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# THE EFFECT OF PHYSICAL EXERCISE ON DIABETIC PEOPLE

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**ABSTRACT: Along with the development of society, people's lives are speeding up with the increasing pressures from society, work and family, which makes them have no spare time for exercising, and have no rule for their lives and diet. Lack of exercise is one of the most important factors that contribute to the rapid growth in diabetes incidence. If not treated effectively in time, diabetes will eventually lead to a number of serious, sometimes life-threatening, complications, such as eye disease, kidney disease, hemiplegia, lower limb gangrene, angiocardiopathy and skin disease. The trial of diabetics subject to walking quick-and-slow were conducted, it is found that appropriate physical activity can improve the physical function and inner organs functions of the diabetics with enhanced physical quality and adaptability, moreover, it can effectively lower the blood pressure and blood glucose of the patients with diabetes will be controlled and increases the fitness.**

**KEYWORDS: Physical Exercise, Diabetes, Walking Quick-And Slow, Blood Glucose**

## I. INTRODUCTION

Diabetes is a common chronic disease with endocrine metabolic system. The combination of physical exercise, medication and dietary is generally the main treatment for diabetes at home and abroad since there is no radical treatment for it. At early 20th century, the American Diabetes Association (ADA), based on a investigation on diabetics and physical activity, proposed that physical activity is a basic method for the combinatorial treatment and all people with diabetes should participate in various kinds of physical activities, and physical exercise in daily life should be recommended. Foreign studies show that older adults with type 2 diabetes taking aerobic exercise three times a week for three months can improve a number of risk factors, including

hypertension and hypercholesterolemia, which lead to arterial stiffness. Based on the trials of patients with diabetes experiencing strength training for two months, some domestic authorities have found significant decreases in blood glucose, lipid, insulin and glycated hemoglobin, and more sensitivity of body to insulin. Currently, domestic treatments for diabetes mainly count on medication and dietary, and little attention is paid to physical exercise since lack of physical activity is a contributing factor for diabetes incidence. The effect of physical exercise on the blood pressure and blood glucose in diabetic patient is studied through the trials of patients with diabetes engaged in walking quick-and-slow.

WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health. Popular ways to be active include walking, cycling, wheeling, sports, active recreation and play, and can be done at any level of skill and for enjoyment by everybody. Regular physical activity is proven to help prevent and manage noncommunicable diseases such as heart disease, stroke, diabetes and several cancers. It also helps prevent hypertension, maintain healthy body weight and can improve mental health, quality of life and well-being.

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Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests. These definitions are offered as an interpretational framework for comparing studies that relate physical activity, exercise, and physical fitness to health.

The epidemiologic study of any concept or event requires that the item under investigation be defined and measured. The common and professional uses of the terms "physical activity," "exercise," and "physical fitness" reveal a need for clarification. This paper, therefore, defines physical activity, exercise, and physical fitness, with the hope that each definition will provide a framework in which studies can be interpreted and compared. Ideally, standardized terminology will promote greater understanding of the relation between physical activity, exercise, physical fitness, and health.

Several elements of physical activity have been identified (see box page 127). Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. The amount of energy required to accomplish an activity can be measured in kilojoules (kJ) or kilocalories (kcal); 4.184 kJ is essentially equivalent to 1 kcal. Technically, the kJ is preferred because it is a measure of energy expenditure; however, historically the kcal, a measure of heat, has 126 Public Health Reports been employed more often. We have chosen to follow historical precedent. Expressed as a rate (kcal per unit time), the amount of energy expended by each person is a continuous variable, ranging from low to high. The total amount of caloric expenditure associated with physical activity is determined by the amount of muscle mass producing bodily movements and the intensity, duration, and frequency of muscular contractions.

Everyone performs physical activity in order to sustain life; however, the amount is largely subject to personal choice and may vary considerably from person to person as well as for a given person over time. The most common units of time used to refer to kcals spent in physical activity are the week and the day. Physical activity during monthly, seasonal, or yearly periods may also be examined to establish the stability of physical activity for longer time periods.

