

## The Study of Correlation between Physical Fitness and Stress of Female\*

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### I. Introduction

Generally, stress causes psycho-physiological reaction, and psychological elements instigate or control physiological elements. Within our body system, the sympathetic nerve or adrenal bulbar which are terminated in target organs such as the heart and blood vessels release catecholamine, and our body reacts to stresses by hormones that cause other effects (Green, 1991).

According to Lee (1989), common body

disabilities caused by stress are headache, aepsia, heartburn, myotonic, fatigue, excitatory, palpitation, shortness of breath, chest pain, excessive diaphoresis, muscle convulsion, diarrhea, abdominal pain, vertigo, dizziness, hypo sexuality, cold limbs, cervicodynia, lumbago, menstrual irregularity, dysuria, hyperorexia, anorexia, and insomnia. These symptoms are medically distinguished, and the importance of exercise is emphasized as a way to cope with the above referenc -ed symptoms.

According to Jeon et al. (1994), solicitude, uneasiness, anxiety, worry, restlessness,

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excessive tension, and stress induce inadequate emotional condition, causing interference in normal practice of business and studying. Reasonable exercise is advised to be the most positive plan to transform this condition to its optimum condition for a healthy life.

On the other hand, Coyne (1976) emphasized adjustment in social and physical environments as another method to treat or deal with stress. Therefore, to reduce the level of stress, a variety of methods could be utilized. However, regular exercise or sports activities are asserted to be the best methods (Mills, 1982).

Key figures that influence human health are proper exercise, nutritional status, presence of smoking, adequate psycholeptic, and sociability. There is an intimate relation between physical fitness and mental fitness. As a result, decline in physical fitness could cause the decline in mental fitness, becoming a causative agent of illness. An increase of physical fitness could improve the conditions of uneasiness, anxiety, and maladjustment in the human body (Williams, 1990).

Physiological effects resulting from exercise and sports activities could be a contrast to abnormal physiological phenomenon caused by stress. For that reason, it is expected for exercising to contribute affirmatively in reducing stress. However, not many studies regarding this topic have been

conducted. Furthermore, there is a tendency to ignore the physiological variable as a causative agent of stress since stress itself is viewed as a psychological variable (Lazarus, 1966).

According to research on stress in connection with sports activities, Berger (1987), Owen (1988), and Morrigan (1987) state that participation in sports activities has a short-term buffer effect on stress. Greist (1987) found that participation in sports could have a long-term buffer effect on stress for patients who are clinically anxious or depressed. Also, Brooke (1987) has stated that aerobic exercise is an effective way to cope with stress from everyday life. According to Berger et al.'s research, jogging has a short-term buffer effect on stress, and a merit of the physical activity is the fact that it reduces anxiety. As a local study, Kim (1993) conducted a research on two groups of women, with swimming as an independent factor. Through this research, comparisons of the psychological and physiological stress level of one group, actively involved in swimming, to another group, not involved in swimming were made. Kim (1991) also publicized the experiment on effects of sports participation on the alleviation of stress. However, most of the preceding studies were focused solely on a particular sport or a certain activity, limiting the results to presence on a reduction of stress.

Improved physical fitness through regular exercise or sports activities could affect psychological and physiological stress. However, studies to prove this assumption are very scarce. Therefore, this research is conducted with adult females, identifying a correlation between physical strength with psychological and physiological stress. This research will present a coping strategy for stress and will identify it to be regular exercise.

## II. Subjects and Methods

### 1. Subjects

The subjects of this study were adult women (139), without a specific medical

illness, participating on their own initiative. Among 400 adult participants, who visited the exercise prescription laboratory in N university located in Chung Nam area, 139 adult women were randomly selected for this research. Characteristic features are as Table 1.

### 2. Testing Items

In this research, the testing items are as seen in Table 2.

### 3. Research Procedures

#### 1) Cardiopulmonary Endurance Test

The testing method is based on the exercise protocol of ACSM (American College of Sports Medicine, 1991). This testing method was modified for the general

Table 1. Physical Characteristics of Participants

Gender (n=139)	Age (yr)	Height (cm)	Weight (kg)
Females	46.80±12.82	156.33±5.62	61.15±9.41

