3.150	1.850
	SD	0.733	0.587	0.813	0.875
Control Group	M	2.000	2.050	3.100	1.850
	SD	0.725	0.795	0.788	0.875
	N	20	20	20	20

2.4 Descriptive Statistical Analysis of the Taijiquan Exercise Commitment of the Experimental and Control Group before the Experiment

SPSS 23.0 was used to make descriptive statistics on the indicators of Taijiquan exercise commitment of the elderly in the Experimental Group before the experiment. The results are shown in table 21. The factor scores of “Want to Commitment” of the elderly Taijiquan exercisers was 3.533, which was between “general” and “agreed”. The score of “Have to Commitment” of the elderly Taijiquan exercisers was 3.850, which was slightly less than the degree of “agreed”. The score of “Satisfaction” of the elderly Taijiquan exercisers was 3.733, which was slightly less than the degree of “agreed”. The score of “Social Constraint” of the elderly Taijiquan exercisers was 2.538, which was between “general” and “disagree”. The score of Involvement Alternative of the elderly Taijiquan exercisers in substitution was 2.410, which was slightly higher than the degree of “disagreement”. The average value of “Personal Investment” expressed by the elderly Taijiquan exercisers is 4.033, which was equal to the degree of “agreed”. The score of “Social Support” of the elderly

Taijiquan exercisers was 3.883, which was slightly less than the degree of “agreed”. The score of “Involvement Opportunity” for the elderly Taijiquan exercisers was 4.000, which was equal to the degree of “agreed”.

SPSS 23.0 was used to make descriptive statistics on the indicators of Taijiquan exercise commitment of the elderly in the Control Group before the experiment. The results are shown in table 21. The factor scores of “Want to Commitment” of the elderly Taijiquan exercisers was 3.542, which was between “average” and “agreed”. The score of “Have to Commitment” of the elderly Taijiquan exercisers was 3.867, which was slightly less than the degree of “agreed”. The score of “Satisfaction” of the elderly Taijiquan exercisers was 3.733, which was slightly less than the degree of “agreed”. The score of “Social Constraint” of the elderly Taijiquan exercisers was 2.550, which was between “average” and “disagree”. The score of Involvement Alternative of the elderly Taijiquan exercisers in substitution was 2.380, which was slightly greater than the degree of “disagreement”. The average value of “individual investment” expressed by the elderly Taijiquan exercisers was 4.033, which was about equal to the degree of “agreed”. The score of “social support” of the elderly Taijiquan exercisers was 3.867, which was slightly less than the degree of “agreed”. The score of “Involvement Opportunity” for the elderly Taijiquan exercisers was 3.983, which was about equal to the degree of “agreed”.

Table 22 Descriptive Statistical Analysis of the Taijiquan Exercise Commitment of the Experiment and Control Group before the Experiment N=20

Options		WC	HC	SAT	SC	IA	PI	SS	IO
Experiment Group	M	3.533	3.850	3.733	2.538	2.410	4.033	3.883	4.000
	SD	0.431	0.768	0.689	1.139	0.963	0.620	0.767	0.595
Control Group	M	3.542	3.867	3.733	2.550	2.380	4.033	3.867	3.983
	SD	0.548	0.625	0.598	0.554	0.875	0.648	0.566	0.527
N		20	20	20	20	20	20	20	20

3. Data of Experimental Group and Control Group after Experiment

After the 12 weeks' experiment, we conducted a questionnaire survey and data collection on the Taijiquan exercise behavior and Taijiquan exercise commitment of the elderly in the experimental group and the control group. The descriptive statistics of the data are as follows:

3.1 Descriptive Statistics of Taijiquan Exercise Behavior of the Experimental and Control Group after Experiment

SPSS 23.0 was used to investigate various indicators of Taijiquan exercise behavior of the elderly in Experimental Group after the experiment, including Exercise Duration, Exercise Frequency, Exercise Intensity and Exercise Adherence. Their descriptive statistical results are shown in table 22. The average time for Experimental Group to participate each time in Taijiquan exercise is 1 ~ 1.5 hours, that is Exercise Duration. The average times of Taijiquan exercise for Experimental Group per week is 5 ~ 7 times, that is Exercise Frequency. The intensity of each Taijiquan exercise for Experimental Group is slight or moderate sweating, that is Exercise Intensity. In the last three months, the average behavior of regularly adhering to Taijiquan exercise for Experimental Group is more than 3 times a week, 1 ~ 2 hours each time, that is Exercise Adherence.

SPSS 23.0 was used to investigate various indicators of Taijiquan exercise behavior of the elderly in the Control Group after the experiment, including Exercise Duration, Exercise Frequency, Exercise Intensity and Exercise Adherence. Their descriptive statistical results are shown in table 22. The average time for Control Group to participate each time in Taijiquan exercise is less than 1 ~ 1.5 hours, that is Exercise Duration. The average times of Taijiquan exercise for Control Group per week is less than 5 ~ 7, that is Exercise Frequency. The intensity of each Taijiquan exercise for Control Group is slight or moderate sweating, that is Exercise Intensity. In the last three months, the average behavior of regularly adhering to Taijiquan exercise for Control Group is less than 3 times a week, 1 ~ 2 hours each time, that is Exercise Adherence.

Table 23 Descriptive Statistical Analysis of the Taijiquan Exercise Behavior of the Experiment and Control Group before the Experiment N=20

Options		Exercise Duration (H)	Exercise Frequency (T)	Exercise Intensity	Exercise Adherence
Experiment Group	M	2.950	3.050	3.100	2.050
	SD	0.759	0.887	0.852	0.866
Control Group	M	1.850	1.850	3.100	1.850
	SD	0.745	0.875	0.788	0.875
N		20	20	20	20

3.2 Descriptive Statistics of Taijiquan Exercise Commitment of the Experimental and Control Group after Experiment

SPSS 23.0 was used to investigate the indicators of Taijiquan exercise commitment of the experimental group after the experiment, including: Want to Commitment, Have to Commitment, Satisfaction, Social Constraints, Involvement Alternative, Personal Investment, Social Support, Involvement Opportunity. The descriptive statistical results are shown in table 23. The factor score of “Want to Commitment” of Taijiquan exercisers in the experimental group was 3.942, which was equal to the degree of “agree”. The score of “Have to Commitment” of Taijiquan exercisers in the experimental group was 4.183, slightly higher than the degree of “agree”. The score of “Satisfaction” of Taijiquan exercisers in the experimental group was 4.083, which was equal to the degree of “agree”. The score of “Social Constraint” of Taijiquan exercisers in the experimental group was 2.288, close to the degree of “disagree”. The score of “Involvement Alternative” of Taijiquan exercisers in the experimental group was 2.160, slightly greater than the degree of “disagree”. The average value of Taijiquan exercisers’ expression of “Personal Investment” in the experimental group was 4.35, higher than the degree of “agree”. The score of “Social Support” factor of Taijiquan exercisers in the experimental group was 4.183, slightly greater than the degree of “agree”. The score of Taijiquan exercisers in the experimental group was 4.300, slightly higher than that of “agree”.

SPSS 23.0 was used to investigate the indicators of Taijiquan exercise commitment of the control group after the experiment, including: Want to Commitment, Have to Commitment, Satisfaction, Social Constraints, Involvement Alternative, Personal Investment, Social Support, Involvement Opportunity. The descriptive statistical results are shown in table 23. The factor scores of “Want to Commitment” of Taijiquan exercisers in the control group was 3.567, which was slightly less than the degree of “agree”. The score of “Have to Commitment” of Taijiquan exercisers in the control group was 3.883, slightly less than the degree of “agree”. The score of “Satisfaction” of Taijiquan exercisers in the control group was 3.767, which was slightly less than the degree of “agree”. The score of “Social Constraint” of Taijiquan exercisers in the control group was 2.525, which was less than the degree of “agree”. The score of “Involvement Alternative” of Taijiquan exercisers in the control group was 2.370, slightly more than the degree of “disagree”. The average value of Taijiquan exercisers’ expression of “Personal Investment” in the control group was 4.067, which was equal the degree of “agree”. The score of “Social

Support” factor of Taijiquan exercisers in the control group was 3.900, slightly less than the degree of “agree”. The score of Taijiquan exercisers in the control group was 3.992, slightly less than that of “agree”.

Table 24 Descriptive Statistical Analysis of the Taijiquan Exercise Commitment of the Experimental and Control Group before the Experiment N=20

Options		WC	HC	SAT	SC	IA	PI	SS	IO
Experiment Group	M	3.942	4.183	4.083	2.288	2.160	4.350	4.183	4.300
	SD	0.680	0.798	0.732	1.027	0.860	0.713	0.721	0.542
Control Group	M	3.567	3.883	3.767	2.525	2.370	4.067	3.900	3.992
	SD	0.525	0.651	0.553	0.567	0.950	0.706	0.668	0.573
N		20	20	20	20	20	20	20	20

4. Results and Analysis

In this part, we made independent sample t-test on the exercise behavior and exercise commitment of the experimental group and the control group before the experiment. We made independent sample t-test on the exercise behavior and exercise commitment of the experimental group and the control group after the experiment. Before and after the experiment, we made an independent sample t-test on the exercise behavior and exercise commitment of the experimental group and the control group.

4.1 Comparison Analysis of Taijiquan Exercise Commitment and Behavior between Experimental and Control Group before Experiment

The T-test of independent samples was used to study the differences of WC, HC, Sat, SC, IA, PI, SS and IO between groups. From table 24, it can be seen that samples of different groups do not show significance for WC, HC, Sat, SC, IA, PI, SS and IO ($p > 0.05$), which means that different groups show consistency for WC, HC, Sat, SC, IA, PI, SS and IO.

The t-test of independent samples was used to study the differences of exercise adherence, exercise frequency, exercise duration and exercise intensity between the control group and the experimental group before and after the experiment. It can be seen from table 24 that the subjects in the control group and the experimental group before and after the experiment showed no significant difference in exercise adherence, exercise frequency, exercise duration and exercise intensity ($p > 0.05$). It means that before and after the experiment, the subjects in the control

group and the experimental group showed consistency in exercise adherence, exercise frequency, exercise duration and exercise intensity. These reveal that there is no difference in the exercise behavior of the subjects.

Table 25 T-test Analysis Results of Taijiquan Exercise Commitment and Behavior of the Experimental and Control Group before the Experiment

	Group (Mean $\pm$ SD)		t	p
	Control Group (n=20)	Experimental Group (n=20)		
WC	3.542 $\pm$ 0.548	3.533 $\pm$ 0.431	0.053	0.958
HC	3.867 $\pm$ 0.625	3.850 $\pm$ 0.768	0.075	0.940
Sat	3.733 $\pm$ 0.598	3.733 $\pm$ 0.689	0.000	1.000
SC	2.550 $\pm$ 0.554	2.538 $\pm$ 1.139	0.044	0.965
IA	2.380 $\pm$ 0.875	2.410 $\pm$ 0.963	-0.103	0.918
PI	4.033 $\pm$ 0.648	4.033 $\pm$ 0.620	0.000	1.000
SS	3.867 $\pm$ 0.566	3.883 $\pm$ 0.767	-0.078	0.938
IO	3.983 $\pm$ 0.527	4.000 $\pm$ 0.595	-0.094	0.926
Exercise Adherence	1.850 $\pm$ 0.875	1.850 $\pm$ 0.875	0.000	1.000
Exercise Frequency	2.050 $\pm$ 0.759	2.350 $\pm$ 0.587	-1.398	0.170
Exercise Duration	2.000 $\pm$ 0.725	2.300 $\pm$ 0.733	-1.301	0.201
Exercise Intensity	3.100 $\pm$ 0.788	3.150 $\pm$ 0.813	-0.198	0.844
* p<0.05 ** p<0.01				

4.2 Comparison Analysis of Taijiquan Exercise Commitment and Behavior between the Experimental and Control Group after Experiment

The T-test of independent samples was used to study the differences between the experimental group and the control group in WC, HC, Sat, SC, IA, PI, SS and IO. It can be seen from table 25 that after the experiment, the samples showed significant ($p<0.05$) for WC, HC, Sat, SC, IA, PI, SS and IO, which means that the samples showed significant differences for WC, HC, Sat, SC, IA, PI, SS and IO after the experiment.

Specific analysis shows that:

After the experiment, WC showed a significant level of 0.01 ($t=-5.120$, $p < 0.0001$), and the average value of the control group (3.57) was significantly lower than the average value of the experimental group (4.41); HC showed a significant level of 0.01 ($t=-5.001$, $p < 0.000$), and the average value of the control group (3.88) was significantly lower than the average value of the experimental group (4.68); Sat showed a significant level of 0.01 ($t=-3.698$, $p=0.001$), and the average value of the control group (3.77) was significantly lower than the average value of the experimental group (4.45); SC showed a significant level of 0.01 ($t=7.324$, $p < 0.000$), and the average value of the control group (2.52) was significantly higher than that of the experimental group (1.45).

After the experiment, IA showed a significant level of 0.01 ($t=3.050$, $p=0.005$), and the average value of the control group (2.37) was significantly higher than that of the experimental group (1.63); PI showed a significant level of 0.01 ($t=-3.343$, $p=0.002$), and the average value of the control group (4.07) was significantly lower than the average value of the experimental group (4.65); SS showed a significant level of 0.01 ($t=-4.056$, $p < 0.000$), and the average value of the control group (3.90) was significantly lower than the average value of the experimental group (4.57); IO showed a significant level of 0.01 ($t=-3.982$, $p < 0.000$), and the average value of the control group (3.99) was significantly lower than the average value of the experimental group (4.58).

4.3 Comparison Analysis of Taijiquan Exercise Behavior between Experimental Group and Control Group after Experiment

The independent sample T-test was used to study the differences of exercise adherence, frequency, duration and intensity between the control and experimental group after the experiment. It can be seen from table 25, after the experiment, the subjects in the control and experimental group showed no significant difference in exercise intensity ($p>0.05$), which means that the subjects in the control and experimental group showed consistency in exercise intensity after the experiment, and there was no difference. In addition, after the experiment, the subjects in the control and experimental group showed significant differences in exercise adherence, frequency and duration ($p<0.05$), which means that there were significant differences between the control and experimental group.

Specific analysis shows that:

After the experiment, the exercise adherence and frequency of the control group and the experimental group showed a significant level of 0.01 ($t=-2.891$, $p=0.006$ in control group; $t=-4.307$, $p=0.0001$ in experimental group), and the average value of the control group (1.85) was significantly lower than the average value of the experimental group (2.65 and 3.05 respectively).

After the experiment, the control group and the experimental group showed a significant level of 0.01 for the duration of exercise ($t=-4.625$, $p=0.000$), and the average value of the control group (1.85) was significantly lower than the average value of the experimental group (2.95).

Table 26 T-test Analysis Results of Taijiquan Exercise Commitment and Behavior of the Experimental and Control Group after the Experiment

	Group (Mean $\pm$ SD)		<i>t</i>	<i>p</i>
	Control Group (n=20)	Experimental Group (n=20)		
WC	3.567 $\pm$ 0.525	4.408 $\pm$ 0.514	-5.120	0.0001**
HC	3.883 $\pm$ 0.651	4.683 $\pm$ 0.296	-5.001	0.0001**
Sat	3.767 $\pm$ 0.553	4.450 $\pm$ 0.614	-3.698	0.001**
SC	2.525 $\pm$ 0.567	1.450 $\pm$ 0.330	7.324	0.0001**
IA	2.370 $\pm$ 0.950	1.630 $\pm$ 0.524	3.050	0.005**
PI	4.067 $\pm$ 0.706	4.650 $\pm$ 0.333	-3.343	0.002**
SS	3.900 $\pm$ 0.668	4.567 $\pm$ 0.308	-4.056	0.0001**
IO	3.992 $\pm$ 0.573	4.583 $\pm$ 0.336	-3.982	0.0001**
Exercise Adherence	1.850 $\pm$ 0.875	2.650 $\pm$ 0.875	-2.891	0.006**
Exercise Frequency	1.850 $\pm$ 0.875	3.050 $\pm$ 0.887	-4.307	0.0001**
Exercise Duration	1.850 $\pm$ 0.745	2.950 $\pm$ 0.759	-4.625	0.0001**
Exercise Intensity	3.100 $\pm$ 0.788	3.100 $\pm$ 0.852	0.0001	1.000

* $p<0.05$ ** $p<0.01$

4.4 Comparison Analysis of Taijiquan Exercise Commitment and Behavior of the Control Group before and after the Experiment

The independent sample T-test was used to study the subjects' differences of WC, HC, Sat, SC, IA, PI, SS and IO in the control group before and after the

experiment. It can be concluded from table 26 that the subjects in the control group showed no significant difference in WC, HC, Sat, SC, IA, PI, SS and IO ($p>0.05$) before and after the experiment. This means that the subjects in the control group showed consistency in WC, HC, Sat, SC, IA, PI, SS and IO before and after the experiment.

The independent sample t-test was used to study the differences of exercise adherence, exercise frequency, exercise duration and exercise intensity in the control group before and after the experiment. From the table 26, it can be concluded that before and after the experiment, the subjects in the control group did not show significant differences in exercise adherence, exercise frequency, exercise duration and exercise intensity ($p>0.05$). This means that before and after the experiment, the subjects in the control group showed consistency in exercise adherence, exercise frequency, exercise duration and exercise intensity.

Table 27 T-test Analysis Results of Taijiquan Exercise Behavior of the Control Group before and after the Experiment

	Group (Mean $\pm$ SD)		<i>t</i>	<i>p</i>
	Control Group (n=20)	Experimental Group (n=20)		
WC	3.542 $\pm$ 0.548	3.567 $\pm$ 0.525	-0.147	0.884
HC	3.867 $\pm$ 0.625	3.883 $\pm$ 0.651	-0.083	0.935
Sat	3.733 $\pm$ 0.598	3.767 $\pm$ 0.553	-0.183	0.856
SC	2.550 $\pm$ 0.554	2.525 $\pm$ 0.567	0.141	0.889
IA	2.380 $\pm$ 0.875	2.370 $\pm$ 0.950	0.035	0.973
PI	4.033 $\pm$ 0.648	4.067 $\pm$ 0.706	-0.156	0.877
SS	3.867 $\pm$ 0.566	3.900 $\pm$ 0.668	-0.170	0.866
IO	3.983 $\pm$ 0.527	3.992 $\pm$ 0.573	-0.048	0.962
Exercise Adherence	1.850 $\pm$ 0.875	1.850 $\pm$ 0.875	0.0001	1.000
Exercise Frequency	2.050 $\pm$ 0.759	1.850 $\pm$ 0.875	0.772	0.445
Exercise Duration	2.000 $\pm$ 0.725	1.850 $\pm$ 0.745	0.645	0.523
Exercise Intensity	3.100 $\pm$ 0.788	3.100 $\pm$ 0.788	0.0001	1.000

* $p<0.05$ ** $p<0.01$

4.5 Comparison Analysis of Taijiquan Exercise Commitment of the Experimental Group before and after the Experiment

The independent sample t-test was used to study the differences of WC, HC, Sat, SC, IA, PI, SS and IO in the experimental group before and after the experiment. It can be seen from table 27 that before and after the experiment, the subjects in the experimental group showed significant differences in WC, HC, Sat, SC, IA, PI, SS and IO ($p < 0.05$). This means that the subjects in the experimental group have differences in WC, HC, Sat, SC, IA, PI, SS and IO before and after the experiment.