## II. LITERATURE SURVEY

H. Haitao, et.al [7] adopts "PARS-3 Physical Activity Grade Measuring Table", and "Physical Self-Confidence Measuring Table" to test the physical exercise situation and physical self-confidence of 327 university students. Results show that: physical exercise has positive influence on physical health and physical self-confidence, in the influence of physical exercise on physical self-confidence, the influence of exercise frequency is relatively big, in the influence of physical health on physical self-confidence, the influence of endurance items and standing long jump is relatively big, in the influence of physical exercise on physical health, the influence of exercise frequency and time of exercise is relatively big.

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Y. Wang and J. Liu, et.al [8] School-based physical education in China is supposed to provide students opportunities to do moderate-to-vigorous physical activity. Providing teachers with real-time feedback of students' physical activity may increase the effectiveness of PE class. Therefore, the purpose of this study was to develop a smart wristband that can monitor students' exercise quantity and exercise intensity and evaluate the exercise intensity and safety in a PE lesson. Data was collected from 2 representative Chinese high schools. Students (101 males and 87 females) wore these self-developed smart wristbands during their physical education classes. Results were obtained by measuring heart rate and physical activity in real-time simultaneously. The research determined that smart wristbands could be adapted to monitoring exercise intensity and safety during PE lessons. It could also apply to measuring physical activity, exercise load, and heart rate of students in PE classes, but also evaluate the effectiveness of PE class and control exercise intensity. Moreover, the wristband can warn students whose heart rate is out of safe range to ensure the safety during exercise. Future studies should testify to the measuring accuracy of the smart wristband.

H. Yang and H. Chen, et.al [9] study aims to observe the effects of aerobic exercise and resistance exercise on physique and chronic inflammation of obese adolescents. 540 obese middle school adolescents from Rizhao of Shandong province are randomly divided into AE group, ST group and NC group with each including180 subjects. On the basis of diet control, AE group is subjected to aerobic exercise, and ST group is subjected to resistance exercise, and NC group has no exercise intervention. The weight, waistline, BMI, FAT, TNFα, IL 6 and CRP expression level are measured respectively before the exercise intervention, eight weeks later during the exercise intervention and four weeks later after the exercise intervention. Results Two kinds of exercise interventions can improve physique and inflammatory state of obese adolescents, but the long-term effect of resistance exercise is better than aerobic exercise, and the better effects are observed in males than in females.

L. -p. Zhong and C. -w. Fan., et.al [10] study has proved that it was a potential factor to reflect the psychological efficacy of Physical Exercises (PE). This study examined the practical efficacy of PE and specific factors which affected the BSE among professional women. In our study PSPP and BES was employed to test the BSE of 1000 professional women served as subject. Oneway ANOVA Analysis indicated that PE frequency, time and intensity are all important contributing factors to the abstract and concrete BSE of professional women. Spearman's Correlation Coefficient Analysis also showed that the above three factors are positively relative to the abstract and concrete BSE. Among them, frequency factor has the best correlations. Conclusions were given as well as some suggestions: PE frequency contributes the most to the professional women's BSE; exercising 30 min or more each time with medium or above intensity helps the professional women effectively improve their BSE.

Y. Takhashi *et al*, [11] plays an important role to help people to regain the social life from disease and physical handicap. However, they can obtain their skills only from their practical experiences. The physical therapist trainee can enrich is experience only from the clinical practical training and this opportunity is limited. Therefore, we have been developing the upper limb patient simulator, which reproduce the stiffness of elbow joint to allow trainees to increase the opportunities to obtain the practical exercise of the physical therapy. The system

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reproduces the diseases by generating stiffness of the elbow joint, when the trainee tries to flex the elbow joint of the patient. We developed a mechanical part and a control system to realize the patient conditions and the full system has been evaluated by veteran physical therapists.

J. Kim and J. Kim., et.al [12] suggests a therapeutic device for hemiparesis that combines robot-assisted rehabilitation and mirror therapy. The robot, which consists of a motor, a position sensor, and a torque sensor, is provided not only to the paralyzed wrist, but also to the unaffected wrist to induce a symmetric movement between the joints. As a user rotates his healthy wrist to the direction of either flexion or extension, the motor on the damaged side rotates and reflects the motion of the normal side to the symmetric angular position. To verify performance of the device, five stroke patients joined a clinical experiment to practice a 10-minute mirroring exercise. Subjects on Brunnstrom stage 3 had shown relatively high repulsive torques due to severe spasticity toward their neutral wrist positions with a maximum magnitude of 0.300kgfm, which was reduced to 0.161kgfm after the exercise. Subjects on stage 5 practiced active bilateral exercises using both wrists with a small repulsive torque of 0.052kgfm only at the extreme extensional angle. The range of motion of affected wrist increased as a result of decrease in spasticity. The therapeutic device not only guided a voluntary exercise to loose spasticity and increase ROM of affected wrist, but also helped distinguish patients with different Brunnstrom stages according to the size of repulsive torque and phase difference between the torque and the wrist position.