Table 2. Testing Items

Category	Items	Note
Stress Test	Physical	15 Items
	Psychological	15 Items
Physical Fitness Test	Cardiopulmonary Endurance	VO <sub>2</sub> max
	Muscle Endurance	Situp
	Muscle Strength	Back Strength Grip Strength
	Power	Sargent Jump
	Agility	Whole Body Reaction
	Flexibility	Flexibility Test

public and by using AEROBIKE 75XL II (KOREA), submaximum exercise load was performed. First, a subject rested for five minutes after arriving at a laboratory, and then a pulse rate was measured upon resting. Revolutions per minute began at 50rpm, and using a relationship between exercise load and pulse rate, PWC 75%HR<sub>max</sub>, from 75%(75%HR<sub>max</sub>) of an estimated maximum pulse rate, VO<sub>2</sub> 75%HR<sub>max</sub> (l/min), and VO<sub>2</sub> 75%HR<sub>max</sub>(ml/kg/min) were produced. With these, maximum volume of oxygenation (VO<sub>2max</sub>, ml/kg/min) was estimated. The formula to estimate a maximum pulse rate is as follows:

$$HR_{max} = 205 - 0.75 \times \text{age.}$$

## 2) Stress Scale

In this research, to measure the stress level, physical(Cronbach's  $\alpha=0.88$ ) and psychological stress scales(Cronbach's  $\alpha=0.87$ ) were applied(Lee, 2001). In order to measure the physical stress, items related to somatization, which can be conceived as physical symptoms caused by stress, were used. The items were extracted from Derogatis's Symptom Checklist-90-Revision. It includes 15 items and uses a 4-point Likert type response format. The scale to measure the psychological stress includes 15 items and uses a 4-point Likert type response format (0 to 3 points) (Lee, 1989)

## 4. Data Analysis

In this experiment, SPSSWIN 10.1 (VER) was used to produce the average and the standard deviation for each and every item. In addition, the correlation analysis was used to analyze the relationship between physical fitness, and physiological and psychological stress.

## III. Results

The purpose of this study was to investigate the correlation between physical fitness, and physiological and psychological stress in adult women. The results are as follows:

### 1. Relationship between Physical Fitness and Physical Stress

The correlation between the measurement of physical strength's primary factors (cardiopulmonary endurance, muscle endurance, muscle strength, agility, power, and flexibility) and the physical stress are shown in Tables 3 and 4.

The results showed a negative correlation between physical stress and physical fitness factors, such as cardiopulmonary endurance, muscle strength, and power. The statistically significant relationship was found in cardiopulmonary endurance ( $r=-.296, p<0.1$ ), muscle strength ( $r=-.192, r=-.251, p<.05$ ,

Table 3. Descriptive Statistics for Physical Fitness

Variables		M ± S.D
Cardiopulmonary Endurance	VO <sub>2</sub> max	28.02±9.38ml/kg/min
Muscle Endurance	Situp	13.73±6.31beats/min
Muscle Strength	Grip strength	30.38±10.58kg
	Back strength	69.87±35.34kg
Power	Sargent Jump	28.22±18.37cm
Agility	Whole Body Reaction	0.34±0.13m/sec
Flexibility	Flexibility Test	11.41±8.11cm

Table 4. Relationship between Physical Fitness and Physical Stress .

Variables		Physical Stress
Cardiopulmonary Endurance	VO <sub>2</sub> max	-.296**
Muscle Endurance	Situp	-.148
Muscle Strength	Grip Strength	-.192*
	Back Strength	-.251**
Power	Sargent Jump	-.256**
Agility	Whole Body Reaction	.124
Flexibility	Flexibility Test	-.013

\* p<.05 \*\* p<.01

p<.01), and power ( $r=-.256$ ,  $p<.01$ ). On the other hand, there was no statistically significant relationship between physical stress and other physical fitness factors, such as muscle endurance, agility and flexibility. In fact, as capacity of primary factors in physical fitness (*cardiopulmonary endurance, muscle strength, and power*) enlarges, physical stress level becomes minimal.

## 2. Relationship between Physical Fitness and Psychological Stress

The results indicating the relationship

between physical fitness and psychological stress are shown in Table 5.

The results indicated a negative correlation between psychological stress and physical fitness factor such as cardiopulmonary endurance. The statistically significant relationship was found in cardiopulmonary endurance factor ( $r=-.232$ ,  $p<.05$ ). On the other hand, there was no statistically significant relationship between psychological stress and other physical fitness factors, such as muscle endurance, muscle strength, power, agility and flexibility. Based on the results of this research, it can be

Table 5. Relationship between Physical Fitness and Psychological Stress

Variables		Psychological Stress
Cardiopulmonary Endurance	VO <sub>2</sub> max	-.232*
Muscle Endurance	Situp	-.052
Muscle Strength	Grip Strength	-.010
	Back Strength	-.012
Power	Sergeant Jump	-.046
Agility	Whole Body Reaction	.010
Flexibility	Flexibility Test	-.012

\* p &lt; .05

suggested that as physical fitness factors such as cardiopulmonary endurance increases, psychological stress decreases.