Specific analysis shows that:

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for WC ($t = -5.830$, $p = 0.000$), and the average value before the experiment (3.53) was significantly lower than the average value after the experiment (4.41); a significant level of 0.01 for HC ($t = -4.527$, $p = 0.000$), and the average value before the experiment (3.85) was significantly lower than the average value after the experiment (4.68); a significant level of 0.01 for Sat ($t = -3.472$, $p = 0.001$), and the average value before the experiment (3.73) was significantly lower than the average value after the experiment (4.45).

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for SC ($t = 4.100$, $p = 0.000$), and the average value before the experiment (2.54) was significantly higher than the average value after the experiment (1.45).

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for IA ($t = 3.180$, $p = 0.003$), and the average value before the experiment (2.41) was significantly higher than the average value after the experiment (1.63).

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for PI ($t = -3.917$, $p = 0.000$), and the average value before the experiment (4.03) was significantly lower than the average value after the experiment (4.65).

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for SS ($t = -3.698$, $p = 0.001$), and the average value before the experiment (3.88) was significantly lower than the average value after the experiment (4.57).

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for IO ($t=-3.820$, $p=0.001$), and the average value before the experiment (4.00) was significantly lower than the average value after the experiment (4.58).

4.6 Comparison Analysis of Taijiquan Exercise Behavior of the Experimental Group before and after the Experiment

The independent sample t-test was used to study the differences of exercise adherence, frequency, duration and intensity in the experimental group before and after the experiment. From table 27, it can be seen that the subjects in the experimental group showed no significant difference in exercise intensity ($p>0.05$). This means that the subjects showed no difference in exercise intensity. In addition, the subjects showed significant differences in exercise adherence, exercise frequency and exercise duration ($p<0.05$), which means that there were significant differences in exercise adherence, frequency and duration between before and after the experiment.

Specific analysis shows that:

Before and after the experiment, the subjects in the experimental group showed a significant level of 0.01 for exercise adherence ($t=-2.891$, $p=0.006$), and the average value before the experiment (1.85) was significantly lower than the average value after the experiment (2.65); a significant level of 0.01 for exercise frequency ($t=-2.943$, $p=0.006$), and the average value before the experiment (2.35) was significantly lower than the average value after the experiment (3.05); a significant level of 0.01 for the duration of exercise ($t=-2.755$, $p=0.009$), and the average value before the experiment (2.30) was significantly lower than the average value after the experiment (2.95).

Table 28 T-test Analysis Results of Taijiquan Commitment and Exercise Behavior of the Experiment Group before and after the Experiment

	Group (Mean $\pm$ SD)		<i>t</i>	<i>p</i>
	Control Group (<i>n</i> =20)	Experimental Group (<i>n</i> =20)		
WC	3.533 $\pm$ 0.431	4.408 $\pm$ 0.514	-5.830	0.0001**
HC	3.850 $\pm$ 0.768	4.683 $\pm$ 0.296	-4.527	0.0001**
SAT	3.733 $\pm$ 0.689	4.450 $\pm$ 0.614	-3.472	0.001**
SC	2.538 $\pm$ 1.139	1.450 $\pm$ 0.330	4.100	0.000**
IA	2.410 $\pm$ 0.963	1.630 $\pm$ 0.524	3.180	0.003**

Table 28 (Continue)

	Group (Mean $\pm$ SD)		<i>t</i>	<i>p</i>
	Control Group (n=20)	Experimental Group (n=20)		
PI	4.033 $\pm$ 0.620	4.650 $\pm$ 0.333	-3.917	0.0001**
SS	3.883 $\pm$ 0.767	4.567 $\pm$ 0.308	-3.698	0.001**
IO	4.000 $\pm$ 0.595	4.583 $\pm$ 0.336	-3.820	0.001**
Exercise Adherence	1.850 $\pm$ 0.875	2.650 $\pm$ 0.875	-2.891	0.006**
Exercise Frequency	2.350 $\pm$ 0.587	3.050 $\pm$ 0.887	-2.943	0.006**
Exercise Duration	2.300 $\pm$ 0.733	2.950 $\pm$ 0.759	-2.755	0.009**
Exercise Intensity	3.150 $\pm$ 0.813	3.100 $\pm$ 0.852	0.190	0.850
* $p < 0.05$ ** $p < 0.01$				

5. Conclusion

Through the 12-week intervention experiment, we obtained the following results: before the experiment, there was no difference in Taijiquan Exercise Behavior between the Experimental and Control Group; there was no difference in Taijiquan exercise commitment between the Experimental and Control Group. There were differences between the Experimental and Control Group in Taijiquan exercise behavior after the experiment. After the experiment, there were differences in Taijiquan exercise commitment between the Experimental and Control Group. There was no difference in Taijiquan exercise behavior and exercise commitment in the Control Group before and after the experiment. There were differences in Taijiquan exercise behavior and commitment in the Experimental Group before and after the experiment.

Phase 4

1. Research Framework of This Phase

This phase is mainly divided into five parts according to the CIPP (Context, Input, Process, and Product) evaluation model. The first part is to develop a questionnaire of TEP-CE evaluation. According to different perspectives of expert evaluation, participant evaluation and leader evaluation, the questionnaire is divided

into three categories. Each type of questionnaire is designed with different questions according to context, input, process and product. After the questionnaire was designed, five experts were invited to test their IOC. The second part is background evaluation, which is to evaluate program context. The third part is input evaluation, which is to evaluate program input. The fourth part is process evaluation, which is to evaluate program process. The fifth part is product evaluation, which is to evaluate program product. The research framework of this phase is as follows:

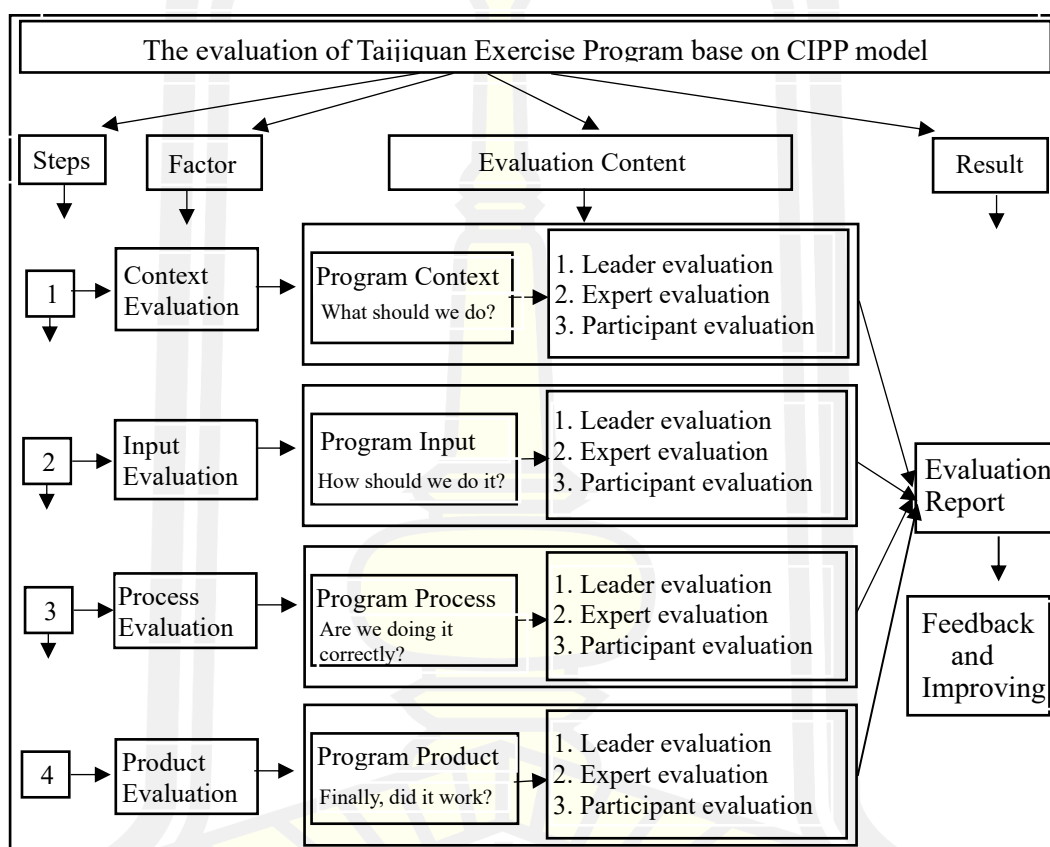


Figure 14 the rationality evaluation of TEP-CE base on CIPP model

2. Test of Validity for Instrument

Before the actual data collection, through literature research, according to the CIPP model, SCM, the objectives of this study and the contents of the first three stages, the semi-structured questionnaire of this study was established through expert interviews, and the first draft questionnaire was completed. On this basis, the validity of the semi-structured questionnaire was determined by IOC method.

A pilot study was conducted on the validity of the test instrument, namely the semi-structure questionnaire. The semi-structure questionnaire consists of three

parts. The first part is a semi-structured questionnaire for evaluation experts. the second part is a semi-structured questionnaire for leaders of this study. The third part is a semi-structured questionnaire for the experimental participants of this study. See Appendix H for the questionnaire.

First, the validity of the general contents in the semi-structured questionnaire was checked and confirmed by five Taijiquan experts using the Index of Item Objective Congruence or IOC (Rovinelli & Hambleton, 1977). Associate professors, Dr. Wang Baili, Dr. Hu Jingchao, sir Wang Yongsheng, sir Liu Yajie, lecturer of Henan Polytechnic University, and Professor, Dr. Shen Guoqing, is from Zhengzhou University. They confirmed the applicability of the general contents of the questionnaire in the elderly Taijiquan exercise commitment. These experts evaluate each item by rating it from 1 to - 1 according to the degree of measurement, where 1 (used for explicit measurement), 0 (used for measuring the degree of uncertainty of the content area) and - 1 (used for explicit no measurement) (Rovinelli & Amp; Amp; Hambleton, 1977). The results of the content experts agreed that most of the questionnaire items clearly measured the objectives (Appendix J).

3. Context Evaluation or Development Evaluation

3.1 The context evaluation for this program from experts

In view of the experts' evaluation of the development context of TEP-CE for the elderly, the following four questions are designed in this study. For the first two questions, experts need to choose one of the five options. The five options are A It is unnecessary very much; B It is unnecessary; C I cannot say it clearly; D It is necessary; E It is necessary very much. The latter two questions are open-ended questions. Experts can write their opinion on the questionnaire or answer them orally. The researcher will record them on a tape recorder and then analyze them out.

The question one is "In view of the current situation of Taijiquan in the elderly group, do you think it is necessary to improve the commitment of Taijiquan exercise in the elderly group?" The survey results show that all five experts believe it is very necessary to improve the current commitment of the elderly to participate in Taijiquan exercise.

The question two is "In view of the current situation of Taijiquan in the elderly, do you think it is necessary to improve the elderly Taijiquan exercise behavior?" The survey results show that all five experts believe it is very necessary to improve the behavior of the elderly to participate in Taijiquan exercise.

The question three is “In view of the current situation of Taijiquan for the elderly, what is your opinion on developing TEP-CE for the elderly?” The answers from the five experts mainly include the following aspect viewpoint.

(1) Increasing the physical activity of the elderly is one of the important ways, China has taken to cope with the rapid aging. However, a large number of elderly people do not regularly participate in sports activities. Although Taijiquan has been written into the *National Fitness Plan of the Chinese Government*, there is no relevant research and practical exploration on how to mobilize the elderly to participate in Taijiquan exercise. Therefore, it is very meaningful to develop the elderly boxing exercise program.

(2) At present, it is very necessary to develop some TEP-CE for the elderly. This is because the current aging phenomenon in China is particularly serious, and the fitness needs of the elderly are very high. However, they often have no idea what kind of practice means they choose. A large number of studies have proved that Taijiquan exercise is very beneficial to the physical and mental health of the elderly. The elderly is also interested in physical exercise. However, to choose a physical activity and stick to it for a long time, we need not only the inner “want to”, but also need the external “have to”. Therefore, it is very urgent and necessary to develop TEP-CE for the elderly.

(3) At present, the majority of elderly Taijiquan exercise groups are 5-10 people, followed by 10-20 people, and finally 1-5 people or individuals. The Taijiquan exercise market is very chaotic in terms of teaching content, exercise time, exercise venue, information release, technical exchange, and having even some cheaters. These phenomena make it difficult for beginners to enter the Taijiquan training groups. Therefore, it is very necessary to develop targeted plans for beginners of Taijiquan.

The question four is “In view of the current situation of Taijiquan for the elderly, what is your opinion on developing TEP-CE for the elderly based on the sport commitment theory?” The answers from the five experts mainly include the following aspect viewpoint.

(1) Sport commitment theory, as a psychological research to explore how to improve people’s physical exercise desire and exercise behavior, has been used in the fields of improving college students’ exercise behavior and elite athletes’ sports adherence in China. However, as the results of the literature review of this

study, there are few studies on the exercise commitment of the elderly. Therefore, we fully affirm the achievements and significance of this study.

(2) Sport commitment theory was first developed for elite athletes, and then gradually applied to the field of physical exercise of ordinary people. From the current results, sport commitment has been applied to ball games, gymnastics, golf, athletics, but not in the field of Taijiquan. Therefore, this study is innovative.

(3) Sport commitment theory is a field of psychological research. It is a good choice to use this theory to influence the psychological desire and behavior of the elderly Taijiquan exercisers. However, how to transform this theory into an intervention design that affects the Taijiquan exercise commitment and behavior, which researchers need to consult more literatures and consult relevant experts.

(4) The phenomenon of polarization is particularly obvious in the Taijiquan exercise group. The beginner's commitment and behavior of Taijiquan exercise are relatively low. Once they become senior Taijiquan exercisers, they will maintain high commitment tendency and high behavior frequency in Taijiquan exercise. Therefore, how to improve the commitment and behavior of the initial Taijiquan exercisers, and then make them keep exercising, is a very necessary program to develop. The sport commitment theory provides a perspective for the program development, and the topic selection is very creative.

From the above answers, we can conclude that the experts believe that the commitment and behavior of the elderly to participate in Taijiquan exercise are not high. It shows that experts believe that there is a context for developing TEP-CE for the elderly

3.2 The context evaluation for this program from leader

In view of leader's evaluation of the development context of TEP-CE for the elderly, this study designed the following 8 questions. The leader is required to evaluate the context of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices, 1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Please put a check mark $\checkmark$ at the option you think is qualified. See the table 28 for the survey results.

Table 29 Descriptive statistical analysis of Leader's context evaluation of developed TEP-CE

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1								
2								
3		√	√			√		√
4	√			√	√		√	
5								

The question one is “How much extent do the participants consider “want to” to participate in Taijiquan exercise before entering the program?” The survey result show that its extent is high.

The question two is “How much extent do the participants consider “have to” to participate in Taijiquan exercise before joining the program?” The survey result show that its extent is general.

The question three is “How much extent of social constraints did the participants have on practicing Taijiquan before joining the program?” The survey result show that its extent is general.

The question four is “How much extent are participants more likely to participate in other exercises before joining the program?” The survey result show that its extent is high.

The question five is “How much extent do the participants want to participate in Taijiquan exercise before joining the program?” The survey result show that its extent is high.

The question six is “How much extent of time and energy did the participants put into their Taijiquan exercises before joining the program?” The survey result show that its extent is general.

The question seven is “How much extent of support did the person important to the participants have for taking part in Taijiquan exercise before joining the program?” The survey result show that its extent is high.

The question eight is “How much extent of good experience does participants have in Taijiquan exercise before joining the program?” The survey result show that its extent is general.

From the above answers, we can conclude that the commitment and

behavior of the elderly to participate in Taijiquan exercise are not high, which show that leader believe that there is a context for developing TEP-CE.

3.3 The Context Evaluation for this Program from Participants

In view of participants' evaluation of the development context of TEP-CE, this study designed the following 8 questions.

The participant is required to evaluate the context of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. See the table 30 for the survey results.

Table 30 Descriptive statistical analysis of Participant's context evaluation of developed TEP-CE

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
M	3.30	3.40	3.10	3.00	3.00	3.30	4.10	3.25
SD	.571	.681	.308	.000	.324	.733	.852	.550
N	20	20	20	20	20	20	20	20

The question one is “How much extent did you ‘want to’ participate in Taijiquan exercise before participating in this program?” The survey results showed that the participants' degree of “want to commitment” before the experiment was average.

The question two is “How much extent do you think that you “have to” participate in Taijiquan exercise before participating in this program?” The survey results showed that the participants' degree of “have to commitment” before the experiment was average.

The question three is “How much extent do you think that Taijiquan exercise is satisfaction before joining this program?” The survey results showed that the participants' degree of “satisfaction” before the experiment was average.

The question four is “How much extent do you think that society constraint engages you in Taijiquan exercise before participating in this program?” The survey results showed that the influence extent of social constraint on

participants' Taijiquan exercise before the experiment was general.

The question five is "How much extent do you think that other physical exercise could not replace Taijiquan before participating in this program?" The survey results show that before the experiment, the participants think that the extent of involvement alternative of other physical activity against Taijiquan exercise is general.

The question six is "How much did you invest in Taijiquan exercise before participating in this project, such as time, energy and effort?" The survey results show that before the experiment, the participants think that the extent of their personal investment for Taijiquan exercise is general.

The question seven is "How much extent do your important people around support your Taijiquan exercise before participating in this program?" The survey results show that before the experiment, the participants think that the extent of their social support for Taijiquan exercise is high.

The question eight is "How much extent do you think that Taijiquan exercise had good involvement opportunities before participating in this program?" The survey results show that before the experiment, the participants think that the extent of their involvement opportunities for Taijiquan exercise is general.

From the analysis of the descriptive statistical results of the survey data, the commitment of the elderly to participate in Taijiquan exercise is not high. It indicates that there is a context for developing TEP-CE.

3.4 Summary

Through the analysis of the context evaluation results of the above three aspects, we can draw the following conclusions. (1) Experts believe that it is very necessary to improve the Taijiquan exercise commitment and behavior of the elderly at present. (2) Experts believe that it is very necessary and innovative to develop the TEP-CE by adopting the sport commitment theory. (3) Leader believes that there is the context to develop the TEP-CE. (4) The survey data of the experimental participants show that there is the context to develop the TEP-CE.

4. Input Evaluation or Design Evaluation

4.1 The input evaluation for this program from experts

Regarding the evaluation of experts on the development input of TEP-CE for the elderly, the following six questions were designed in this study. The first three questions are choice questions. Experts need to choose one of the five options for the problem.

