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## The influence of tai chi gymnastics and diabetic gymnastics on decreasing blood sugar levels in the elderly type 2 diabetes mellitus

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### Abstract

Human aging is linked to a number of degenerative changes, one of which is a decline in metabolic function, specifically a loss in insulin action, which raises blood sugar levels by accumulating glucose in the blood. The opinions, beliefs, or thoughts expressed in this research pertain to the impact of Tai Chi gymnastics and exercises for Diabetes Mellitus on lowering blood sugar levels in older adults with type 2 Diabetes Mellitus. This kind of research is descriptive, and the research methodology is qualitative. With (Research from Libraries). According to the study's findings, exercise significantly lowers blood sugar levels in older adults with type 2 diabetes mellitus.

**Keywords:** Blood sugar levels, tai chi exercises, diabetes mellitus exercises, ergonomic exercises, type 2 diabetes mellitus

### Introduction

Aging is a natural process that all living organisms must go through. The body will deteriorate physically and psychologically as one ages. Degenerative changes in the skin, bones, heart, blood vessels, lungs, neurons, metabolism, and other body parts are linked to aging in humans. Diabetes Mellitus is one of the degenerative illnesses that should be monitored at this time <sup>[1]</sup>. The onset of diseases like Diabetes Mellitus and reduced physical capacity make the elderly prone to stress. Because it likely to get worse in the future, diabetes mellitus is a major issue for people all over the world. In Indonesia, the prevalence of disease has changed throughout time, moving from infectious diseases and starvation to degenerative diseases like diabetes mellitus (Prawitasari, 2019) <sup>[2]</sup>. Education, medical dietary therapy, physical activity, and pharmaceutical therapy are the four cornerstones of diabetes management (Utomo *et al.*, 2011) <sup>[2]</sup>.

According to WHO projections, there will be 366 million individuals with diabetes worldwide by 2030, up from 171 million in 2000 (R.A. Fadilah, 2013) <sup>[3]</sup>. The World Health Organization (WHO) projects that by 2030, there will be around 21.3 million more diabetics in Indonesia than there were in 2000 (Lede *et al.*, 2018) <sup>[7]</sup>. According to a report from the International Diabetes Federation (IDF), Indonesia is now ranked fifth in the world among nations with the highest frequency of older individuals with diabetes mellitus, up from seventh place previously.

A group of metabolic disease symptoms known as diabetes mellitus are defined by blood sugar levels that are higher than normal, which impact how foods such as fat, protein, and carbohydrates are metabolized. The etiology of diabetes mellitus is complex <sup>[1]</sup> A class of metabolic illnesses known as diabetes mellitus is typified by hyperglycemia, which is brought on by deficiencies in either the secretion of insulin, its activity, or both (Ermawati, 2012) <sup>[4]</sup>. Diabetes Mellitus is characterized as a diverse metabolic condition that is both genetically and clinically characterized by a lack of glucose tolerance (Rusdi, 2020) <sup>[6]</sup>. Diabetes Mellitus is a metabolic condition caused by insufficient or resistant insulin, which impairs the body's ability to metabolize glucose, fat, and protein (Setyorogo & Trisnawati, 2013) <sup>[9]</sup>. State that insufficient insulin production by the body results in diabetes mellitus, which is characterized by abnormal blood sugar levels.8 Diabetes mellitus is characterized by long-term hyperglycemia, a variety of metabolic conditions affecting the kidneys, eyes, and blood vessels, as well as lesions visible under an electron microscope on the basement membrane.