#### IV. Discussion

This study was conducted with 139 adult women to examine the correlation between physical fitness, and physiological and psychological stress levels for the purpose of promoting the necessity of regular exercise in improving one's health as well as to actively suggest preferable ways of coping with stress.

According to Greist (1987), exercise not only reduces anxiety and depression but it also improves the threshold value of stress. This prepares against stress symptoms, creating a long-term buffer effect. Also, Harburg (1979) has stated that it is better to express anxiety and stress outwardly than to keep it inwardly to oneself. This is a positive attitude and method in dealing with stress. One of the ways

to outwardly express is through exercise.

Roskies et al. (1986) stated that participation in different types of sports such as jogging and weight training has a significant effect on stress reduction. According to Greist (1987), exercise has a short-term buffer effect on stress, as well as a long-term buffer effect on stress for patients who are clinically anxious or depressed.

According to Morgan et al. (1987), jogging is significant for a buffer effect on stress as well as for treatment. Also, swimming and cycling are effective in relieving dysfunctional stress.

Long (1984) conducted a study with adult women and compared the level of psychological tension between the group of females who jogged for 10 months and the group of adult women who did not participate in jogging. The group who participated in jogging for 10 months showed decreases in the level of psychological tension. This indicates that the types of physical activities,

which improve cardiopulmonary, generally decrease physical and psychological stress. Many previous studies insisted that there was significant relationship between the participation in physical activities and stress. People who participated in physical activities showed lower stress level than people who did not participate (Kim, 1992; Kwan, 1993; Kim, 1993).

According to Williams (1990), the key elements that have positive impacts on human health are proper exercise, nutritional status, adequate psycholeptic, and sociability. There is a significant relationship between physical fitness and mental fitness. Therefore, a decline in physical fitness could cause the decline in mental fitness, becoming a causative agent of illness. An increase of physical fitness could improve uneasiness, anxiety, and maladjustment in human body.

Improving physical strength through regular exercise decreases physical and psychological stress. In Ryu's research (1995), among the physical fitness factors, muscle strength and muscle endurance showed a positive correlation with stress, whereas, agility, balance, and flexibility showed a negative correlation with stress. In this research, physical fitness factors such as cardiopulmonary endurance, muscle strength, and power were found to be significantly correlated with physical stress. Most physical fitness factors showed a negative correlation

with physical stress. This result indicates that as the capacity of cardiopulmonary endurance, muscle strength, and power enlarges, physical stress becomes minimal. Also, among physical fitness factors, cardiopulmonary endurance was significantly correlated with psychological stress. Most physical fitness factors showed a negative correlation with psychological stress, but only cardiopulmonary endurance was statistically significant. The result means that as the capacity of physical fitness factors enlarges, the psychological stress becomes minimal. Based on the results of this research, it can be concluded that there is a relationship between physical fitness and stress. The most important aspect that should be discussed is that improvement in physical strength, caused by a regular exercise, was effective in reducing stress.

## V. Conclusion

This study was conducted with adult women (139) as subjects, to examine the correlation between physical fitness, and physiological and psychological stress level. This study was conducted also to suggest the necessity of regular exercise in improving physical fitness. The findings of this study were as follows:

1. Among the physical fitness factors, cardiopulmon -ary endurance, along with muscle strength and power had significant relations with physical stress ( $p<.01$ ).
2. Among the physical fitness factors, cardiopulmon -ary endurance showed a significant relation with psychological stress ( $p<.05$ ).

According to the results of this study, as capacity of primary factors in physical fitness enlarges, stress becomes minimal. It is considered that improvement in physical fitness, caused by a regular exercise, was effective in reducing stress.

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## ABSTRACT

The purpose of this study was to examine the relationship between physical fitness, and physical and psychological stress of females. The subjects of this study were 139 adult women, without a specific medical illness. The stress level was evaluated by Derogetis's checklist-90-Revision symptom of physical and psychological stress (Cronbach's  $\alpha=0.88, 0.87$ ).

The physical fitness factors in this study were *cardiopulmonary endurance, muscle endurance, muscle strength, power, agility, and flexibility*. To analyze the data to examine the relationship between the physical and psychological stress, and physical fitness, correlation analysis was applied.

The findings of this study were as follows. First, among the physical fitness factors, cardiopulmonary endurance, along with muscle strength and power had significant relations with physical stress ( $p<.01$ ). Second, among the physical fitness factors, cardiopulmonary endurance showed a significant relation with psychological stress ( $p<.05$ ).

**Key Words:** Physical Fitness, Physical Stress, Psychological Stress