The five options are A It is very unreasonable; B It is unreasonable; C I cannot say it clearly; D It is reasonable; E It is very reasonable. The latter three questions are open-ended questions. Experts can write their opinion on the questionnaire or answer them orally. The researcher will record them on a tape recorder and then analyze them out.

The question one is “Do you think the input of SCM and scale to used investigate Taijiquan exercise commitment in the elderly is reasonable?” The survey results show that five experts all think the input of SECS-CE validated to used investigate Taijiquan exercise commitment in the elderly is very reasonable.

The question two is “Do you think the input of SCM factors to use intervene Taijiquan exercise commitment and behavior in the elderly is reasonable?” The survey results show that five experts all think the input of SCM to use intervene Taijiquan exercise commitment and behavior in the elderly is very reasonable.

The question three is “Do you think the input of the experimental scheme of TEP-CE for Chinese elderly people based on SCM is reasonable?” The survey results show that five experts all think the input of experimental scheme of TEP-CE for Chinese elderly people based on SCM is very reasonable.

The question four is “Do you think there are any shortcomings and needs to be improved in the input of exercise commitment scale used to investigate the Taijiquan exercise commitment of the elderly in China?” The answers from the five experts mainly include the following aspect viewpoint.

(1) On the one hand, the scale of sport commitment theory with 2 dimensions, 6 elements and 34 items is most classical and concise, which is more suitable for application in the field of the elderly. Therefore, the scale validated in this study is reasonable. On the other hand, the latest SCM and scale have changed, and it is suggested that the follow-up study should consider using the latest scale.

(2) In the TECS-CE, the relationship social constraints and Taijiquan exercise commitment of the elderly were validated to be negatively correlated. This result is worth verifying again. Because, as individuals in society, the elderly is bound to be subject to some social constraints. Therefore, this may be the difference in research results caused by the unreasonable language expression.

(3) In the terms of personal investment, the revised scale deleted “I spent a lot of money in Taijiquan exercise”. It is certain that as an elderly group, spending too much will affect their participation commitment and behavior. It is worth affirming that this clause has been deleted from the validated scale. However, in the actual Taijiquan exercise, they do pay some money. It is suggested that the follow-up study can specifically explore the cost of physical exercise for the elderly.

The question five is “Do you think there are any shortcomings and needs to be improved in the input of formulation of TEP-CE based on the elements of exercise commitment theory?” The answers from the five experts mainly include the following aspect viewpoint.

(1) This study uses the elements of SCM, and according to the items of the scale, it is reasonable to formulate the TEP-CE. However, the combination of the setting of the main exercise content and the SCM is not enough, which needs to be paid attention or improved in the follow-up study.

(2) Compared with other physical activities, especially for the elderly, it is more difficult to master Taijiquan exercise methods, which requires special teachers to teach. Although the program has leader assisted teaching, it cannot fully meet the needs of the elderly for Taijiquan technology learning and health knowledge. Therefore, on the one hand, the achievements of the program can be affirmed, and on the other hand, the contents of the program that need to be improved should also be paid more attention to.

(3) As a kind of physical activity, Taijiquan exercise is the display of physical exercise ability. Sport commitment theory is the research content of psychology, which studies the inner state of exercisers. It is not easy to find the junction between the two. The first part of the project design, “the main content of each Taijiquan exercise for Chinese elder”, is not closely related to the sport commitment theory. This is the deficiency of the program design.

The question six is “Do you think there are any shortcomings and

needs to be improved in Taijiquan exercise intervention for the elderly in China from the perspective of SCM?" The answers from the five experts mainly include the following aspect viewpoint.

(1) It is reasonable for this study to use the elements of SCM to formulate TEP-CE for the elderly. However, the application of social support elements should focus on the family members of the participants to formulate intervention programs.

(2) Based on the theory of sport commitment, this study has formulated the audio intervention design for participants, the intervention design given by the leader to participants, and the mutual intervention design between participants, which is reasonable. However, the intervention design is too focused on language use, and there is no intervention in designing exercise venues, using equipment, clothing and other hardware facilities.

(3) The intervention program of Taijiquan exercise for the elderly designed in this study is only implemented around one hour of concentrated exercise. The scheme does not design the relevant content of Taijiquan that participants participate in or pay attention to in their daily life, such as: competitions attended by the elderly, videos watched on the internet, and private gatherings of teammates.

(4) In most Taijiquan association, the leader is the person who coordinates the relations between all parties, and is also the Taijiquan leader and teacher. In the Taijiquan exercise intervention scheme for the elderly designed in this study, only the leader setting is indispensable, which is a rationality of the program design. However, leader is not equal to a teacher, and his Taijiquan teaching authority is relatively lacking. Therefore, this aspect should be considered in the follow-up study of construction.

From the above answers, it can be concluded that the leader believes that the input of the elderly TEP-CE developed based on the SCM is reasonable. In addition, they also put forward some suggestions on the deficiency of the program input.

4.2 The input evaluation for this program from leader

Regarding the leader's evaluation of the development input of the TEP-CE for the elderly, this study designed the following eight questions. The leader was asked to answer these questions, which evaluate the input of TEP-CE in the last three

months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Ask the leader to tick $\checkmark$ at the options he thinks meet. See the table 31 for survey results.

Table 31 Descriptive statistical analysis of Leader's input evaluation of developed TEP-CE

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1								
2								
3								
4		$\checkmark$		$\checkmark$	$\checkmark$			
5	$\checkmark$		$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$

The question one is “How much extent can ‘want to commitment’ improve participants’ Taijiquan exercise commitment and behavior?” The result show that its extent is higher.

The question two is “How much extent can ‘have to commitment’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is high.

The question three is “How much extent can ‘satisfaction’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is higher.

The question four is “How much extent can ‘social constraint’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is high.

The question five is “How much extent can ‘involvement alternative’ reduce participants’ attitude towards participating in other exercise programs? The result show that its extent is high.

The question six is “How much extent can ‘personal investment’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is higher.

The question seven is “How much extent can ‘social support’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is higher.

The question eight is “How much extent can ‘involvement opportunity’ improve participants’ Taijiquan exercise commitment and behavior? The result show that its extent is higher.

From the above survey results, it can be concluded that the leader’s evaluation score of input of TEP-CE for the elderly is high. It shows that the leader thinks that the input of TEP-CE for the elderly is quite reasonable.

4.3 The input evaluation for this program from participants

Regarding the participants’ evaluation of the development input of the TEP-CE for the elderly, this study designed the following eight questions. The leader was asked to answer these questions, which evaluate the input of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Ask the participant from experimental group to tick $\checkmark$ at the options he thinks meet. See the Table 32 for survey results.

Table 32 Descriptive statistical analysis of participants’ Input evaluation of developed TEP-CE

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
M	3.90	4.00	4.90	3.10	3.00	4.70	4.80	4.70
SD	0.447	0.562	0.308	0.308	0.324	0.657	0.410	0.571
N	20	20	20	20	20	20	20	20

The question one is “How much extent do you think ‘want to’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “want to commitment” can induce their commitment and behavior to some extent.

The question two is “How much extent do you think ‘have to’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “have to commitment” can induce their commitment and behavior to some extent.

The question three is “How much extent do you think ‘satisfaction’ can imply your commitment and behavior to participate in Taijiquan exercise? The survey results show that participants in the experimental group think that “satisfaction” can induce their commitment and behavior largely.

The question four is “How much extent do you think ‘social constraint’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “social constraint” can induce their commitment and behavior to some general.

The question five is “How much extent do you think ‘involvement alternative’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “involvement alternative” can induce their commitment and behavior to some general.

The question six is “How much extent do you think ‘personal investment’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “personal investment” can induce their commitment and behavior largely.

The question seven is “How much extent do you think ‘social support’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “social support” can induce their commitment and behavior largely.

The question eight is “How much extent do you think ‘involvement opportunity’ can imply your commitment and behavior to participate in Taijiquan exercise?” The survey results show that participants in the experimental group think that “involvement opportunity” can induce their commitment and behavior largely.

From the analysis of the descriptive statistical results of the survey data, except that the scores of “social constraint” and “investment alternative” have no effect on the input of the TEP-CE, the participants in the experimental group have higher evaluation scores on the input of the TEP-CE. It shows that the participants in the experimental group think that the input of the TEP-CE is reasonable.

4.4 Summary

Through the analysis of the input evaluation results in the above three aspects, we can draw the following conclusions. (1) Experts believe that the input of the TECS-CE validated in this study is reasonable. (2) Experts believe that the input of the TEP-CE for the elderly developed by the sport commitment theory in this study is reasonable. (3) Experts believe that the input of the experiment in this study is reasonable. (4) Leader believes that the input of the TECS-CE and TEP-CE developed in this study are reasonable. (5) The participants in the experimental group think that the input of the TECS-CE validated and TEP-CE developed in this study are reasonable.

5. Process Evaluation or Implementation Evaluation

5.1 The process evaluation for this program from experts

Regarding the evaluation of experts on the development process of TEP-CE, the following six questions are designed in this study. The first three questions are choice questions. Experts need to choose one of the five options according to the question. The five options are A is very unreasonable; B is unreasonable; C is that cannot say it clearly; D is reasonable; E is very reasonable. The latter three questions are open-ended questions. Experts can write them on the questionnaire or directly answer them orally. The researcher will record them on a tape recorder and then sort them out.

The question one is “Do you think the process of the TECS-CE for the elderly developed in this study is reasonable?” The survey results show that five experts all think the validating process of TECS-CE is very reasonable.

The question two is “Do you think the process of the TEP-CE developed in this study is reasonable?” The survey results show that three experts think the process of TEP-CE using SCM elements is very reasonable. The two experts believe that the process is reasonable.

The question three is “Do you think the experimental implementation process of TEP-CE is reasonable?” The survey results show that four experts think the experimental implementation process of TEP-CE is very reasonable. The one expert believe that the process is reasonable.

The question four is “Do you have any suggestions on the revision and application process of TECS-CE?” The answers from the five experts mainly include the following aspect viewpoint.

Overall, based on the SCM and scale, the researcher used the methods of literature, CFA and EFA to test and revise the TEP-CE, which is in line with the research procedures and norms. However, some problems still need to be improved in the following study.

The problem one is that many questions are designed in the demographic characteristics questionnaire, and some questions have not been analyzed in the follow-up study, which is not closely related to this study. For example, “what do you think are the current obstacles affecting your participation in Taijiquan exercise?” It didn’t play its role in several stages of research, or it didn’t appear in the design of this program.

The problem two is about the spending of the elderly in Taijiquan exercise. The options set do not conform to the actual situation of the elderly in Taijiquan exercise spending. It also contradicts the question of “I spent a lot of money on exercising Taijiquan.” in the scale.

The problem three is that it is inappropriate to change some items of the sport commitment scale into some items of the Taijiquan exercise commitment for the elderly. For example, the “social constraint” factor is a negative factor in this study due to the influence of the translated or applicable population. It led to some confusion in the implementation of this program.

The problem four is that several provisions of “want to commitment” are quite similar. In the process of using the scale, the answers of participants were almost the same, and it was suggested that researchers should merge similar clauses of “want to commitment” or change the Chinese expression.

The question five is “Do you have any suggestions for the process of using SCM in developing TEP-CE for the elderly in China?” The answers from the five experts mainly include the following aspect viewpoint.

Overall, based on the factors and scales of the TECS-CE, the researcher used multiple rounds of expert interviews, questionnaire surveys and IOC research methods to formulate the TEP-CE for the elderly, which is in line with the research norms and has certain innovation. However, some problems still need to be improved

in the following study.

The first problem that needs to be improved is that after the program's experimental scheme is formulated, a small-scale and short-time group experiment is required before the formal experiment so that test and modify the potential problems of the scheme.

The second problem that needs to be improved is the lack of participation of elderly Taijiquan practitioners in the process of formulating this program. The establishment of several steps and contents of the program needs the participation of the elderly will be more reasonable. Because in the process of the elderly participating in the formulation of the program, researchers will find the intrinsic motivation and real needs of the elderly, and then formulate a program that meets the needs of the elderly Taijiquan exercisers, such as their favorite sentences and cases.

The third problem is the researcher formulated a Taijiquan exercise question for the elderly based on the results of expert interviews, but after the program design was completed, the researcher did not pay a return visit to the interviewed experts. Experts suggest that a return visit be added to improve the design of the program.

The question six is "Do you have any suggestions on the experimental implementation process of applying exercise commitment theory in Chinese elderly Taijiquan exercise?" Overall, experts believe that the implementation of the experiment is reasonable and has practical value and significance from the perspective of the implementation steps of the program designed by the researchers. However, some aspects are need to be improved.

The first problem that needs to be improved is that researchers need to consider the cognitive problems of the elderly in using electronic devices. If some elderly people can't use their mobile phones to play the audio you have made, what did you do in the experiment? It is suggested that this problem be described clearly in the following study.

The second problem that needs to be improved is that the number of elderly people in a group of 20 is too large. As for the current group of Taijiquan, most of them are concentrated in more than 10 people. A group of 20 people is less.

The third problem that needs to be improved is that the leader spent

three minutes telling the case about Taijiquan exercise, which is relatively urgent. It is suggested to extend the duration, and change the way from explanation to chat, or use Wechat, books, briefings and brochures, which may achieve better results.

The fourth problem that needs to be improved is that during the implementation of the experiment, researchers should consider the influence of weather, season, site and environmental factors. The experiment was carried out in summer. If the experiment was carried out in winter, would the same effect be achieved?

5.2 The process evaluation for this program from leader

Regarding the evaluation of leader on the development process of TEP-CE, the following six questions are designed in this study. According to these questions, the leader was asked to evaluate the developing process of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Ask the leader to tick √ at the options he thinks meet. See the Table 33 for survey results.

Table 33 Descriptive statistical analysis of Leader's process evaluation of Taijiquan exercise program development for the elderly

	Q1	Q2	Q3	Q4	Q5	Q6
1						
2						
3						
4						
5	√	√	√	√	√	√

The question one is “How much extent did you participated in Taijiquan exercise instruction on time for this program in the last three months?”

The question two is “How much extent did you give the Taijiquan exercise instruction for this program's participants in the last three months?” The survey results show that its extent is higher.

The question three is “How much extent of quality did you finish the

TEP-CE in the last three months?” The survey results show that its extent is higher.

The question four is “How much extent did the participants participate in Taijiquan exercises on time in the last three months?” The survey results show that its extent is higher.

The question five is “How much extent of quality did the participants participate in Taijiquan exercise in the last three months?” The survey results show that its extent is higher.

The question six is “How much extent of quality did the participants complete the TEP-CE in the last three months?” The survey results show that its extent is higher.

5.3 The process evaluation for this program from participants

Regarding participants’ evaluation of the development process of TEP-CE, this study designed the following nine questions. According to these questions, the participant was asked to evaluate the process of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. See the Table 34 for survey results.

Table 34 Descriptive statistical analysis of participants’ process evaluation of TEP-CE developed

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
M	4.90	4.95	4.85	4.95	4.90	4.90	4.90	4.95	4.85
SD	0.307	0.223	0.366	0.223	0.307	0.307	0.307	0.223	0.366
N	20	20	20	20	20	20	20	20	20

The question one is “How much extent did leader participate in the guidance of Taijiquan exercise on time in the past three months?” The survey result show that the participants believed the leader was on time to participate in the guidance of Taijiquan exercise.

The question two is “In the past three months, how much extent did

leaders participate in Taijiquan practice guidance according to the experimental requirements?” The survey result show that the participants believed the leaders participated in the guidance of Taijiquan exercise in strict accordance with the requirements in the past three months.

The question three is “How much extent of quality did leader complete the TEP-CE in the past three months?” The survey result show that participants believed the leader completed the TEP-CE with high quality in the past three months.

The question four is “How much extent did you participate in Taijiquan exercise on time in the past three months?” The survey result show that participants believed they participated in Taijiquan exercise with on time very much.

The question five is “How much extent did you participate in Taijiquan exercise as required in the past three months?” The survey result show that participants believed they participated in Taijiquan exercise in strict accordance with the requirements in the past three months.

The question six is “How much extent of quality did you complete in the TEP-CE in the past three months?” The survey result show that participants believed they completed in Taijiquan exercise with high quality in the past three months.

The question seven is “How much extent did the participants around you participate in Taijiquan exercise on time in the past three months?” The survey result show that participants believed they around them have participated in Taijiquan exercise with on time very much in the past three months.

The question eight is “How much extent did the participants around you participate in Taijiquan exercise as required in the past three months?” The survey result show that participants believed they around them have participated in Taijiquan exercise in strict accordance with requirements in the past three months.

The question nine is “How much extent of quality did the participants around you complete the TEP-CE in the past three months?” The survey result show that participants believed they around them have completed in Taijiquan exercise with high quality in the past three months.

5.4 Summary

Through the analysis of the process evaluation results in the above

three aspects, we can draw the following conclusions.

(1) Experts believe that based on the sport commitment scale, the process of validating the TECS-CE for the elderly in this study is reasonable. (2) Experts believe that the process of developing TEP-CE using the sport commitment theory, TECS-CE is reasonable. (3) Experts believe that the process of implementing the TEP-CE experiment for the elderly is reasonable. (4) Leader believes that the implementation process of TEP-CE for the elderly is reasonable. (5) The participants in the experimental group think that the process of implementing the TEP-CE experiment is reasonable.

6. Product Evaluation or Effective Evaluation

6.1 The product evaluation for this program from expert

Regarding the evaluation of experts on the development product of TEP-CE, the following six questions are designed in this study. The first four questions are choice questions. Experts need to choose one of the five options according to the question. The five options are A It is very unreasonable; B It is unreasonable; C It is that cannot say it clearly; D It is reasonable; E It is very reasonable. The latter two questions are open-ended questions. Experts can write them on the questionnaire or directly answer them orally. The researcher will record them on a tape recorder and then sort them out.

The question one is “Do you think the validated TECS-CE based on exercise commitment scale in this study is effective?” The survey results show that four experts think based on exercise commitment scale, the validated TECS-CE in this study is very effective. One expert think it is effective.

The question two is “Do you think the TEP-CE based on sport commitment elements in this study is effective?” The survey results show that three experts think the TEP-CE based on exercise commitment element for the elderly in this study is very effective. Two expert think it is effective.

The question three is “Do you think the experiment of TEP-CE based on sport commitment elements in this study is effective?” The survey results show that three experts think the TEP-CE based on exercise commitment elements in this study is very effective. Two expert think it is effective.

The question four is “Do you think the product of TEP-CE based on

sport commitment theory is effective?” The survey results show that four experts think the TEP-CE based on exercise commitment theory is very effective. One expert think it is effective.

The question five is “In your opinion, what aspects of TEP-CE based on exercise commitment theory should be improved in this study?” Overall, the experts believe that the developed TEP-CE is very effective and significant. However, there are still problems that need to be improved and considered by researcher. Other survey results are as follow.