A person with diabetes mellitus has a variety of symptoms brought on by an increase in blood sugar levels brought on by a relative and absolute shortage of insulin (Rusdi, 2020) [16]. The most complicated condition is diabetes, which can lead to other illnesses. This has to do with blood vessel, nerve, and other internal structure damage brought on by consistently elevated blood sugar levels. Diabetics may encounter a range of long-term. Diabetes mellitus is commonly classified into two types: Type 1 diabetes mellitus is characterized by an absolute lack of endogenous insulin as a result of autoimmune destruction of the pancreatic beta cells in the islets of Langerhans; type 2 diabetes mellitus is characterized by peripheral insulin resistance and impaired insulin action. Secretion of insulin. According to data from the World Health Organization, type 2 diabetes mellitus affects 90-95% of people worldwide, making it the kind with the largest prevalence of the disease. 1. Type 2 diabetes is more frequent than type 1 diabetes and is thought to affect up to 90% of people, according to Salindeho *et al.* (2016) [11].

According to Suwanti *et al.* (2019) [20], blood sugar levels are used to diagnose diabetes mellitus. Blood sugar levels are defined as the amount of glucose present in blood plasma. An enzymatic investigation using venous plasma blood sample is the suggested procedure to make the diagnosis. In the interim, a capillary blood sugar check with a glucometer can be used to track the effects of medication. According to type 2 Diabetes Mellitus is primarily caused by a relative lack of the insulin hormone and typically affects adults, while it can also occasionally affect children and adolescents. Usually happens gradually, without any symptoms, and gets worse over time. Insulin need, also known as type 2 diabetes mellitus, is a condition marked by elevated blood glucose levels brought on by the body's inability to respond to insulin (Bulu *et al.*, 2019) [2].

Given the worldwide prevalence of diabetes brought on by rising wealth, it is reasonable to assume that Indonesia will experience a sharp rise in type 2 Diabetes Mellitus during the next ten to twenty years due to a number of variables. (1) genetic variables that are passed down via families; (2) lifestyle changes from traditional to western, including overeating, laziness, and lack of exercise; and (3) demographic factors related to population growth, urbanization, and the proportion of people over 40 years of age (Richardo *et al.*, 2021) [15]. Not only does Diabetes Mellitus cause mortality, but it also has a lifelong negative impact, necessitating expensive medical treatment for those who have the condition. Smaltzer and (Sinaga, 2016) [19] stated that the high number of patients may also be a contributing factor to the prevalence of diabetes because of changes in people's lifestyles brought about by ignorance and low education regarding diet, physical activity, and health maintenance. Because mellitus in the aged is complex and impacted by both intrinsic and extrinsic causes, it tends to grow.

For diabetics, regular aerobic exercise can reduce cardiovascular risk and increase insulin sensitivity. Exercise and physical activity habits have an impact on blood sugar levels. Sitting comfortably and using the internet are two activities that should be avoided by elderly individuals with diabetes mellitus. Any skeletal muscle-driven movement that uses energy is considered physical exercise. According to Pangestika *et al.* (2022) [11], inactivity is a known risk factor for chronic diseases and is thought to be a major cause of death worldwide. Exercise or physical activity has a direct impact on how quickly muscles recover from bloodstream glucose (i.e., how much muscle takes up glucose). When exercising, the muscles consume the glucose that is stored in them; if the amount of glucose is decreased, the muscles take up the extra glucose by pumping glucose from the blood. This will lower blood glucose levels and improve blood glucose regulation.

According to Hariyanto's research, only two individuals with Diabetes Mellitus who engaged in moderate physical exercise had normal blood glucose levels [18]. Studies conducted in Denpasar indicate a strong correlation between blood sugar levels and physical exercise. When growing muscle, glucose is more easily absorbed than fat. Physical activity can be used to build muscle. Loud glucose levels and physical activity are inversely correlated, meaning that the more the physical activity, the lower the blood glucose level. Nonetheless, Haryanto's research revealed no meaningful connection between blood sugar levels and physical exercise. In keeping with Martha's findings, which showed that the incidence of diabetes

mellitus and inactivity did not significantly correlate. Exercise is important for controlling blood glucose levels in people with type 2 diabetes mellitus. Since muscle contractions have characteristics similar to those of insulin, the primary cause of type 2 Diabetes Mellitus is insulin resistance, or the body's inability to respond to insulin, which causes blood glucose levels to rise when muscles contract. Insulin resistance therefore declines with physical activity, such as playing sports. Sports-related physical activity can help people with type 2 Diabetes Mellitus control their blood sugar levels and lose weight (Rahmadiya & Dahlia, 2022) [14].

