Application of the Transtheoretical Model of Exercise Behavior Change Plan in High School Students
Frank C. Pan*, and Chih-Hao Chen

Abstract—The purpose of this study is to discuss the effect of the intervention of exercise behavior change plan for high school students on study subjects’ social and psychological factors and exercise stages. This research uses the transtheoretical model as the research framework. One experiment group and one control group were used in a quasi-experimental design research. The experimental group accepted health-related physical fitness course and the traditional course; the control group accepted traditional physical education course. There is a significant difference before and after the intervention in the experimental group. Karl’s test shows the experimental group gained a better improvement than that in the control group. The Analysis of Covariance had shown the exercise intervention in the experimental group. Karl’s test shows the experimental group gained a better improvement than that in the control group. There was no major effect on the perceived exercise barrier (F=7.62, p<0.05) of the experimental group were obviously larger than those of the control group. There was no major effect on the perceived exercise barrier (F=0.61, p>0.05) after the intervention of exercise behavior change plan. However, the rate of high school students the practical implementation of the exercise is not high, obviously influenced by the exercise barrier. The academic and examination pressure may be the major causes of the exercise barrier in the high school.

Keywords—Transtheoretical model (TTM), High school students, exercise behavior

I. INTRODUCTION

Modern civilization does not mean a healthy life. A lot of labor is being replaced by modern technology. Automation and mechanization of the living environment, for example, a wide range of household appliances, means of transport developed, and the development of the Internet, making the material and cultural level of people rising, the required physical and labor-intensive society very different from the past. Modern technology reduces people's physical activity, leading to declining opportunities for human activities; making sedentary lifestyle (the sitting lifestyle) replaced the previous dynamic way of life. Reduce the chances of the activities that most people live and inadequate physical activity of sedentary lifestyle and physiological function are aging recession early double blow, led to modern life, the greatest threat to health, even a physical degradation of disease.

Among the ten major causes of death propose by department of Health of R.O.C. in 1998 [1], cancer, cerebral-vascular disease and heart disease were highest in the top three, diabetes and hypertension were also located in the fifth and ninth. More evidence that these chronic diseases have been a serious threat to people's lives [1].

Past three decades in Taiwan the main threat to health has been the tradition from infective diseases into a present of chronic diseases, physical function and degenerative diseases (such as low back pain & joint lesions). In fact, most of these conditions could be greatly improved through an appropriate amount of exercise. Engaged in regular exercise can prevent coronary heart disease (CAD) [2] by improving cardiovascular and other risk factors [3], control non-insulin-dependent diabetes mellitus (NDDM) [4], help maintaining weight [5] to gain healthy body mass index [6], and help preventing chronic diseases other than DM [7]. In other words, Adequate and regular exercise not only can improve the body's oxygen uptake, promote blood circulation, improve oxygen supply parts of the body organs, but also reduce blood fat and the heart load, prevent coronary heart disease, hypertension, diabetes and other chronic diseases.

A. High School as Golden Age

High school students are in their golden age for life. School at this stage includes a substantial amount of physical education as part of the curriculum to help students maintain good health through exercise, improve physical fitness. However, the education and examination system in Taiwan had brought high school students excessive pressure, and thus distorts the virtues of the physical education curriculum. As the core to the physical education, physical fitness is the basis for all activities. Poor physical work will affect the daily life, health and learning. Ironically, physical education in the school is found to be designed as sports skill learning, rather than physical movement and training [8].

B. TTM as Theoretical Base

This study uses the transtheoretical model (TTM) that developed by Prochaska and DiClemente in 1983[9]. This theory was used to predict the behavior change of smoking cessation. The transtheoretical model is applied to all areas of health behavior, physical activity or exercise behavior in the recent years [10]. The theory integrates ten processes of behavior change methods and the five stages of change as well as decisional balance and self-efficacy to incubate a favorable behavior, [11]. Transtheoretical model is a dynamic model; emphasizing the nature of behavioral change, covering the act
behavior change, how to change the behavior and what are the factors that affect the behavior change. Stages of change model is the core of the transtheoretical model, is divided into five stages:

1. Precontemplation: Objects of study in this stage are not yet ready to think about changing behavior. Improvement may be either tangible or intangible, or the combination of both.