First, the experimental result is too absolute. The life of the elderly after retirement should be rich and colorful. The design of this program tends to lead the physical exercise mode of the elderly to a single one. This problem needs further consideration by researcher.

Secondly, researcher need to think that there should be some elderly people who leave or quit temporarily because of other affairs during 12 weeks’ experiment, and some people who want to join. However, the researcher did not describe these problems in the experiment, and it needs to do improvement.

Thirdly, the age span of the participants in the experimental group is a little long. There are obvious differences in physical fitness between the 60-year-old and the 75-year-old, but the duration of exercise in the experiment is 1 hour. We doubt the exercise quality of the elderly with poor physical fitness.

Finally, researcher need to think that as the physical function of the elderly, some terms in the experiment are not suitable and need to be improved according to the situation of the elderly. For example, “Exercising Taijiquan gives me the opportunity to improve my health and fitness. Exercising Taijiquan gives me the opportunity to improve my physical skills.” will the physical health and exercise skills of the elderly be improved all the time. This requires researcher to think seriously.

The question six is “What services do you think the TEP-CE based on SCM can provide for the decision-making and planning of Taijiquan exercise for the elderly group?” The survey results are as follow.

First, it should be affirmed that in China’s rapidly aging society, studying physical exercise is a very meaningful topic. It can provide a solution perspective for the current planning and design of Chinese government departments to deal with the health, medical, entertainment, social and other problems of the elderly.

Secondly, Taijiquan, as a kind of exercise suitable for the elderly, has been verified in many aspects. The formulation of the TECS-CE can predict the Taijiquan exercise commitment of the elderly, and understand the Taijiquan exercise adherence, withdrawal tendency and exercise frequency of the elderly.

Thirdly, the TEP-CE for the elderly developed by the researcher is very helpful to improve the Taijiquan exercise commitment and behavior of the elderly, which has a positive reference value for the promotion and popularization of Taijiquan, and can provide a reference for the design of Taijiquan promotion planning of government departments.

Finally, the intervention means designed in the program can provide reference for the design of Taijiquan publicity strategy and publicity plan.

6.2 The product evaluation for this program from leader

Regarding the evaluation of leader on the development product of TEP-CE, the following nine questions are designed in this study. Based on these questions, the leader is asked to evaluate the developing product of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Ask the leader to tick √ at the options he thinks meet. See the Table 35 for survey results.

Table 35 Descriptive statistical analysis of Leader's process evaluation of TEP-CE developed

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
1									
2									
3							√	√	
4	√			√	√				
5		√	√			√			√

The question one is “How much extent did the participants talk often about Taijiquan exercise in their daily life in the past three months?” The survey results show that its extent is high.

The question two is “How much extent did participants improve their Taijiquan exercise behavior in the past three months?” The survey results show that its extent is higher.

The question three is “How much extent have participants increased their Taijiquan exercise frequency in the past three months?” The survey results show that its extent is higher.

The question four is “How much extent were participants satisfied with Taijiquan exercise in the past three months?” The survey results show that its extent is high.

The question five is “How much extent did participants suggest that people around them engage in Taijiquan exercise in the past three months?” The survey results show that its extent is high.

The question six is “How much extent have participants increased their time and energy input in Taijiquan exercise in the past three months?” The survey results show that its extent is higher.

The question seven is “How much extent have participants increased their social constraints on participating in Taijiquan exercise in the past three months?” The survey results show that its extent is general.

The question eight is “How much extent have participants reduced their focus on alternative physical exercise programs in the past three months?” The survey results show that its extent is general.

The question nine is “How much extent did the participants agree with the involvement opportunities of Taijiquan exercise in the past three months?” The survey results show that its extent is higher.

6.3 The product evaluation for this program from participants

Regarding the evaluation of participants on the development product of TEP-CE, the following nine questions are designed in this study. Based on these questions, the participant is asked to evaluate the developing product of TEP-CE in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. Ask the leader to tick √ at the options he thinks meet. See the Table 36 for survey results.

Table 36 Descriptive statistical analysis of participants' product evaluation of TEP-CE developed

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
M	5.00	5.00	4.30	5.00	4.40	5.00	5.00	4.60	5.00
SD	0.000	0.000	0.801	0.000	0.820	0.000	0.000	0.680	0.000
N	20	20	20	20	20	20	20	20	20

The question one is “In the future, how much extent will you commit and continue to engage in Taijiquan exercise?” The survey results showed that the experimental participants had a strong willingness to participate in Taijiquan exercise.

The question two is “In the future, how much extent do you promise to stick to Taijiquan exercise?” The survey results showed that the experimental participants had a strong willingness promise to stick to Taijiquan exercise.

The question three is “In the future, how much extent do you promise to be satisfied with practicing Taijiquan?” The survey results showed that the experimental participants believed that they would be satisfy with the Taijiquan exercise in the future.

The question four is “In the future, how much extent do you promise to participate in Taijiquan even without social constraints? The survey results showed that the experimental participants had a strong willingness to participate the Taijiquan exercise without social constraints in the future.

The question five is “In the future, how much extent do you promise that other physical exercises cannot replace Taijiquan exercise?” The survey results showed that the experimental participants believed that other physical exercises could not replace Taijiquan in the future.

The question six is “In the future, how much extent do you promise to increase personal investment in Taijiquan?” The survey results show that the experimental participants agree strongly that they will promise to increase personal investment in Taijiquan in the future.

The question seven is “In the future, how much extent do you think that important people around you support your Taijiquan exercise?” The survey results show that the experimental participants agree strongly that important people around

them support their Taijiquan exercise in the future.

The question eight is “In the future, how much extent do you think that Taijiquan exercise will make you feel excited and have fun?” The survey results show that the experimental participants will feel excited and fun in Taijiquan exercise.

The question nine is “In the future, how much extent do you think that Taijiquan exercise will increase your health and motor skills?” The survey results show that Taijiquan exercise will increase participants’ health and motor skills.

7. Summary

Through the analysis of the product evaluation results in the above four aspects, we can draw the following conclusions. (1) Experts believe that it is reasonable the product of the TECS-CE. (2) Experts believe that the TEP-CE designed with the sport commitment theory is reasonable. (3) Experts believe that the product in the TEP-CE experiment for the elderly is reasonable. (4) Leader believes that the product of TEP-CE is reasonable. (5) The participants in the experimental group believed that the product in the TEP-CE experiment for the elderly is reasonable. At the same time, the respondents also put forward suggestions for improvement in view of the problems existing in each stage of the study.

The summary of this chapter

In this chapter, this chapter studies four aspects through four phases. The first phase is the validating of the scale (experimental tool), and of the relationship between exercise commitment and behavior. In this study, the TECS-CE was obtained. The second phase is the development of TEP-CE, that is, the experimental scheme of TEP-CE for the elderly has been developed. The third phase adopts experimental method to implement TEP-CE. The research results show that the exercise commitment and exercise behavior of the participants in the experimental group are higher than those of the control group after the experiment, and higher than themselves at before experiment. The fourth phase is to evaluate the rationality of this study. The results show that the validated TECS-CE, the developed TEP-CE, and the implemented Taijiquan exercise intervention experiment by this research is reasonable and in line with the research norms.

CHAPTER V

DISCUSSIONS AND CONCLUSIONS

In order to cope with the aging population, WHO (2018) suggested that “Maintaining healthy behaviors throughout life, particularly engaging in regular physical activity and strength training to maintain muscle mass.” The researcher pointed out that “to improve the health of older adults, Taijiquan interventions must be translated into community programs that meet the needs and abilities of older adults (Stevens et al., 2014). The research shows that maintaining and improving the individual’s commitment to exercise is one of the main factors to promote exercise participation (Wilson et al., 2004). However, in the relevant studies of exercise commitment, there is no tested measurement tool for Taijiquan exercise commitment of the elderly. Wilson et al., have pointed out” The relationship between determinants proposed within the SCM and commitment warrants additional scrutiny particularly in applications of the model to new contexts or populations (Wilson et al., 2004).” Therefore, this research validated the adaptability of ECS in the context of elderly Taijiquan exercise in China and developed a TEP-CE, experimented this program and evaluated rationality of this research.

This final chapter provides a discussion of the research findings based on four objectives of this study. First section discussed about the TECS-CE developed. The second section discussed the developed TEP-CE. The third section discussed the implementation of TEP-CE experiment. The fourth section discussed the evaluation for rationality of this study. Finally, this chapter summarized the conclusions of this study.

DISCUSSIONS

The first phase is the Validity and Reliability of the TECS-CE Factor Structure

In phase one, the primary purpose of this study was to validate an instrument, which is TECS-CE, and the relationship between exercise commitment and behavior with a sample of Taijiquan exercise. Therefore, using Cross-sectional survey and structural equation modeling technique, the TECS-CE measurement model

was validated for factorial validity.

“The relationship between determinants proposed within the SCM and commitment warrants additional scrutiny particularly in applications of the model to new contexts or populations (Wilson et al., 2004).” In addition, mature measurement tools should be revised before they can be used in different cultures and different subjects. Therefore, further testing with diverse samples, Chinese populations, before an application is needed.

The following content discuss the TECS-CE measurement model or construct validity.

TECS-CE measurement model. Exploratory factor analysis (EFA) was conducted on the TECS-CE data to examine their construct validity for elderly Taijiquan exerciser samples using the SPSS 23.0. Means and standard deviations, from 203 of the validation samples, were 1.916 to 4.690 and 0.4743 to 0.8646 respectively. Means and standard deviations for the number of 253 of the calibration samples were 1.916 to 4.690 and 0.4743 to 0.8646 respectively. It is accepted for the assumption of multivariate normality (Tabachnick & Fidell, n.d.). Therefore, this data is suitable to analysis in this study.

Based on the recommendations of Dzubian and Shirkey, several indicators were examined to determine the suitability of the TECS-CE inter-item correlation matrix for EFA procedures (Dziuban & Shirkey, 1974). The principal component orthogonal rotation was used to conduct exploratory factor analysis on 34 reserved items. The results show that KMO = 0.804 and 0.755, Bartlett’s test of sphericity $P = 0.000$ and 0.000 , indicating that there are common factors among the observed variables.

The principal component method was used for preliminary EFA. The scale of commitment dimensions obtained two factors with eigenvalues greater than one, which explained 65.005% of the total variance. Combined with the gravel map, it is found that the questionnaire structure and item distribution are the most reasonable when two factors are selected. The two factors of commitment dimensions obtained by EFA are consistent with the original ECS. The scale of commitment determinants obtained six factors with eigenvalues greater than one, which explained 75.378% of the total variance. There is an inflection point at the sixth factor, indicating that it is most appropriate to extract six factors. Delete the questions with load lower than 0.40, and delete question “I spent a lot of money on exercising Taijiquan.” Finally, TECS-CE is composed of 2 dimensions, 6 factors and 33 items.

The Structural Relationships of the TECS-CE. In order to verify the rationality of the commitment dimension model and the commitment determinant model, Amos 6.0 was used for the data of another 250 elderly Taijiquan exercisers for Confirmatory factor analysis (CFA). There are two hypothetical models of Taijiquan Exercise Commitment Model: Model (M1) is a first-order two factor model, and the “Want to Commitment” and “Have to Commitment” of the first-order factor constitute two related factors; Model (M2) is a second-order three factor model. The goodness-of-fit result of model M1 is: $\chi^2/df = 2.15$, $P = 0.046$, which meet the goodness of fit standard within 2 or 3 proposed by some researchers (Carmines & Mciver, 1981). The Root Mean Square Error of Approximation (RMSEA) = 0.045, which is lower than the fitting standard of 0.08 (Steiger, 1990). Adjusted Goodness-of-fit Index (AGFI) = 0.942, Goodness-of-fit Index (GFI) = 0.966, Non-Normed Fit Index (NNFI) = 0.993, Comparative Fit Index (CFI) = 0.995, reaching the fitting standard of 0.90 (Stevens et al., 2014). These index values show that the model fits well with the observed data. The selection of several possible (competitive) models is completed by comparing their fitting with the data (QIU & CUI, 2012). Comparing the hypothetical models M1 and M2, model M1 has better model fitting, so model M1 is selected. The dimension model of TECS-CE is a two factor model.

The goodness of fit results of the model is: $\chi^2/df = 1.371$, $P = 0.000$, RMSEA = 0.039, AGFI = 0.882, GFI = 0.903, NNFI = 0.984, CFI = 0.986. The analysis results show that each goodness-of-fit index reaches the acceptable standard, indicating that the model and data fit well. Correlation analysis was made for the six factors that determine commitment. There is a medium or weak correlation between each factor and the absolute value of the correlation coefficient is between 0.374-0.596, the correlation coefficient between some factors is negative, such as the negative correlation between social constraints and satisfaction and social support. This result is consistent with some research results. For example, social constraints have been either unrelated or negatively correlated with commitment in previous youth sport studies (Carpenter & Coleman, 1998; Carpenter & Scanlan, 1998), indicating that there is a good independence between each factor. Based on the above indicators, the dimensional model and determinant model of exercise commitment obtained in this study are reliable.

Correlation analysis and regression analysis. In order to test whether the results measured by the exercise commitment scale are in line with the theoretical

assumptions, the correlation analysis between commitment dimensions, determinants and exercise behavior indicators is carried out. The results show that the scores measured by subscales are positively correlated with the frequency, duration, intensity and adherence of exercise behavior, while social constraints and involvement alternative are negatively correlated with exercise behavior. In order to further explore the predictive power of exercise commitment on exercise behavior, on the basis of correlation analysis, regression analysis was carried out with the dimension of exercise commitment and the determinants of exercise commitment as independent variables and exercise behavior as dependent variables. The results regression analysis is show the dimension and determinants of exercise commitment have significant predictive power on exercise behavior. It shows that TECS-CE can be used as a tool to develop TEP-CE for the elderly in this study.

The second phase is the developed TEP-CE

According to the theory of sport commitment and the purpose of this study, and based on the demography characteristics of Taijiquan exercise of the elderly, we formulated the outline of expert interviews. In order to make the interview questions meet the objectives and hypothesis of this study, before the actual data collection was implemented, we conducted IOC test on the expert interview questions. The results of IOC survey show that experts agree that the interview questions were clearly measuring the objective. Through in-depth interviews with 4 managers, 4 leaders, 4 professors and 4 exercisers. NVivo 12.0 software is used to collate and code the collected data, analyze the tree shaped core nodes and key information, and finally sort out the core recommendations of expert interviews, that is, to formulate the outline of the TEP-CE. The outline is used the guideline of developing TEP-CE.

Based on the TECS-CE and guideline, according to the physical function and health status of the elderly, the Taijiquan exercise habits that the elderly has formed, and the Taijiquan exercise content that the elderly has mastered, combined with the method of psychological intervention, we divide the TEP-CE into five parts. The first part is the Taijiquan exercise content. The second part is language voice intervention for elderly. The third part is the instructional intervention of the leader. The fourth part is the communication and interaction intervention between and among participants. The fifth part is the implementation-monitoring table of TEP-CE.

We invited five experts to verify the IOC of the TEP-CE. Verification

results show the program is consistent with the intervention objectives. Finally, we established five aspects of intervention, which are (1) the Taijiquan exercise content, (2) language voice intervention for elderly, (3) the instructional intervention of the leader, (4) the communication and interaction intervention between and among participants, (5) the implementation-monitoring table.

The third phase is the experimental of TEP-CE

In order to select qualified experimental participants, the demographic characteristics, screening criteria and Taijiquan exercise commitment questionnaire were developed or used. We distributed questionnaires to 70 elderly Taijiquan exercisers, and finally selected 40 as the subjects of this study. SPSS 23.0 was used to conduct descriptive statistical analysis on the demographic characteristics of the recruiters selected as the experimental subjects. A total of 40 people were selected as the subjects of this experiment. Among them, 20 were in the experimental group and 20 were in the control group. In the recruitment of Taijiquan exercise leaders, the five leaders we interviewed about finally determined Mr. GENG as the leader of the experimental group. Before and after the experiment, we collected the demographic characteristics, Taijiquan exercise behavior and Taijiquan exercise commitment of the Experimental Group and the Control Group respectively.

After that, we analyzed the Taijiquan exercise behavior and exercise commitment of the elderly in the experimental group and the control group. It includes four aspects: (1) Comparative analysis of Taijiquan exercise commitment and behavior data before and after the experiment in the experimental group. (2) We compared and analyzed the training commitment and behavior data of the control group before and after the experiment. (3) Before the experiment, we compared the Taijiquan exercise commitment and behavior between the experimental group and the control group. (4) After the experiment, we compared the Taijiquan exercise commitment and behavior between the experimental group and the control group.

We obtained the following results: before the experiment, there was no difference in Taijiquan Exercise behavior between the Experimental Group and the Control Group; there was no difference in Taijiquan exercise commitment between the Experimental Group and the Control Group. There were differences between the Experimental Group and the Control Group in Taijiquan exercise behavior after the experiment. There were differences in Taijiquan exercise commitment between the Experimental Group and the Control Group after the experiment. There was no

difference in Taijiquan exercise behavior and exercise commitment in the Control Group before and after the experiment. There were differences in Taijiquan exercise behavior and commitment in the Experimental Group before and after the experiment.

The fourth is evaluation of this project

We divided into five parts according to the CIPP (Context, Input, Process, and Product) evaluation model to evaluate the rationality of this research.

The first part is to develop a questionnaire of Taijiquan exercise project evaluation through literature research, according to the CIPP model, sport commitment theory, the objectives of this study and the contents of the first three phases, the semi-structured questionnaire of this study was established through expert interviews. According to different perspectives of expert evaluation, participant evaluation and leader evaluation, the questionnaire is divided into three categories. Each type of questionnaire is designed with different questions according to context, input, process and product. After the questionnaire was designed, five experts were invited to test their IOC. The results show that the evaluation content of the design is consistent with the research objectives.

The second part is background evaluation, which is to evaluate program context. The third part is input evaluation, which is to evaluate program input. The fourth part is process evaluation, which is to evaluate program process. The fifth part is product evaluation, which is to evaluate program product.

Through the analysis of the context assessment, we can draw the following conclusions. (1) Experts believe that it is very necessary to improve the Taijiquan exercise commitment and behavior of the elderly at present. (2) Experts believe that it is very necessary and innovative to develop the TEP-CE by adopting the sport commitment theory and TECS-CE. (3) Leader believes that there is the context to develop the TEP-CE. (4) The survey data of the experimental participants show that there is the context to develop the TEP-CE.

Through the analysis of the input evaluation results, we can draw the following conclusions. (1) Experts believe that the input of developed the TECS-CE, the TEP-CE, and the experiment in this study is reasonable. (2) Leader believes that the input of the TECS-CE, TEP-CE, and experiment developed in this study are reasonable. (3) The survey results of participants in the experimental group showed that the TECS-CE, TEP-CE and experiment developed in this study is reasonable.