People with Diabetes Mellitus can avoid complications by managing their blood sugar, testing their blood sugar frequently, taking hypoglycemic medications, following a low-calorie diet, and engaging in mild physical activity. It is advised to control diabetes, particularly for Diabetes, with a healthy diet, regular exercise, and weight loss (Komalasari & Pristianto, 2022) [6]. Aerobic exercises including walking, running, cycling at a leisurely pace, gymnastics, and swimming are suggested as ways to reduce blood sugar levels. Exercise regimens should be modified based on an individual's age and level of physical fitness (Suwanti *et al.*, 2019) [20]. Consequently, it is imperative to implement a type 2 Diabetes Mellitus control regimen. One of these involves physical activity that older people with diabetes mellitus can engage in, such as gymnastics and Tai Chi, both of which are thought to lower blood sugar levels. Exercise and physical activity should primarily focus on F.I.T.T. (frequency, intensities, time, type) in older adults with type 2 diabetes mellitus. It is advised to engage in moderate-intensity exercise (60-70% of maximum heart rate) for 30-60 minutes, three times a week, and no more than two days in a row without engaging in gymnastics.

Tai Chi gymnastics Aripriana (2016) [1] is a type of gymnastics designed specifically for senior citizens. Tai Chi is a low- to moderate-intensity exercise that can improve cardiorespiratory function, aerobic capacity, flexibility, body balance, and quality of life. It can also help with glucose control, which can lead to improvements in the microcirculation of the extremities. Diabetes mellitus exercise, on the other hand, can increase physical fitness through low-impact aerobics with rhythmic, enjoyable, and non-boring motions. Exercise for those with diabetes mellitus can enhance blood flow, regulate blood sugar levels, lessen insulin resistance, and boost muscle insulin sensitivity (Lubis & Kanzasabilla, 2021) [8].

The goal of this essay is to serve as a foundation for ideas about how Tai Chi and other diabetes-related exercises differ in their ability to lower blood sugar levels in older adults with type 2 diabetes in a more general sense, the accuracy of the data you wish to examine, and how to adapt the gymnastics model for older adults with type 2 diabetes.

## Research methods

This sort of research is descriptive, employs a qualitative approach, and frequently involves analysis. For the purpose of reviewing literature studies, literature research is the data collection approach. The process of gathering information from libraries, reading and taking notes, and analyzing research materials are all included in literature studies. Tai Chi and diabetes mellitus exercises are the independent variables in this study. An independent variable is one that influences or causes a dependent variable. The study's dependent variable, the drop in blood sugar levels in older adults with Type 2 Diabetes Mellitus, is the one that is affected by the independent variable. The purpose of this study is to describe the variations in the effects of Tai Chi and Diabetes Mellitus activities on lowering blood sugar levels in older adults with type 2 diabetes.

This research specifically aims to describe the differences between Tai Chi and Diabetes Mellitus exercises on lowering blood sugar levels in elderly people with type 2 Diabetes Mellitus, as well as the effects of combining Tai Chi and Diabetes Mellitus exercises with ergonomic exercise on lowering blood sugar levels in the elderly with type 2 Diabetes Mellitus. This will be accomplished by conducting a literature search (library research).

The writers searched books, papers, journals, and articles that were connected to the texts covered in this study in order to compile this research.