L. Pollonini, R. Re, R. J. Simpson and C. C. Dacso, et.al [13] Current methods for monitoring exercise exertion rely upon heart rate monitors, which represent a crude and lagging indicator of conditioning. The rationale for the present study is that both systemic and local metabolic mechanisms are responsible for physical performance, and therefore they should be simultaneously quantified to achieve an objective assessment of human conditioning. We propose a compact, wearable Near-Infrared Spectroscopy (NIRS) device integrated with Electro-Cardio-Graphy (ECG) and Photo-Plethy-Smography (PPG) to simultaneously assess the cardiovascular and local response to exercise. The system was tested on subjects performing a graded maximal exercise by comparing our readings with metabolic variables measured with respiratory gas analysis. We found strong correlations between local deoxyhemoglobin concentration [HHb], heart rate and oxygen uptake, as well as between oxyhemoglobin concentration [$HbO_2$] and stroke volume. This study shows that combined NIRS, ECG and PPG measurements yield useful information to understand the interplay between systemic and local muscular responses to exercise.

A. W. K. Lam, A. HajYasien and D. Kulic, et.al [14] proposes a system providing continuous visual feedback and guidance to patients to improve quality of motion performance and adherence to instructions. The system consists of body-worn inertial measurement units which continuously measure the patient's pose. The measured pose is overlaid with the instructed motion on a visual display shown to the user during exercise performance. Two user studies were conducted with healthy participants to evaluate the usability of the visual guidance tool. Motion data was collected by the inertial measurement sensors and used to evaluate quality of motion, comparing user performance with and without visual feedback and with or without exercise guidance. The quantitative and qualitative results of the studies

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confirm that performing the exercises with the visual guidance tool promotes more consistent exercise performance and proper technique.

N. Constant *et al*, [15] presents the development and testing of WalkCoach app, a smart service system integrating a consumer-grade smartwatch (Polar M600) in the monitoring of supervised walking exercises. By monitoring a participant's baseline activity and improvements with time, it will be possible to provide personalized exercise prescriptions that can be easily modified or personalized to adjust and optimize for improved walking ability as the therapy progresses. This paper demonstrates the accuracy of the smartwatch-based WalkCoach app in a pilot cohort study of 10 healthy older adults (>65 yrs) who were recruited to perform a 400m overground walking task. Results are promising and show that the consumer-grade smartwatch accurately measures steps (step count = 637) compared to a video/manual step count (650 steps; Pearson's r = 0.96, P <;0.001). In the future, WalkCoach will be improved to produce granular analytics on a patient's compliance and performance to the supervised walking exercises.

## III. METHODOLOGY

Through the files of diabetic patients archived in the Affiliated Hospital, volunteers with diabetes were recruited and then studied by their and their families' agreements with signed approvals and documents of taking on themselves the responsibility for any risk. Through a test, a hundred patients were randomly chosen as subject. The subjects were divided into two groups with each of fifty at random, one is the trial group and the other is the control group. The subjects were excluded if they had exercise limiting or some other severe diseases such as myocardial ischemia, severe hypertension, proliferative retinopathy, positive urine ketone or kidney failure. Diabetes was diagnosed in accordance with the World Health Organization (WHO) (1999) criteria. Physical exercise training was held in the morning (thirty minutes after breakfast) every second day from 7:00 to 7:40, through the middle of April to the middle October. After the trial group and control group were chosen, no intervention was made to the medicines and daily lives of the control group who just went with their daily routines. Physical exercise intervention of walking quick-and-slow was done to the trial group in the morning every second day. Walking quick-and-slow is an aerobic activity with many muscle groups involved and it is easy to launch since it has few limitations on site.