Through the analysis of the process evaluation, we can draw the following conclusions. (1) Experts believe that based on the sport commitment theory, the

process of validating the TECS-CE, developing the TEP-CE in this study is reasonable. (2) Leader and participants in the experimental group think that the process of implementing the TEP-CE experiment is reasonable. Through the analysis of the product evaluation, we can draw the following conclusions. (1) Experts believe that it is reasonable the product of the TECS-CE, the TEP-CE and experiment intervention in this research. (2) Leader and participants believe that the product of TEP-CE is reasonable.

At the same time, the respondents also put forward suggestions for improvement in view of the problems existing in each stage of the study.

Practical Implications

China is aging rapidly and is expected to become a super aging country by 2030. How to solve the problems of fitness, medical treatment, entertainment and exercise for the elderly is an issue that the Chinese government is actively exploring. It has been proved that Taijiquan has a positive effect on improving the health level of the elderly, and is an important entertainment, exercise and medical assistance. Sport commitment is defined as a psychological state representing the desire or resolve to continue sport participation (Scanlan, Carpenter, Simons, et al., 1993b). The research shows that it is more reliable to predict and explain exercise behavior through exercise commitment (Chen & Li, 2005). It can be seen that the commitment to Taijiquan exercise is an important factor affecting the Taijiquan exercise behavior of the elderly. Paying attention to and improving the Taijiquan exercise commitment of the elderly is one of the important ways to promote their Taijiquan exercise behavior.

Therefore, based on the theory of sport commitment and the current situation of Taijiquan exercise for the elderly in China, this study developed the TECS-CE and TEP-CE. The evaluation results show that the scale and program can promote the elderly Taijiquan exercise behavior. There have been pointed out that “to improve the health of older adults, Taijiquan interventions must be translated into community programs that meet the needs and abilities of older adults (Stevens et al., 2014). The TECS-CE developed in this study can be used as a measuring tool to understand the elderly’s Taijiquan exercise tendency in the community, to understand their Taijiquan exercise commitment tendency, and then formulate targeted intervention strategies. The TEP-CE developed in this study can be used as a community program for the elderly to participate in Taijiquan exercise, to promote their Taijiquan exercise participation and behavior.

Recommendations for the Future Research

The current study has limitations. First, the use of a cross-sectional design limits identification of a causal link between Taijiquan exercise commitment factors and commitment. In this regard, our results provided a snapshot of an ongoing dynamic process. Longitudinal research examining the dynamic nature of Taijiquan exercise commitment is warranted to better understand whether commitment changes, and how change over time is associated with changes in the resolve to continue sports. For example, Carpenter and Scanlan (1998) showed that longitudinal changes in SCM determinants were related to concomitant changes in sport commitment in a manner consistent with SCM propositions among a sample of youth soccer players. Therefore, the future research still needs to explore deeply the TECS-CE and TEP-CE.

Second, at present, although the research progress of the Exercise Commitment Scale is still dominated by the research results of Weiss (2004) in *The relationship between commitment and exercise behavior*. But the Sport Commitment Scale has made new progress. For example, in 2016, Scanlan and her colleagues have developed the new scale, the sport commitment scale with two dimensions, ten factors and 60 items. Therefore, on the one hand, we cannot deny the exploration significance and value of this study. On the other hand, future research can make a comparative study between the latest scale and the classic scale to explore which scale is more suitable for testing the Taijiquan exercise commitment of the elderly.

Thirdly, in terms of the content selection of the program, there are many forms of Taijiquan technology. We only chose Yang style Taijiquan 103. In the future, we can take other forms of Taijiquan exercise as the content of the program. In terms of population selection of the program, this study selected the elderly with 3-12 months' experience in Taijiquan exercise. However, how to make the elderly have a commitment to Taijiquan exercise for the first time and how to make the ordinary elderly have a commitment to Taijiquan exercise need to be explored in subsequent studies.

Fourth, in terms of optimization of intervention content, in addition to the content already included in this program, the future research can play gentle music when the elderly perform Taijiquan exercise. Language intervention is added to the music. For example, Chinese medicine knowledge, such as Qi and Blood are

connected when the body moves slowly. Words, such as exercise makes people feel comfortable and exercise makes us healthy; language explanations and hints, such as every Taijiquan action name.

Fifth, in terms of instructor intervention, future research can compile a manual of language intervention in Taijiquan exercise for the elderly based on TECS-CE and sport commitment theory. The manual can include scientific research results on Taijiquan exercise, the fitness effect achieved by participants through Taijiquan exercise, the medical effect achieved by Taijiquan exercise, and the good interpersonal relationship of Taijiquan groups.

In addition, the experiment itself is the cultivation of a commitment or habit, or make the participants master an exercise skill. In future research, the experiment itself can be analyzed separately as a commitment factor.

CONCLUSIONS

In the phase one, this thesis determined the items and factors of the TECS-CE through exploratory and confirmatory factor analysis, and tested the reliability and validity of the scale. We recruited 453 elderly Taijiquan exercisers as subjects. 203 of the subjects were used for EFA, 250 for CFA and 30 out of 250 for test-retest reliability test. Through the structural test of the theoretical model, the TECS-CE is composed of 2 dimensions, 6 factors and 33 items. The commitment dimension is composed of 2 factors (want to and have to) and 9 items, and the commitment determinant is composed of 6 factors (satisfaction, social constrain, involvement alternative, personal investment, social support, involvement opportunity) and 24 items.

In the phase two, based on the objective to develop a TEP-CE, this phase combined with the theory of SCM and the basic objectives of this study, through in-depth interviews with 4 managers, 4 leaders, 4 professors and 4 exercisers. We summarize the core recommendations of expert interviews, namely developing an outline of the intervention program of Taijiquan exercise for Chinese elderly. The outline is used the guideline of developing TEP-CE to intervene Taijiquan exercise. Through the analysis of the expert interview results, we divide the TEP-CE into five parts. The first part is the Taijiquan exercise content. The second part is language voice intervention for elderly. The third part is the instructional intervention of the

leader. The fourth part is the communication and interaction intervention between and among participants. The fifth part is the implementation-monitoring table of TEP-CE.

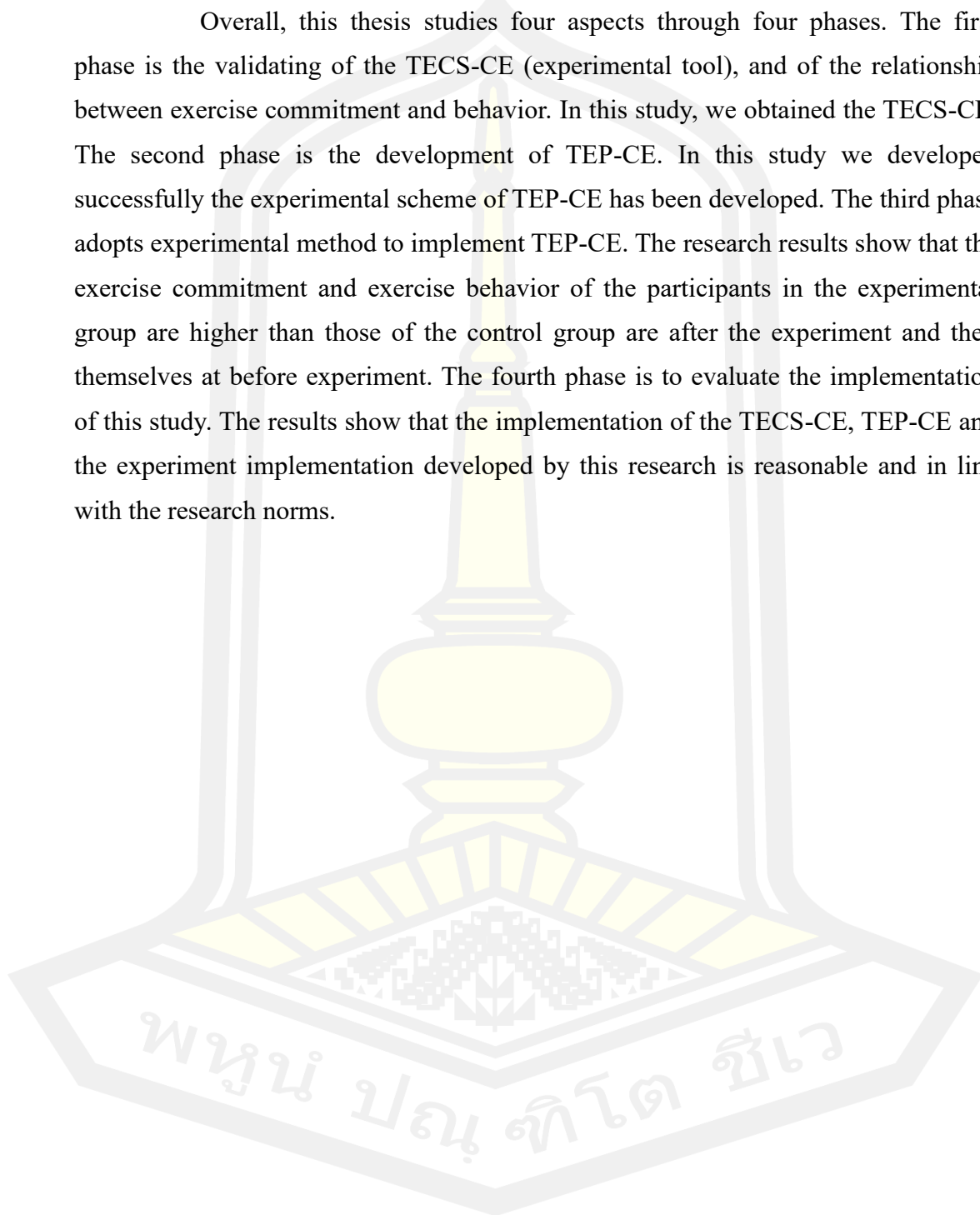
In the phase three, we verified the TEP-CE through experimental intervention, so that test whether the program can promote the exercise commitment and behavior of the elderly Taijiquan exercisers in China. Through the 12-week intervention experiment, we obtained the following results. Before the experiment, there was no difference in Taijiquan exercise behavior between the Experimental Group and the Control Group. There was no difference in Taijiquan exercise commitment between the Experimental Group and the Control Group. There were differences between the Experimental Group and the Control Group in Taijiquan exercise behavior after the experiment. There were differences in Taijiquan exercise commitment between the Experimental Group and the Control Group after the experiment. There was no difference in Taijiquan exercise behavior and exercise commitment in the Control Group before and after the experiment. There were differences in Taijiquan exercise behavior and commitment in the Experimental Group before and after the experiment.

In the phase four, according to the CIPP (Context, Input, Process, and Product) evaluation model, this phase was divided into five parts. The first part is to develop a questionnaire of TEP-CE evaluation. According to different perspectives of expert evaluation, participant evaluation and leader evaluation, the questionnaire is divided into three categories. Each type of questionnaire is designed with different questions according to context, input, process and product. The second part is background evaluation, which is to evaluate program context, and to answer, “What should we do”. The third part is input evaluation, which is to evaluate program input and to answer, “How should we do it”. The fourth part is process evaluation, which is to evaluate program process and to answer, “Are we doing it correctly”. The fifth part is product evaluation, which is to evaluate program product and to answer, “Did it work”.

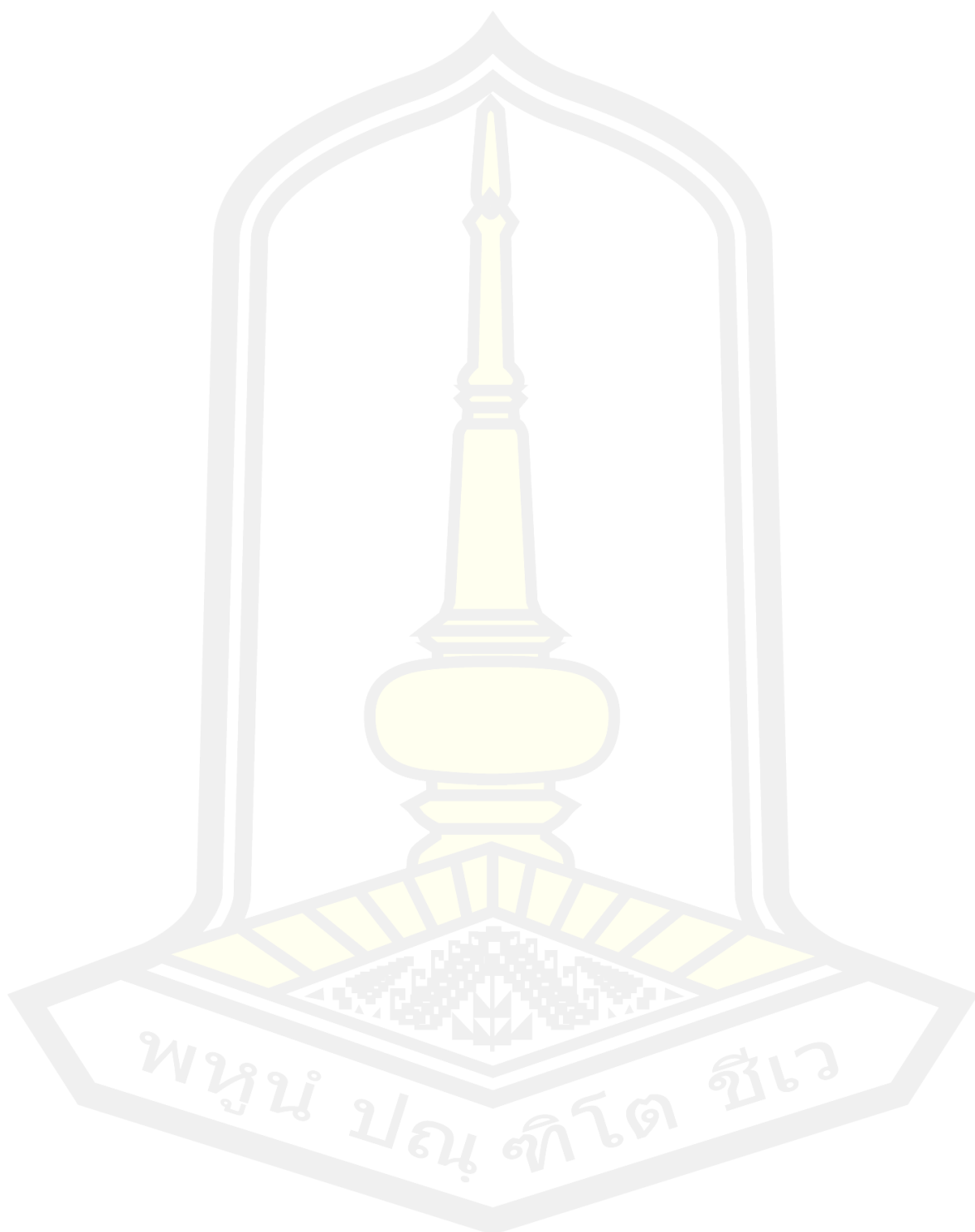
Through the analysis of the product evaluation results in the above four aspects, we can draw the following conclusions. (1) Experts believe that it is reasonable the product of the TECS-CE. (2) Experts believe that the TEP-CE designed with the sport commitment theory is reasonable. (3) Experts believe that the product in the TEP-CE experiment is reasonable. (4) Leader believes that the product of TEP-CE is

reasonable. (5) The participants in the experimental group believed that the product in the TEP-CE experiment is reasonable.

Overall, this thesis studies four aspects through four phases. The first phase is the validating of the TECS-CE (experimental tool), and of the relationship between exercise commitment and behavior. In this study, we obtained the TECS-CE. The second phase is the development of TEP-CE. In this study we developed successfully the experimental scheme of TEP-CE has been developed. The third phase adopts experimental method to implement TEP-CE. The research results show that the exercise commitment and exercise behavior of the participants in the experimental group are higher than those of the control group are after the experiment and then themselves at before experiment. The fourth phase is to evaluate the implementation of this study. The results show that the implementation of the TECS-CE, TEP-CE and the experiment implementation developed by this research is reasonable and in line with the research norms.