2. Contemplation: Objects of study in this stage are considering changing behavior. The initial stages of changing are considering that in a linear way of moving, but many people may try a variety of different change ways before while they are not reaching the goal of behavior change afterward, some people may return to the original certain stages of relapsing, such as: return to the contemplation from the action. Advance or retreat form a dynamic loop moving method and modified the linear change in helical model.

B. Methods to Change

To sum up, there are ten processes of change to promote behavior change in the transtheoretical model; methods of changing may be either tangible or intangible, or the combination of both. Stages of change model is the core of the transtheoretical model, is divided into five stages:

1. Precontemplation: Objects of study in this stage are not ready to contemplate the behavior change. Improvement may be either tangible or intangible, or the combination of both.

2. Contemplation: Objects of study in this stage are considering changing behavior. The initial stages of changing are considering that in a linear way of moving, but many people may try a variety of different change ways before while they are not reaching the goal of behavior change afterward, some people may return to the original certain stages of relapsing, such as: return to the contemplation from the action. Advance or retreat form a dynamic loop moving method and modified the linear change in helical model.
III. RESEARCH METHODS

A. Research Design

This study uses a quasi-experimental design, the experiment group and the control group took the pretest and the post-test to proceed. Experimental treatment is the experiment group receives the traditional physical education to combine with health physical fitness curriculum plans; the control group receives experimental treatment of traditional physical education curriculum. Both experimental and control groups were treated with the 8-week course.

B. Object of Study

In this study, 50 high school students were taken from a public high school in Taiwan as the research object. Students are randomly divided into two groups, experiment and control.

C. Research Tools

1. Self-efficacy for Exercise of the scale, a total of thirty questions. Mainly measured by five-point Likert-type Scale designed to assess their main measurement of the object in different contexts, but also to grasp the extent of regular exercise[12].

2. Perceive Exercise Barrier of the scale, a total of thirty questions. Mainly measured by five-point Likert-type Scale designed to assess their main measuring the movement of the individual and the environment perceived barriers, but also to grasp the extent of regular exercise.

3. Perceive Exercise Benefit of the scale, a total of thirty questions. Mainly measured by five-point Likert-type Scale designed to assess their main measuring including physiological, psychological and social interests.

4. Exercise Stage Instrument reference to adapt the exercise stage scale of Cardinal (1997)[13], and according to the concept of change stage in the transtheoretical model, to compile the five stages of exercise options of precontemplation, contemplation, preparation, action, and maintenance.

IV. RESULTS

This study the experimental group and control group basic information, including gender, age, perceived health status, served as community and school teams to participate in sports clubs, sports injuries, etc., by Chi-square test required no significant differences.

A. Exercise Stage

Table I shows pre-test, the case of regular exercise in orders to "Precontemplation" the most, accounting for 50%.

<table>
<thead>
<tr>
<th>Item</th>
<th>Group</th>
<th>Exp. Group (n=25)</th>
<th>Con. Group (n=25)</th>
<th>Total (n=50)</th>
<th>Pearson χ² (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td></td>
<td>12(48)</td>
<td>13(52)</td>
<td>25(50)</td>
<td>2.226</td>
</tr>
<tr>
<td>Contemplation</td>
<td></td>
<td>3(12)</td>
<td>2(8)</td>
<td>5(10)</td>
<td>.694</td>
</tr>
<tr>
<td>Preparation</td>
<td></td>
<td>3(12)</td>
<td>2(8)</td>
<td>5(10)</td>
<td>.694</td>
</tr>
<tr>
<td>Action</td>
<td></td>
<td>5(20)</td>
<td>3(12)</td>
<td>8(16)</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td>2(8)</td>
<td>5(20)</td>
<td>7(14)</td>
<td></td>
</tr>
</tbody>
</table>

The distribution of the various exercise stage was no significant difference between the two groups.

B. Homogeneity

The homogeneity of the social-psychological factor between two groups during pretest is computed, as shown in table II. The average raw score are 39.34, 39.86, and 33.02 with standard deviation at 5.26, 4.31, and 8.54 respectively. There was no significant difference of the social-psychological between the two groups.