Given the special physical condition of the diabetics, the subjects with diabetes were required to carefully take care of the situations of their bodies. At the beginning of exercise, all the subjects were required to evaluate their bodies' conditions and diabetes situations and to examine their blood glucose levels to confirm their metabolisms. If a subject has a high level or low level of blood glucose, exercise training should be forbidden. And the subjects were also required to keep watching out their heart rates and breaths during exercise. In exercise training, a sharp increase in heartbeat, paleness, dizziness, unconsciousness, blurred vision and sweating heavily are symbols that hypoglycemia may occur ,in this case, the subjects should immediately stop exercising and eat some food with high content of sugar. At the end of exercise training, immediately still rest was not allowed and the subjects were required to do some relaxing activities like shaking legs or swinging arms followed by some gymnastics of low intensity. After exercise training, it is essential to supplement some water and sugar to keep away delayed hypoglycemia regardless of its absence or not.

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## IV. RESULT ANALYSIS

The performance analysis of impact of physical exercises on diabetics people.

**Table.1 Performance Analysis**

| Parameters | Control Group | Physical Group |
|---|---|---|
| Blood Pressure (mmHg) | 149 | 132 |
| Blood Glucose (mmol/L) | 254 | 176 |
| Fitness | 86 | 91 |

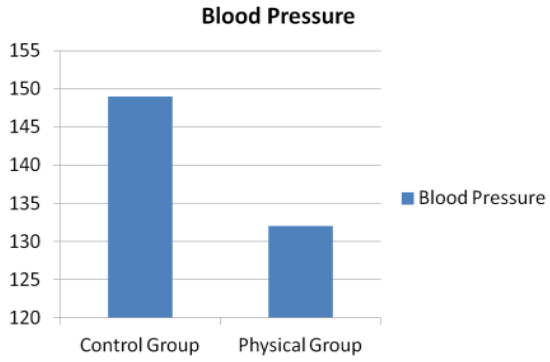


**Fig.1: Blood Pressure Comparison Graph**

In Fig.1 blood pressure comparison graph is observed between control group and physical group.

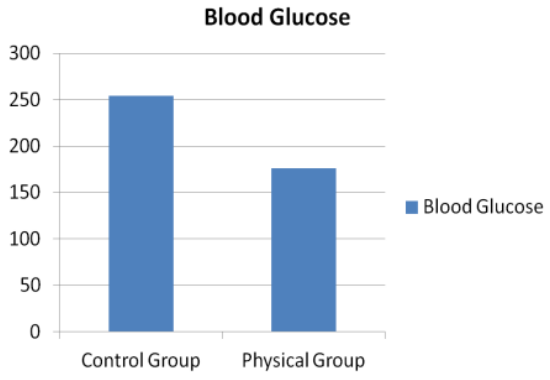


**Fig.2: Blood Glucose Comparison Graph**

Blood glucose comparison graph is observed in Fig.2 between control group and physical group.

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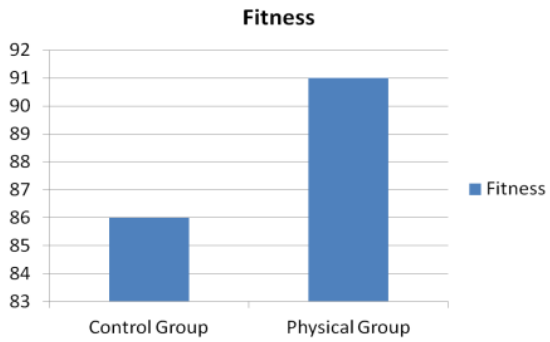


**Fig.3: Fitness Comparison Graph**

In Fig.3 fitness comparison graph is observed between control group and physical group.

## V.CONCLUSION

In this section effect of physical exercise on diabetic people is concluded. The development of society, people's lives are speeding up with the increasing pressures from society, work and family, which makes them have no spare time for exercising, and have no rule for their lives and diet. The trial of diabetics subject to walking quick-and-slow were conducted, it is found that appropriate physical activity can improve the physical function and inner organs functions of the diabetics with enhanced physical quality and adaptability, moreover, it can effectively lower the blood pressure and blood glucose of the patients with diabetes are controlled and increases the fitness by physical exercise.

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