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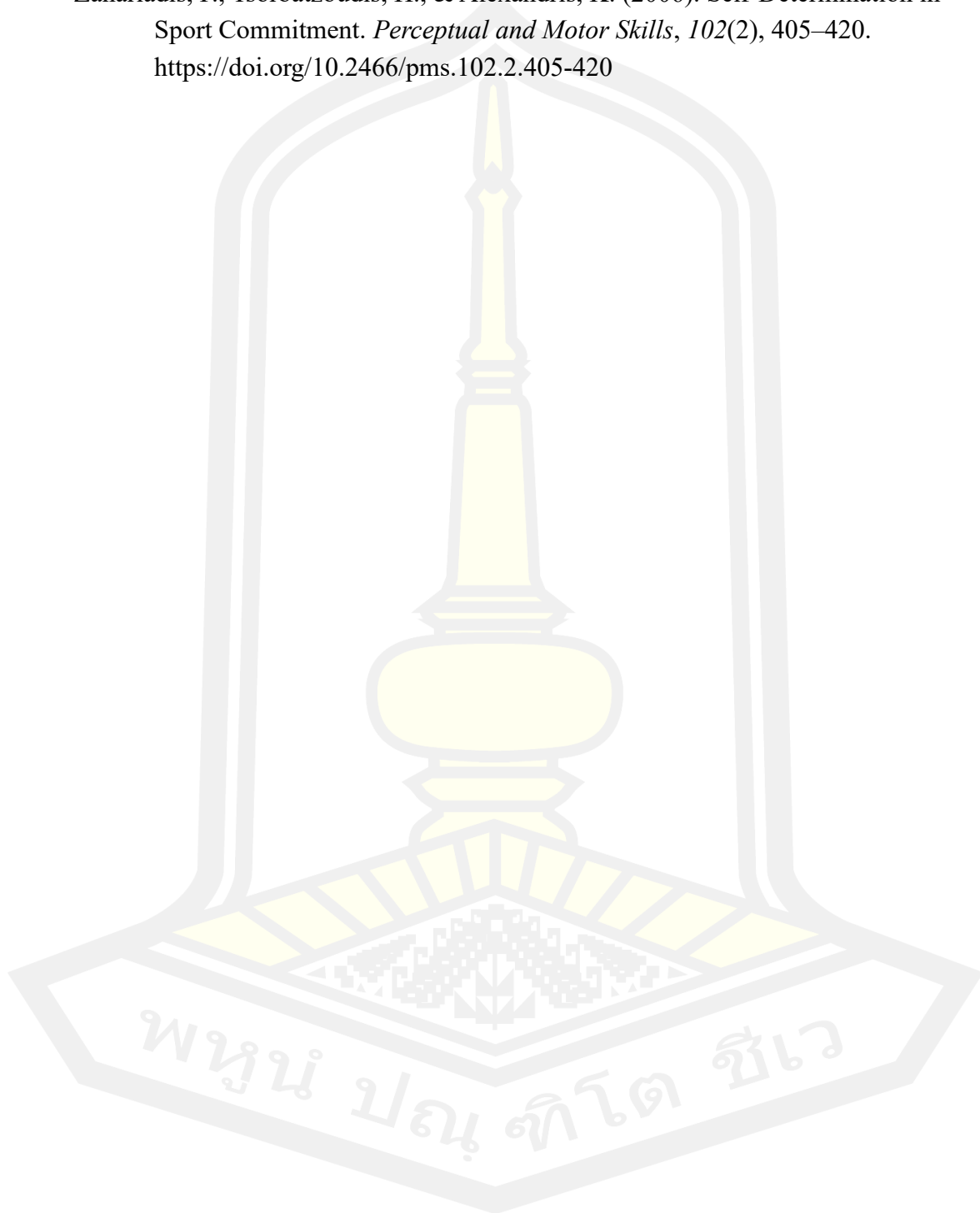
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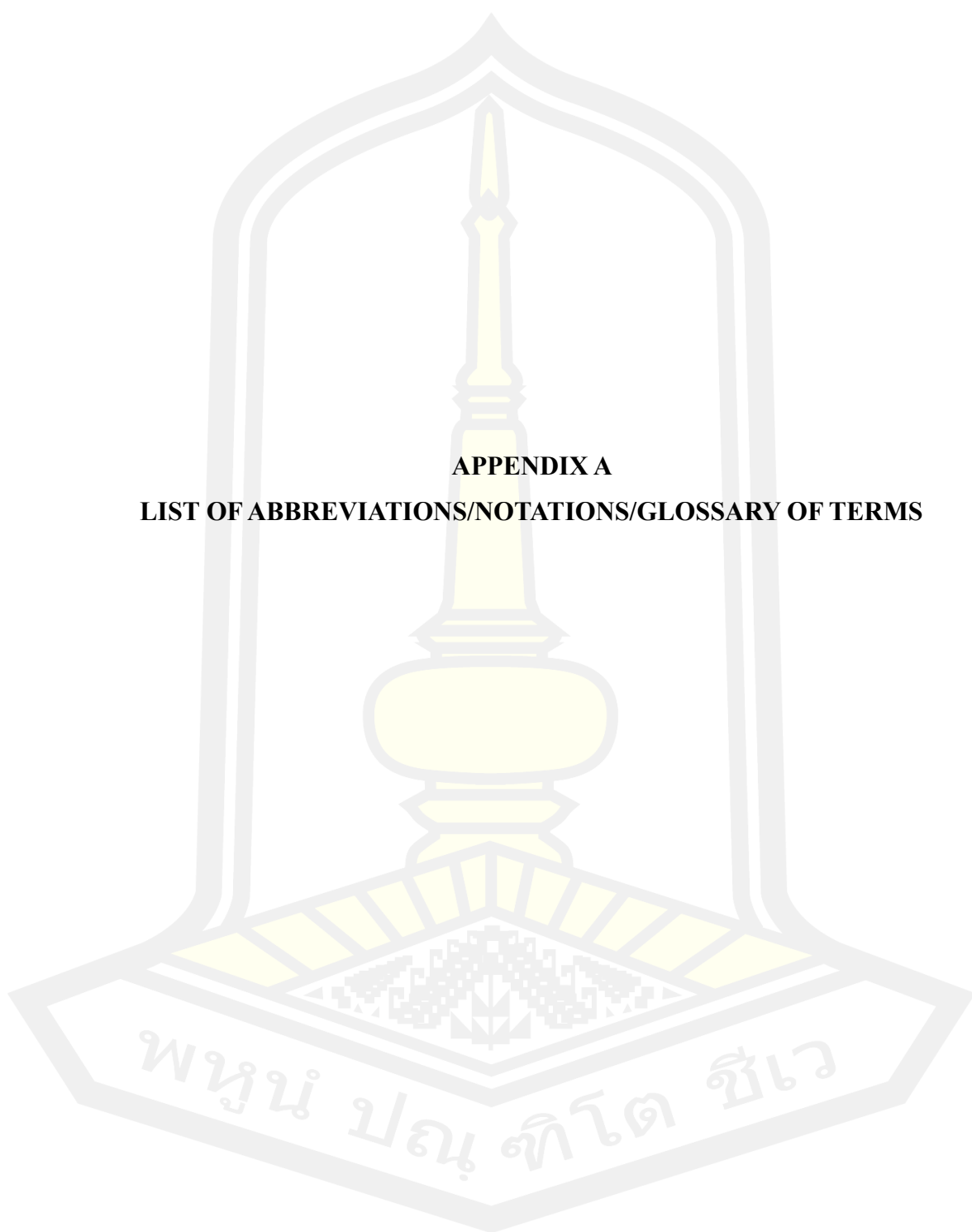
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APPENDIX

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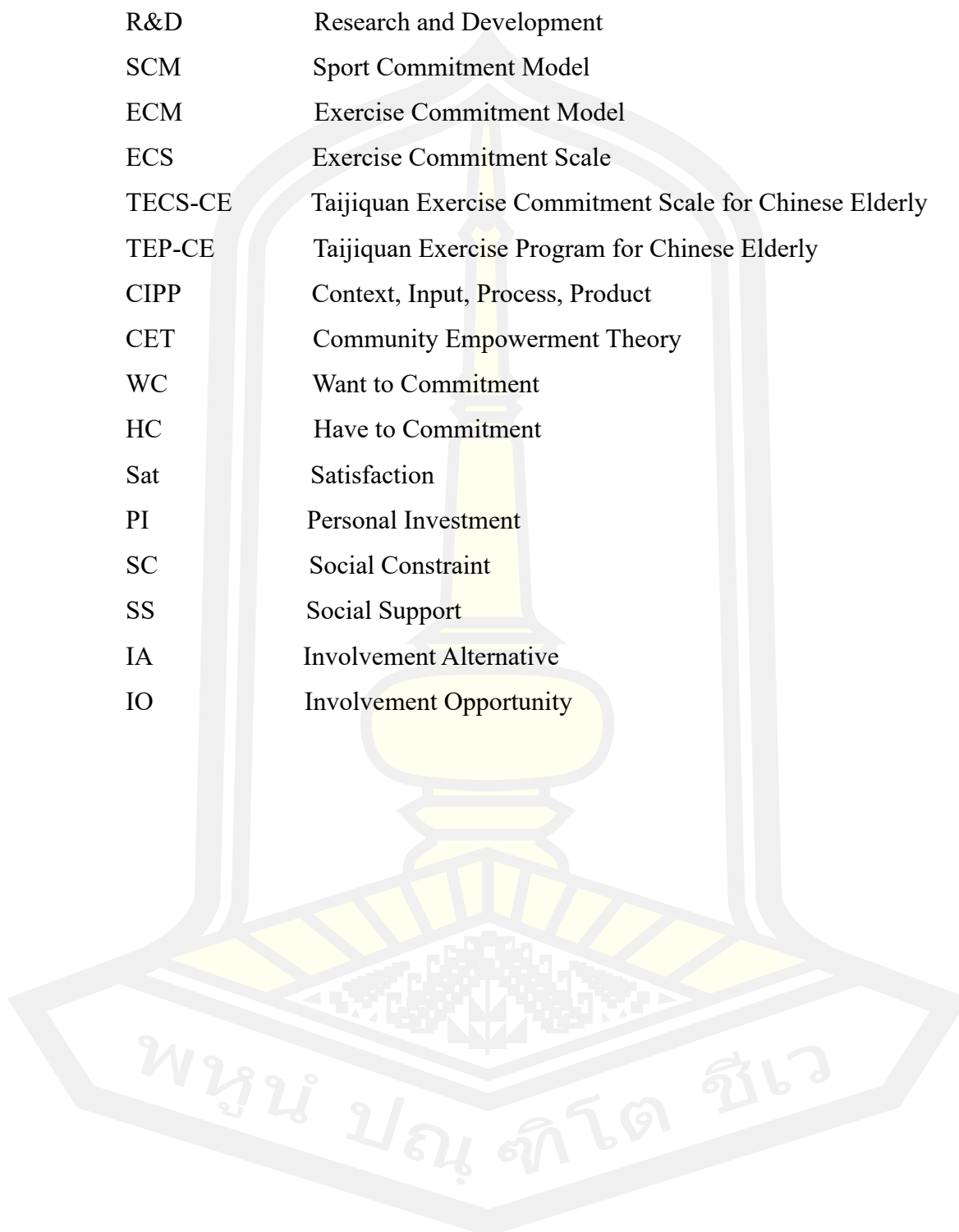


APPENDIX A

LIST OF ABBREVIATIONS/NOTATIONS/GLOSSARY OF TERMS

LIST OF ABBREVIATIONS/NOTATIONS/GLOSSARY OF TERMS

R&D	Research and Development
SCM	Sport Commitment Model
ECM	Exercise Commitment Model
ECS	Exercise Commitment Scale
TECS-CE	Taijiquan Exercise Commitment Scale for Chinese Elderly
TEP-CE	Taijiquan Exercise Program for Chinese Elderly
CIPP	Context, Input, Process, Product
CET	Community Empowerment Theory
WC	Want to Commitment
HC	Have to Commitment
Sat	Satisfaction
PI	Personal Investment
SC	Social Constraint
SS	Social Support
IA	Involvement Alternative
IO	Involvement Opportunity



APPENDIX B

**Taijiquan Exercise Commitment and Behavior Questionnaires for Chinese
Elderly**

Questionnaire

**Title: Developing the Taijiquan Exercise Program for Chinese Elderly: The
Sport Commitment Model Perspective**

This project is part of doctoral degree study

At Mahasarakham University, Thailand

PLEASE ANSWER ALL QUESTIONS

Contact:

Researcher: SUN Xianghao

E-mail address: 506535219@qq.com



CONSENT LETTER AS RESEARCH RESPONDENT

RESEARCH TITLE: Developing the Taijiquan Exercise Program for Chinese Elderly: The Sport Commitment Model Perspective

Dear Respondent,

We are pleased to inform you that you have been selected as a research respondent. Before you decide to be a part of this study, please be informed that there is no risk on your participation in this research. By completing this survey implied that you agree to take part in this study.

The purpose of this study is to explore the commitment status of Chinese elderly to exercise in Taijiquan activities, which can reflect the elderly desire and determination to continue to participate in Taijiquan exercise. Your answer should reflect your honest views and opinions.

Your participation and information provided will be kept in strict confidentiality, and is only meant for academic research purpose. You also have the right to withdraw from this research at any time without assigning any reason whatsoever.

If you have any questions about the participation of the event and the contents of the survey, please contact Mr. Sun at + 8618739987065

Thank you for your active support and close cooperation!

Sincerely,

SUN Xianghao

Ph.D candidate in Exercise and Sport Science
The Faculty of Education
Mahasarakham University, in Thailand.

Questionnaire

Thank you for agreeing to complete this survey about commitment of elderly Taijiquan exercise. Please read each question carefully before responding. Your spontaneous and honest response is important to the success of the study. Please return the questionnaire to one of the research assistants as you exit the place, such as park, gym and club.

SECTION 1: Demographic Information Survey

1. Your gender is: -? A male B female
2. How old are you in this year?
 A 60-65 B 65-70 C 70-75 D over 75
3. Which district of Jiaozuo City do you often exercise Taijiquan?
 A Jiefang District B Shanyang District
 C zhongzhan District D Macun District
4. How much do you spend on Taijiquan exercise every month?
 A 0-200 yuan B 200-500 yuan
 C 500-1000 yuan D 1000-1500 yuan
5. How long have you practiced Taijiquan?
 A 0-1 year B 1-3 years C 3-5 years D more than 5 years
6. How many times do you practice Taijiquan every week?
 A 1-3 times B 3-5 times C 5-7 times D over 7 times
7. How long do you practice Taijiquan every time?
 A about 30m B about 1 hour C 1-1.5 hour D over 1.5 hour
8. How does your body change after each Taijiquan exercise?
 A No feeling B Slight fever C A little sweating
 D Some sweating E A lot of sweating.
9. When do you choose to exercise Taijiquan every day?
 A 5:30—7:30 B 8:30—11:30 C 3:00—5:00
 D 5:00—7:00 E 7:00—9:00
10. What is your first purpose of participating in Taijiquan exercise? (Multiple choice)
 A Fitness B Entertainment C Medical D Hobbies F Others: _____

11. How is your health?

A Health B Sub-health C Chronic disease D Patient

12. What is your education level?

A Junior high school B Senior high school C Junior college

D Bachelor degree E Graduate or above

13. Where do you exercise Taijiquan?

A Park B Sport club C Stadium D Playground

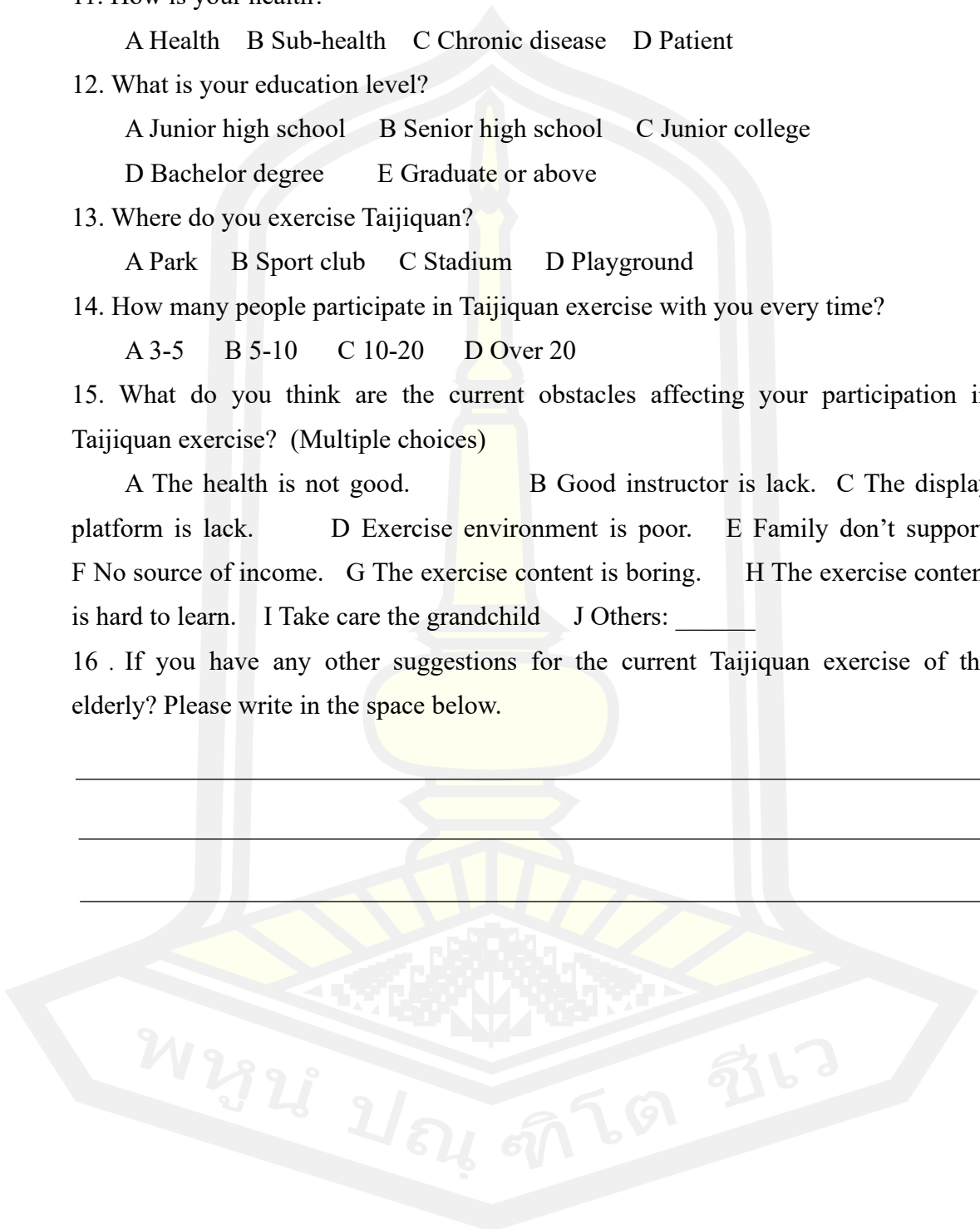
14. How many people participate in Taijiquan exercise with you every time?

A 3-5 B 5-10 C 10-20 D Over 20

15. What do you think are the current obstacles affecting your participation in Taijiquan exercise? (Multiple choices)

A The health is not good. B Good instructor is lack. C The display platform is lack. D Exercise environment is poor. E Family don't support. F No source of income. G The exercise content is boring. H The exercise content is hard to learn. I Take care the grandchild J Others: _____

16 . If you have any other suggestions for the current Taijiquan exercise of the elderly? Please write in the space below.



SECTION 2: Taijiquan Exercise Commitment Survey

Please rate each attribution its commitment to your choice of attending Taijiquan exercise event using the scale ranging from 1 (Not agree at all) to 5 (Strongly agree) by circling.

ONE OF THE FIVE ALTERNATIVES

Note: 1=Strongly Disagree, 2=Somewhat Disagree, 3=Neither Agree nor Disagree, 4=Somewhat Agree, 5=Strongly Agree

Item pool comprising the Taijiquan Exercise Commitment Scale						
Commitment constructs and subscale items of Taijiquan exercise						
	Item	1	2	3	4	5
	Want to Commitment					
1	I am determined to keep exercising Taijiquan.					
2	I am dedicated to keep exercising Taijiquan.					
3	I am committed to keep exercising Taijiquan.					
4	I am willing to do almost anything to keep exercising Taijiquan.					
5	I want to keep exercising Taijiquan.					
6	It would be hard for me to quit exercising Taijiquan.					
	Have to Commitment					
7	I feel obligated to continue exercising Taijiquan.					
8	I feel it is necessary for me to continue exercising Taijiquan.					
9	I feel exercise Taijiquan is a duty.					
	Satisfaction					
10	All thing considered, exercise Taijiquan is very satisfying.					
11	Because I exercise Taijiquan I feel satisfied.					
12	I find exercising Taijiquan to be very rewarding.					
	Social Constraints					
13	People will think I am a quitter if I stop exercising Taijiquan.					
14	I feel pressure from other people to exercise Taijiquan.					
15	I have to keep exercising Taijiquan to please others.					