<table>
<thead>
<tr>
<th>Item</th>
<th>Group</th>
<th>Exp. Group (n=25)</th>
<th>Con. Group (n=25)</th>
<th>Total (n=50)</th>
<th>T (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy</td>
<td></td>
<td>40.04(4.9)</td>
<td>38.64(5.5)</td>
<td>39.34(5.26)</td>
<td>0.945(352)</td>
</tr>
<tr>
<td>Exercise Barrier</td>
<td></td>
<td>39.96(4.1)</td>
<td>39.76(4.6)</td>
<td>39.86(4.31)</td>
<td>0.168(72)</td>
</tr>
<tr>
<td>Exercise Benefit</td>
<td></td>
<td>33.4(8.9)</td>
<td>32.64(8.3)</td>
<td>33.02(8.54)</td>
<td>0.317(577)</td>
</tr>
</tbody>
</table>

C. Behavior Change after Intervention

The differences before & after the intervention of exercise behavior change plan, as shown in the table III, the "Precontemplation" and the "Contemplation" are deemed to have no intention to exercise regularly. "Preparation" is considered to be prepared to exercise regularly. "Action" and "Maintenance" are considered to have regular exercise. Karl test shows the experimental group 8.96 (df = 2) (p = 0.011 <.05); control group 10.16 (df = 2) (p = 0.006 <.05). There was significant difference before & after the intervention of exercise behavior change plan in experimental group. But there was no significant difference before & after the intervention of exercise behavior change plan in control group.

D. The Effectiveness of the Intervention

The effectiveness of the intervention of exercise behavior change plan could be found in detail in the table IV. It shows some effect on self-efficacy after the intervention of exercise behavior change plan. There was a significant difference (F=7.62, p<0.05), adjusted mean of the experimental group was 41.17 and the control group was 38.49. There was no major effect on the perceived exercise barrier after the intervention of exercise behavior change plan. There was no significant difference (F=0.61, p>0.05), adjusted mean of the experimental group was 40.45 and the control group was 39.80. There was some effect on the perceived exercise benefit after the intervention of exercise behavior change plan. There was a significant difference (F=16.91, p<0.05), adjusted mean of the experimental group was 37.13 and the control group was 32.51.

V. DISCUSSIONS

The effect of the intervention program is obvious. The experimental group, there are 12 students in the "Precontemplation" stage, three for the “Contemplation” , another three in the “Preparation”, five in “Action” , and 2 students in the “Maintenance” stage before the intervention apply. After the intervention, six students of the same group remain in the "Precontemplation", four for “Contemplation”,
11 students in “Preparation”, and 2 for “Action” and “Maintenance” respectively. There is a clear effect before & after the intervention plan in experimental group.

There was a significant difference on self-efficacy and the perceived exercise benefit after the intervention of exercise behavior change plan, in a total of two sets of pre-test variables for the analysis of covariance. There was no significant difference on the perceived exercise barrier after the intervention of exercise behavior change plan. The results of this trial and other subjects for adult experimental results are very different. Study, whether high school students or adults can understand most of the benefits of exercise. However, the rate of high school students the practical implementation of the exercise is not high, obviously influenced by the exercise barrier. The academic and examination pressure may be the major causes of the exercise barrier in the high school.

### TABLE III
**BEFORE & AFTER THE INTERVENTION OF EXERCISE BEHAVIOR CHANGE PLAN (N=50)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Con. Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>12(48)</td>
<td>6(24)</td>
<td>PC 13(52)</td>
<td>11(44)</td>
</tr>
<tr>
<td>Contemplation</td>
<td>3(12)</td>
<td>4(16)</td>
<td>CT 2(8)</td>
<td>2(8)</td>
</tr>
<tr>
<td>Preparation</td>
<td>3(12)</td>
<td>11(44)</td>
<td>PP 2(8)</td>
<td>5(20)</td>
</tr>
<tr>
<td>Action</td>
<td>5(20)</td>
<td>2(8)</td>
<td>AC 3(12)</td>
<td>3(12)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>2(8)</td>
<td>2(8)</td>
<td>MN 5(20)</td>
<td>4(16)</td>
</tr>
</tbody>
</table>

### VI. CONCLUSIONS

High school is the golden age for life. One of the main objectives of physical education is to help students maintain good health through exercise, improve physical fitness. However, the school and examination system may be the major causes of the exercise barrier in the high school in Taiwan. Developing the good habit of regular exercise is time dependent. Long involvement with the track, can be more detailed understanding of the persistence of regular exercise of high school students.

ACKNOWLEDGMENT

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REFERENCES