Item pool comprising the Taijiquan Exercise Commitment Scale						
Commitment constructs and subscale items of Taijiquan exercise						
	Item	1	2	3	4	5
16	People disappointed with me if I quit exercising Taijiquan.					
	Involvement Alternatives					
17	Compared to exercising Taijiquan, there are other things I could do which would be more fun.					
18	Compared to exercising Taijiquan, there are other things I could do which would be more enjoyable.					
19	Compared to exercising Taijiquan, there are other things I could do which would be more worthwhile.					
20	I would be happier doing something else instead of exercising Taijiquan.					
21	I would like to do something else instead of exercising Taijiquan.					
	Personal Investment					
22	I have invested a lot of effort into exercising Taijiquan.					
23	I have invested a lot of energy into exercising Taijiquan.					
24	I have invested a lot of time into exercising Taijiquan.					
25	I spent a lot of money on exercising Taijiquan.					
	Social Support					
26	People important to me support my exercising Taijiquan.					
27	People important to me think it is okay to exercise Taijiquan.					
28	People important to me encourage me to exercise Taijiquan.					
	Involvement Opportunities					
29	Exercising Taijiquan gives me the opportunity to feel excited.					
30	Exercising Taijiquan gives me the opportunity to relieve any stress I am feeling.					
31	Exercising Taijiquan gives me the opportunity to have a good time.					
32	Exercising Taijiquan gives me the opportunity to be with my friends.					
33	Exercising Taijiquan gives me the opportunity to improve my health and fitness.					
34	Exercising Taijiquan gives me the opportunity to improve my physical skills.					

This is the end of the questionnaire. Please take a little more time to check whether there are omissions and mistakes in the filled contents. Once again, we would like to express our heartfelt thanks for your sincere participation!

Thank you very much!

APPENDIX C

Item pool comprising the Exercise Commitment Scale

Item pool comprising the Exercise Commitment Scale

Commitment constructs and subscale items

Want to Commitment

- I am determined to keep exercising.
- I am dedicated to keep exercising.
- I am committed to keep exercising.
- I am willing to do almost anything to keep exercising.
- I want to keep exercising.
- It would be hard for me to quit exercising.

Have to Commitment

- I feel obligated to continue exercising.
- I feel it is necessary for me to continue exercising.
- I feel exercise is a duty.

Satisfaction

- All thing considered, exercise is very satisfying.
- Because I exercise I feel satisfied.
- I find exercising to be very rewarding.

Social Constraints

- People will think I am a quitter if I stop exercising.
- I feel pressure from other people to exercise.
- I have to keep exercising to please others.
- People disappointed with me if I quit exercising.

Involvement Alternatives

- Compared to exercising, there are other things I could do which would be more fun.

Compared to exercising, there are other things I could do which would be more enjoyable.

Compared to exercising, there are other things I could do which would be more worthwhile.

I would be happier doing something else instead of exercising.

I would like to do something else instead of exercising.

Personal Investment

I have invested a lot of effort into exercising.

I have invested a lot of energy into exercising.

I have invested a lot of time into exercising.

I have invested a lot of my own money into exercising.

Social Support

People important to me support my exercising.

People important to me think it is okay to exercise.

People important to me encourage me to exercise.

Involvement Opportunities

Exercising gives me the opportunity to do something exciting.

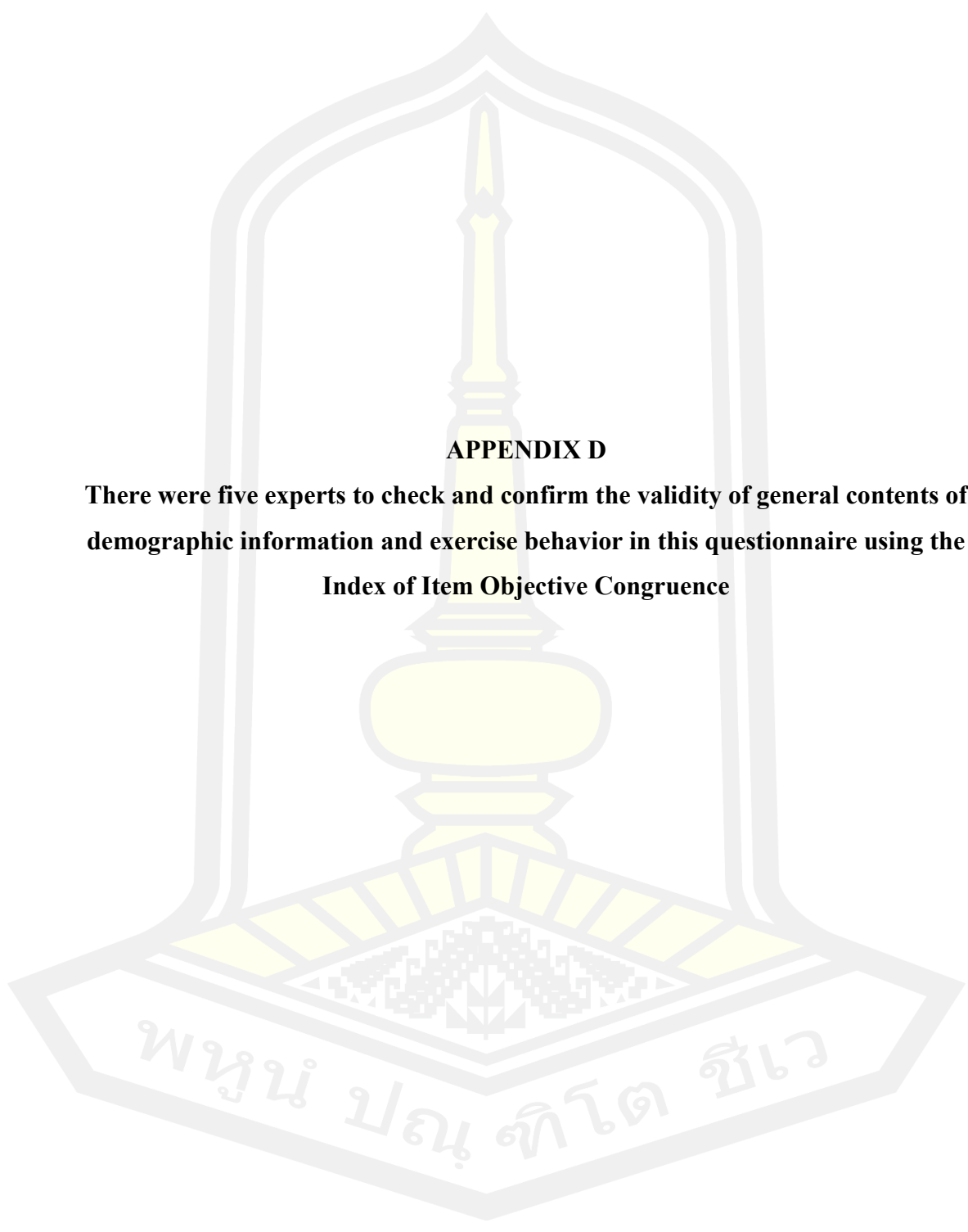
Exercising gives me the opportunity to relieve any stress I am feeling.

Exercising gives me the opportunity to have a good time.

Exercising gives me the opportunity to be with my friends.

Exercising gives me the opportunity to improve my health and fitness.

Exercising gives me the opportunity to improve my physical skills.



APPENDIX D

There were five experts to check and confirm the validity of general contents of demographic information and exercise behavior in this questionnaire using the Index of Item Objective Congruence

There were five experts to check and confirm the validity of general contents of demographic information and exercise behavior in this questionnaire using the Index of Item Objective Congruence, as follow:

The Table of Summary for Index of Item Objective Congruence							
No.	Items	Expert Evaluation					IOC value
		1	2	3	4	5	
1	Your gender is: -?	1	1	1	1	1	1
2	How old are you this year? A 60-65 B 65-70 C 70-75 D 75 over	1	1	1	1	1	1
3	Which district of Jiaozuo City do you often exercise Taijiquan?	1	1	1	1	1	1
4	How much do you spend on Taijiquan exercise every month?	1	1	1	1	1	1
5	How long have you practiced Taijiquan?	1	1	1	1	1	1
6	How many times do you practice Taijiquan every week?	1	1	1	1	1	1
7	How long do you practice Taijiquan every time?	1	1	1	1	1	1
8	When do you choose to exercise Taijiquan every day?	1	1	1	1	1	1
9	How does your body feel after each exercise?	1	1	1	1	1	1
10	What is your first purpose of participating in Taijiquan exercise? (Multiple choice) A Fitness B Entertainment C Medical D Hobbies F Others:	1	1	1	0	1	0.8
11	How is your health?	1	1	1	1	1	1
12	What is your education level?	1	1	1	1	1	1
13	Where do you exercise Taijiquan?	1	1	1	1	1	1
14	How many people participate in Taijiquan exercise with you every time?	1	1	1	1	1	1
15	What do you think are the current obstacles affecting your participation in Taijiquan exercise? (Multiple choice). A The health is not good. B Good instructor is lack. C The display platform is lack. D Exercise environment is poor. E Family don't support. F No source of income. G The exercise content is boring. H The exercise content is hard to learn. I Others:	1	1	0	1	1	0.8
16	If you have any other suggestions for the current Taijiquan exercise of the elderly? Please write in the space below.	1	1	1	1	1	1

There were five experts to check and confirm the validity of general contents of exercise commitment in this questionnaire using the Index of Item Objective Congruence, as follow:

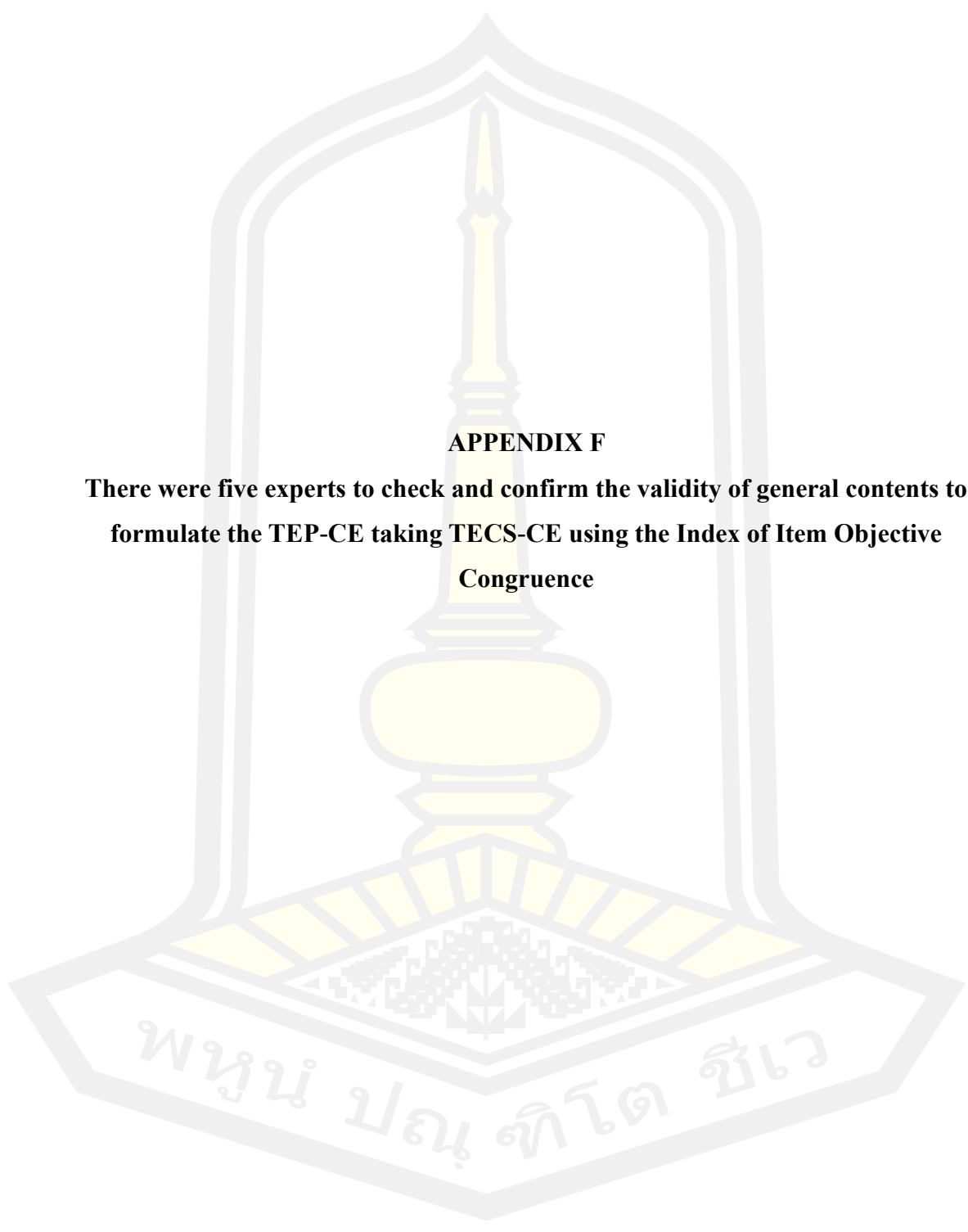
The Table of Summary for Index of Item Objective Congruence								
No.	Items	Propose	IOC score for the expert					IOC value
			1	2	3	4	5	
1	I am determined to keep exercising Taijiquan.	To understand the internal desire of elderly Taijiquan practitioners to exercise Taijiquan.	1	1	1	1	1	1
2	I am dedicated to keep exercising Taijiquan.		1	1	0	1	1	0.8
3	I am committed to keep exercising Taijiquan.		1	1	1	1	1	1
4	I am willing to do almost anything to keep exercising Taijiquan.		1	1	1	1	0	0.8
5	I want to keep exercising Taijiquan.		1	0	1	1	1	0.8
6	It would be hard for me to quit exercising Taijiquan.		1	1	1	0	1	0.8
7	I feel obligated to continue exercising Taijiquan.	To understand the external factors of Taijiquan Exercise desire of the elderly. The higher the external factors, the higher the desire.	1	1	1	1	1	1
8	I feel it is necessary for me to continue exercising Taijiquan.		1	1	1	1	1	1
9	I feel exercise Taijiquan is a duty.		1	1	1	1	0	0.8
10	All thing considered, exercising Taijiquan is very satisfying.	To understand the self-satisfaction of the elderly in Taijiquan exercise. The higher the satisfaction, the higher the desire.	0	1	1	1	1	0.8
11	Because I exercise Taijiquan I feel satisfied.		1	0	1	1	1	0.8
12	I find exercising Taijiquan to be very rewarding.		1	1	1	1	1	1
13	People will think I am a quitter if I stop exercising Taijiquan.	To understand the external binding force of Taijiquan exercise for the elderly. The higher the binding force, the higher the desire.	1	1	0	1	1	0.8
14	I feel pressure from other people to exercise Taijiquan.		1	1	1	1	1	1
15	I have to keep exercising Taijiquan to please others.		1	1	1	1	1	1
16	People disappointed with me if I quit exercising Taijiquan.		1	1	1	1	1	1
17	Compared to exercising Taijiquan, there are other sport I could do which would be more fun.	To understand the degree of substitution of Taijiquan exercise by elderly practitioners. The higher the degree of substitution, the lower the desire.	1	1	1	0	1	0.8
18	Compared to exercising Taijiquan, there are other sport I could do which would be more enjoyable.		1	1	1	1	1	1
19	Compared to exercising Taijiquan, there are other sport I could do which would be more worthwhile.		1	1	0	1	1	0.8
20	I would be happier doing some sport instead of exercising Taijiquan.		1	1	1	1	1	1

The Table of Summary for Index of Item Objective Congruence								
No.	Items	Propose	IOC score for the expert					IOC value
			1	2	3	4	5	
21	I would like to do other sport else instead of exercising Taijiquan.		1	1	1	1	1	1
22	I have invested a lot of effort into exercising Taijiquan.	To understand the investment of elderly Taijiquan practitioners in Taijiquan exercise. The higher the investment, the higher the desire.	1	1	1	1	1	1
23	I have invested a lot of energy into exercising Taijiquan.		1	1	1	1	1	1
24	I have invested a lot of time into exercising Taijiquan.		1	1	0	1	1	0.8
25	I spent a lot of money on exercising Taijiquan.		1	1	1	1	1	1
26	People important to me support my exercising Taijiquan.	To understand the degree of social support of elderly Taijiquan practitioners for Taijiquan exercise. The higher the degree of support, the higher the tendency.	1	1	1	1	1	1
27	People important to me think it is okay to exercise Taijiquan.		1	1	1	1	1	1
28	People important to me encourage me to exercise Taijiquan.		1	0	1	1	1	0.8
29	Exercising taijiquan gives me the opportunity to feel excited.	To understand the benefit degree of elderly Taijiquan practitioners from Taijiquan exercise. The higher the benefit degree, the higher the desire.	1	1	1	1	1	1
30	Exercising Taijiquan gives me the opportunity to relieve any stress I am feeling.		1	1	1	1	1	1
31	Exercising Taijiquan gives me the opportunity to have a good time.		1	1	1	1	1	1
32	Exercising Taijiquan gives me the opportunity to be with my friends.		1	1	1	1	1	1
33	Exercising Taijiquan gives me the opportunity to improve my health and fitness.		1	1	1	1	1	1
34	Exercising Taijiquan gives me the opportunity to improve my physical skills.		0	1	1	1	1	0.8

APPENDIX E

Correlation and Regression Analysis of Taijiquan Exercise Behavior (Exercise Adherence, Exercise Frequency, Duration, Exercise Intensity) and Exercise Commitment Among Chinese Elderly.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	58740.102	2	29370.051	107.246	.000 ^b
	Residual	67642.574	247	273.857		
	Total	126382.676	249			
a. Dependent Variable: Total exercise						
b. Predictors: (Constant), Have to Commitment, Want to Commitment						



APPENDIX F

**There were five experts to check and confirm the validity of general contents to
formulate the TEP-CE taking TECS-CE using the Index of Item Objective
Congruence**

There were five experts to check and confirm the validity of general contents to formulate the TEP-CE taking TECS-CE using the Index of Item Objective Congruence, as follow:

The Table of Index of Item Objective Congruence								
No.	Questions	Propose	IOC score for the expert					IOC value
			1	2	3	4	5	
1	In terms of the want to commitments and its items, how do you think to formulate the Taijiquan exercise program for the elderly in China?	Make use of the want to commitment and its items to formulate a specific program to intervene in Taijiquan exercise for the elderly in China.	1	1	1	1	1	1
2	In terms of the have to commitments and its items are concerned, how do you think to formulate the Taijiquan exercise program for the elderly in China?	Make use of the have to commitment and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	1	1
3	In terms of satisfaction and its items, how do you think to formulate the Taijiquan exercise program for the elderly in China?	Make use of satisfaction and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	1	1
4	In terms of social constraint and its items, how do you think to formulate the Taijiquan exercise program for the elderly in China?	Make use of social constraint and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	0	0.8
5	In terms of involvement alternative and its items, how do you think to formulate a Taijiquan exercise program for the elderly in China?	Make use of involvement alternative and its items, to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	0	1	1	0.8
6	In terms of personal investment and its items, how do you think to formulate the Taijiquan exercise program for the elderly in China?	Make use of personal investment and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	1	1
7	In terms of social support and its items, how do you think to formulate the Taijiquan exercise program for the elderly in China.	Make use of social support and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	1	1
8	In terms of involvement opportunity and items, how do you think to formulate a Taijiquan exercise program for the elderly in China.	Make use of involvement opportunity and its items to formulate a specific program to intervene in Taijiquan exercise of the elderly in China.	1	1	1	1	1	1
9	I hope you can put forward more suggestions on how to formulate a scientific and reasonable Taijiquan exercise program for the elderly in China, so as to make this study more scientific and reasonable.	To get more reasonable suggestions.	0	1	1	0	1	0.6

APPENDIX G

NOTICE OF RECRUITMENT OF EXPERIMENTAL SUBJECTS RESEARCH

**TITLE: Developing the Taijiquan Exercise Program for Chinese Elderly: the
Sport Commitment Model Perspective**

NOTICE OF RECRUITMENT OF EXPERIMENTAL SUBJECTS
RESEARCH TITLE: Developing the Taijiquan Exercise Program for Chinese
Elderly: The Sport Commitment Model Perspective

Dear Respondent,

We appreciate your participation in the recruitment of this experiment. Before deciding whether to choose you as the experimental object, we must inform you that the purpose of this experiment is to improve your commitment and behavior to participate in Taijiquan exercise through language intervention under the guidance of Sport Commitment Theory. There is no risk in participating in this experiment.

In order to determine whether you meet the screening criteria of the experimental subjects, we hope you can answer the following questions in a sincere and objective manner.

Your participation and information provided will be kept in strict confidentiality, and is only meant for academic research purpose. You also have the right to withdraw from this research at any time without assigning any reason whatsoever.

After completing the questionnaire, if you still agree to participate in this experiment. Please mark the agreement and sign in the space below. Do not operate this option if you do not agree.

I agree to participate in this experiment. Agreement ☐

Signature: Mr. / Mrs.

If you have any questions about the participation of the event and the contents of the survey, please contact Mr. Sun at + 8618739987065

Thank you for your active support and close cooperation!

Sincerely,

SUN Xianghao

Ph.D candidate in Exercise and Sport Science

The Faculty of Education

Maharakham University, in Thailand.

The questionnaire about subjects' Demographic characteristics, screening criteria and commitment

Your name:_____. your phone number:_____. Filling date: _____.

Part one. Investigation on demographic characteristics.

1. Your gender is:_____. A Male B Female
2. How old are you in this year? A 60-65 B 65-70 C 70-75 D over 75
3. Which district of Jiaozuo City do you often exercise Taijiquan?
A Jiefang District B Shanyang District C Zhongzhan District D Macun District
4. What is your monthly income?
A 0-1000 yuan B 1000-2000 yuan C 2000-5000 yuan D 5000 yuan and above
5. What is your education level?
A Junior high school and below B Senior high school
C Junior college D Bachelor degree or above

Part two. Investigation on screening criteria of experimental subjects.

1. Can you communicate with people normally?
A No, it is not. B Yes, I can.
2. Can you participate in sports activities normally?
A No, it is not. B Yes, I can.
3. Can you guarantee to complete the 12 weeks' experiment?
A No, it is not. B Yes, I can.
4. Do you have more than 3 months and less than 12 months of Taijiquan exercise experience?
A No, it is not. B Yes, I can.
5. Is your Taijiquan exercise place near the people's Square in the Jiefang area?
A It is very far. B It is far. C It is close. D It is very close.
6. How is your health?
A Health B Sub-health C Chronic disease D Patient

Part three. Commitment status survey, to see the TECS-CE.

APPENDIX H
Program Evaluation Questionnaire

Program Evaluation Questionnaire

Thank you for agreeing to complete this survey on the rationality evaluation of developed TEP-CE. Please read each question carefully before answering. Your spontaneous and honest answers are important to the success of the research.

The First Section: The Program Evaluation Questionnaire of Expert

Note: The settings of items 1-4 are for CONTEXT evaluation. The settings for items 5-10 are for INPUT evaluation. The settings for items 11-16 are for PROCESS evaluation. The settings for items 17-22 are for PRODUCT evaluation.

1. In view of the current situation of Taijiquan in the elderly group, do you think it is necessary to improve the commitment of Taijiquan exercise in the elderly?

A It is unnecessary very much. B It is unnecessary. C I cannot say it clearly.

D It is necessary. E It is necessary very much.

2. In view of the current situation of Taijiquan in the elderly group, do you think it is necessary to improve the elderly Taijiquan exercise behavior?

A It is unnecessary very much. B It is unnecessary. C I cannot say it clearly.

D It is necessary. E It is necessary very much.

3. In view of the current situation of Taijiquan for the elderly, what is your opinion on developing TEP-CE?

4. In view of the current situation of Taijiquan for the elderly, what is your opinion on developing TEP-CE based on the sport commitment theory?

5. Do you think the input of SCM and scale to use investigate Taijiquan exercise commitment in the elderly is reasonable?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable

6. Do you think the input of SCM factors to use intervene Taijiquan exercise commitment and behavior in the elderly is reasonable?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable

7. Do you think the input of the experimental scheme of TEP-CE based on SCM is reasonable?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable

8. Do you think there are any shortcomings and needs to be improved in the input of exercise commitment scale used to investigate the Taijiquan exercise commitment of the elderly group in China?

9. Do you think there are any shortcomings and needs to be improved in the input of formulation of TEP-CE based on the elements of exercise commitment theory?

10. Do you think there are any shortcomings and needs to be improved in the input of Taijiquan exercise intervention for the elderly group in China from the perspective of SCM?

11. Do you think the process of the TECS-CE developed in this study is reasonable?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable.

12. Do you think the process of the TEP-CE developed in this study is reasonable?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable.

13. Do you have any suggestions on the validation and application process of exercise Commitment Scale in Chinese elderly Taijiquan exercise?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.
D It is reasonable. E It is very reasonable.

14. Do you have any suggestions for the process of using sport commitment model in developing TECS-CE?

15. Do you have any suggestions for the process of using sport commitment model in developing TEP-CE?

16. Do you have any suggestions on the experimental implementation process of applying exercise commitment theory in Chinese elderly group Taijiquan exercise?

17. Do you think the validated TECS-CE based on exercise commitment scale in this study is effective?

- A It is very un-effective. B It is un-effective. C I cannot say it clearly.
D It is effective. E It is very effective.

18. Do you think the TEP-CE based on SCM in this study is effective?

- A It is very unreasonable. B It is unreasonable. C I cannot say it clearly.

D It is reasonable. E It is very reasonable

19. Do you think the Taijiquan exercise intervention experiment for the elderly group based on exercise commitment elements in this study is effective?

A It is very un-effective. B It is un-effective. C I cannot say it clearly.
D It is effective. E It is very effective.

20. Do you think the product of developed TEP-CE based on SCM is effective?

A It is very un-effective. B It is un-effective. C I cannot say it clearly.
D It is effective. E It is very effective.

21. In your opinion, what aspects of Taijiquan exercise program for the elderly group based on SCM should be improved in this study?

22. What services do you think the TEP-CE based on SCM can provide for the decision-making and planning of Taijiquan exercise for the elderly?

The Second Section: The Program Evaluation Questionnaire of Leader

Note: (1) According to the following questions, please evaluate the Taijiquan exercise program in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices—1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. (2) The settings of items 1-8 are for CONTEXT evaluation. The settings for items 9-16 are for INPUT evaluation. The settings for items 17-22 are for PROCESS evaluation. The settings for items 23-32 are for PRODUCT evaluation.

	Item	1	2	3	4	5
	Context Evaluation					
1	How much extent do the participants consider “want to” to participate in Taijiquan exercise before joining the program?					
2	How much extent do the participants consider “have to” to participate in Taijiquan exercise before joining the program?					
3	How much extent of social constraints did the participants have on practicing Taijiquan before joining the program?					
4	How much extent are participants more likely to participate in other exercises before joining the program?					
	Item	1	2	3	4	5
5	How much extent do the participants want to participate in Taijiquan exercise before joining the program?					
6	How much extent of time and energy did the participants put into their Taijiquan exercises before joining the program?					
7	How much extent of support did the person important to the participants have for taking part in Taijiquan exercise before joining the program?					
8	How much extent of good experience does participants have in Taijiquan exercise before joining the program?					
	Input Evaluation					
9	How much extent can “want to commitment” improve participants’ Taijiquan exercise commitment and behavior?					
10	How much extent can “have to commitment” improve participants’ Taijiquan exercise commitment and behavior?					
11	How much extent can “satisfaction” improve participants’ Taijiquan exercise commitment and behavior.					
12	How much extent can “social constraint” improve participants’ Taijiquan exercise commitment and behavior.					
13	How much extent can “involvement alternative” reduce participants’ attitude towards participating in other exercise programs?					
14	How much extent can “personal investment” improve participants’ Taijiquan exercise commitment and behavior.					
15	How much extent can “social support” improve participants’ Taijiquan exercise commitment and behavior.					
16	How much extent can “involvement opportunity” improve participants’ Taijiquan exercise commitment and behavior.					
	Process Evaluation					
17	How much extent did you participated in Taijiquan exercise instruction on time for this program in the last three months?					
18	How much extent did you give the Taijiquan exercise instruction for this program’s participants in the last three month?					

	Item	1	2	3	4	5
19	How much extent of quality did you finish the Taijiquan exercise program in the last three months?					
20	How much extent did the participants participate in Taijiquan exercises on time in the last three months?					
21	How much extent of quality did the participants participate in Taijiquan exercise in the last three months?					
22	How much extent of quality did the participants complete the Taijiquan exercise program in the last three months?					
	Product Evaluation					
23	How much extent did the participants talk often about Taijiquan exercise in their daily life in the past three months?					
24	How much extent did participants improve their Taijiquan exercise behavior in the past three months?					
25	How much extent have participants increased their Taijiquan exercise frequency in the past three months?					
26	How much extent were participants satisfied with Taijiquan exercise in the past three months?					
27	How much extent did participants suggest that people around them engage in Taijiquan exercise in the past three months?					
28	How much extent have participants increased their time and energy input in Taijiquan exercise in the past three months?					
29	How much extent have participants increased their social constraints on participating in Taijiquan exercise in the past three months?					
30	How much extent have participants reduced their focus on alternative physical exercise programs in the past three months?					
31	How much extent did the participants agree with the involvement opportunities of Taijiquan exercise in the past three months?					
32	What's your comment on Taijiquan Teaching in the past three months? _____ _____					

The Third Section: The Program Evaluation Questionnaire of Participants

Note: (1) According to the following questions, please evaluate the Taijiquan exercise programs in the last three months by using a scale ranging from 1 (lower) to 5 (higher). One of five options from these choices--1 means its extent is lower; 2 means its extent is low; 3 means its extent is general; 4 means its extent is high; 5 means its extent is higher. (2) The settings of items 1-8 are for CONTEXT evaluation. The settings for items 9-16 are for INPUT evaluation. The settings for items 17-25 are for PROCESS evaluation. The settings for items 26-35 are for PRODUCT evaluation.

	Item	1	2	3	4	5
	Context Evaluation					
1	How much extent did you “want to” participate in Taijiquan exercise before participating in this program?					
2	How much extent do you think that you “have to” participate in Taijiquan exercise before participating in this program?					
3	How much extent do you think that practicing Taijiquan is satisfaction before joining this program?					
4	How much extent do you think that society constraints engage you in Taijiquan exercise before participating in this program?					
5	How much extent did you think that other physical exercise could not replace Taijiquan before participating in this program?					
6	How much did you invest in Taijiquan exercise before participating in this project, such as time, energy and effort?					
7	How much extent did your important people around support your Taijiquan exercise before participating in this program?					
8	How much extent did you think that Taijiquan exercise had good involvement opportunities before participating in this program?					
	Input Evaluation					
9	How much extent do you think “want to” can imply your commitment and behavior to participate in Taijiquan exercise?					
10	How much extent do you think “have to” can imply your commitment and behavior to participate in Taijiquan exercise?					
11	How much extent do you think “satisfaction” can imply your commitment and behavior to participate in Taijiquan exercise?					
12	How much extent do you think “social constraint” can imply your commitment and behavior to participate in Taijiquan exercise?					
13	How much extent do you think “involvement alternative” can imply your commitment and behavior to participate in Taijiquan exercise?					
14	How much extent do you think “personal investment” can imply your commitment and behavior to participate in Taijiquan exercise?					
15	How much extent do you think “social support” can imply your commitment and behavior to participate in Taijiquan exercise?					
16	How much extent do you think “involvement opportunity” can imply your commitment and behavior to participate in Taijiquan exercise?					
	Process Evaluation					
17	How much extent did leader participate in the guidance of Taijiquan exercise on time in the past three months?					
18	In the past three months, how much extent did leaders participate in Taijiquan practice guidance according to the experimental requirements?					

	Item	1	2	3	4	5
19	How much extent of quality did leader complete the Taijiquan exercise program in the past three months?					
	Context Evaluation					
20	How much extent did you participate in Taijiquan exercise on time in the past three months?					
21	How much extent did you participate in Taijiquan exercise as required in the past three months?					
22	How much extent of quality did you complete in the Taijiquan exercise program in the past three months?					
23	How much extent did the participants around you participate in Taijiquan exercise on time in the past three months?					
24	How much extent did the participants around you participate in Taijiquan exercise as required in the past three months?					
25	How much extent of quality did the participants around you complete the Taijiquan exercise program in the past three months.					
	Product Evaluation					
26	In the future, how much extent will you commit and continue to engage in Taijiquan exercise?					
27	In the future, how much extent do you promise to stick to Taijiquan exercise?					
28	In the future, how much extent do you promise to be satisfied with practicing Taijiquan?					
29	In the future, how much extent do you promise to participate in Taijiquan even without social constraints?					
30	In the future, how much extent do you promise that other physical exercise cannot replace Taijiquan?					
31	In the future, how much extent do you promise to increase personal investment in Taijiquan?					
32	In the future, how much extent do you think that important people around you support your Taijiquan exercise?					
33	In the future, how much extent do you think that Taijiquan exercise will make you feel excited and have fun?					
34	In the future, how much extent do you think that Taijiquan exercise will increase your health and motor skills?					
35	What are your comments on Taijiquan practice in the past three months? _____ _____					

APPENDIX I
Extracted Survey Log

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The survey log --- Comprehensive implementation of data collection of this study

In the second stage of research, I adopted the following strategies to collect data. The first way is to recruit some research assistants in my university. I also shared with them my experience to improve efficiency. The second way is that I use the online questionnaire to distribute the questionnaire, to expand the distribution scope. The third way is that friends introduce me to the places they are familiar with, to distribute questionnaires. In order to increase the enthusiasm of the respondents, we bought some small gifts, such as soap, small Taijiquan cultural and creative products, etc., and distributed them to the respondents who completed the questionnaire.

During the survey, in addition to my feelings about the elderly's commitment and behavior in Taijiquan exercise, I had many ideas. For example, an 86-year-old trainee left a deep impression on me. His listening ability was poor, but his mind was still clear. As long as you can ensure that he can hear your words, he can still communicate with you normally. I learned that he has been practicing Taijiquan for more than 30 years, and exercise it almost every day. When we talked about the commitment and behavior of Taijiquan exercise, he said that "At first, I just wanted to master some hitting skills and exercise methods. I could not often remember the movements. I thought the exercise was boring. After persistent exercise, I gradually fell in love with this sport. Taijiquan exercise has become a habit in my life".

After the survey, my mood was complex. I sat in front of the computer every day, looking up information, thinking, writing papers, and in order to get my doctoral thesis as soon as possible, I was very anxious and could not sleep every day. I only took exercise occasionally. I always feel that I am in a sub-health state. Can I live to be 86 like this old man? Can you live to the age of 86 with dignity like him?



Figure 15 Some photos from the survey.

Experiment log, A nervous and smooth start to the experiment

After public recruitment, questionnaire distribution, interview, time and place determination, pre experiment and other links, we finally started our experiment on May 30, 2022. As the first exercise of the experiment, although the leader and I had warned them to come the night before. However, I still came to the experimental site with a small gift in advance. Before 7.30, I was worried that someone would be absent. However, with the arrival of experimental participants one after another, I gradually relaxed my nervousness when watching their warm smiling faces and saying “young man, good morning”. Finally, the first exercise ended smoothly. Some participants enthusiastically told me that, “Young man, I have heard the tape that you sent to us. I think it is a good way to let me attend the Taijiquan exercise. The tape is like an alarm that reminds me that I should take part in Taijiquan exercise.”

After that, in order to carry out the second exercise smoothly, leaders and I reminded them one by one not to forget to attend on time next time and said goodbye to them kindly. Before the first exercise, some participants began to communicate with each other during the rest and after the exercise. Their communication often started with Taijiquan techniques, and finally began to understand their age, work before retirement, home address and other information. This is in line with the various items of involvement opportunities in SCM. They have a chance to make friends. Maybe in the next exercise, they will have a chance to get along with friends happily.



Figure 16 Photos in the process of experiment.

Experiment log 3, My harvest

Harvest 1 is that it inspires me. During the exercise with the elderly participants in the experimental group, some elderly people said, “Young man, your Taijiquan is very good. You should keep practicing. When you reach our age, you will have a very beautiful technical level.” This reminds me of a story. Later, I told this story to my Leader, which became an example of guiding participants to increase their commitment to Taijiquan exercise. The story is “When someone asked a 90-year-old grandmother what the most regrettable thing in your life was?” The grandmother replied, “I wanted to play the violin when I was 60, but I didn't do it because I was afraid of being too old. If I had chosen to play the violin at that time, I would be a violinist in my thirties now.” It is never too late to learn something new, which has also become a motto of increasing commitment to scientific research.

Harvest 2 is the idea of a new research topic. During the whole experiment, I found that there were people participating in various exercise programs on the square. In addition to common exercises, Taijiquan, dance, brisk walk, stage step, dragon dance, kite flying, etc., there are also various self-created sports that make me very curious. These make me have to think about what causes them to participate in different projects. Why the elderly who practice Taijiquan live a peaceful life. Why the elderly who practice dancing wear gorgeous clothes, why the elderly who walk fast always have a large group of people together. Confusion with these questions reminds me of another research topic, that is, what are the psychological factors for different groups to choose the same exercise method? What are the psychological factors for the same group to choose different exercise methods? What are the psychological factors and characteristics of the times that different groups choose different ways of exercise?



Figure 17 Data collection some photos after the experiment.

BIOGRAPHY

NAME SUN Xianghao

DATE OF BIRTH November 11, 1989

PLACE OF BIRTH Kaifeng city, China

ADDRESS No.2001, Shiji roal, Shanyan district, Jiaozuo city,Henan province,China

POSITION 2015 Engage in Physical Education Teaching and Scientific Research

PLACE OF WORK Henan Polytechnic University in China

EDUCATION

2007 to 2011 Bachelor's Degree, Field of Study
Traditional Ethnic Sports, Admitted to the
College of Physical Education of Henan
University

2011-2014 Master's Degree, Field of Study
Traditional Ethnic Sports, Admitted
to the Graduate School of Henan
University

2018-2023 Doctor of Philosophy Program
in Exercise and Sport Science,
Mahasarakham University