## Results and Discussion

Blood sugar levels can rise as a result of inactivity. Physical activity and exercise can directly lower body fat levels, control blood glucose levels, improve insulin sensitivity, and reduce stress in older adults with diabetes mellitus. This is because these activities increase the amount of blood glucose used by active muscles (Nuraisyah *et al.*, 2021) <sup>[10]</sup>. High blood sugar levels and diabetes mellitus in the elderly are caused by physiological changes associated with aging, dietary habits, and infrequent participation in sports (Derek *et al.*, 2017) <sup>[3]</sup>. Change that affects homeostasis begins at the cellular level and progresses to the tissue level and organ level. A person is more likely to acquire diabetes mellitus beyond the age of 40 due to an increase in glucose intolerance that starts at that age. The ability of pancreatic beta cells to make insulin is diminished with age (Nugroho *et al.*, 2013) <sup>[9]</sup>.

(Richardo *et al.*, 2021) <sup>[15]</sup>. A person with Diabetes Mellitus is most likely to be between the ages of 45 and 65. This age range is linked to a number of degenerative diseases, including Diabetes Mellitus. As one ages, their body's ability to tolerate glucose decreases. This disease is brought on by alterations in glycoprotein receptors, which lessen the ability of insulin to transport glucose into muscle, liver, and adipose tissue cells. This leads to an inadequate response to insulin. Although the sensitivity of insulin-related receptors declines with age, insulin secretion does not.

According to study, hyperglycemia is more strongly associated with age between 50 and 70 years old (Rahmadiya & Dahlia, 2022) <sup>[14]</sup> elevated blood glucose in older people resulting from insulin resistance brought on by dietary modifications, altered body composition, decreased exercise, and impaired neurohormonal function. According to Kirkman *et al.*, sarcopenia, decreased physical activity, and the buildup of adipose tissue are the main causes of age-related insulin resistance. Sarcopenia, or loss of muscle mass, is a common condition among the elderly. Muscle weakness and decreased physical activity come from the size and strength of skeletal muscle, the primary tissue involved in glucose metabolism, declining. These factors result in decreased energy expenditure and fat tissue buildup, which exacerbates insulin resistance.

Men and women have an equal risk of developing diabetes, according to the incidence of the disease among the elderly. Women simply have a higher risk of developing diabetes due to risk factors because they are physically more likely to have a higher body mass index. This also has to do with how progesterone and estrogen influence how the body's cells react to insulin when one reaches the elderly category, it is important to understand that reduced glucose tolerance increases with age and is strongly correlated with elevated blood sugar levels and the length of time one has diabetes mellitus. Diabetes Mellitus is a lifelong condition that limits a person to maintaining normal blood sugar levels.

Because regular exercise causes the insulin response to become sensitive and lower blood sugar, tai chi gymnastics is a kind of art and exercise for mental and physical health and balance. Tai Chi is a kind of non-pharmacological treatment that can be used to reduce blood sugar levels by relaxing and increasing physical exercise. Regular relaxation can be used to alleviate stress since, in theory, it can calm the brain and repair the body. Through hypothalamic relaxation (Arrais & Dib, 2006) <sup>[2]</sup> It will cause arteriolar dilatation and control and lessen sympathetic nervous system activity. Exercises for Diabetes Mellitus and Tai Chi are both useful in reducing blood sugar levels. Both Tai Chi and Diabetes Mellitus exercise can lower blood sugar levels; however, based on several research findings published in each journal, Diabetes Mellitus exercise is more effective at doing so than Tai Chi exercise.

### Modification of the exercise model for lowering blood sugar in the elderly with type 2 diabetes mellitus

Physical activity and exercise are very important in the management of diabetes because of their effect on lowering blood glucose levels by increasing glucose uptake by muscles and improving insulin use. Exercise and physical activity will increase blood flow, which will lead to more open capillary nets and more insulin receptors available. These more active receptors will also cause a decrease in blood glucose levels in diabetic patients.

Blood sugar levels can be effectively regulated by exercise. Work out. It is advised to exercise for 30 to 60 minutes at a moderate effort (60 to 70 bpm), three to five times a week, and no more than two days in a row without sleeping. If senior citizens with type 2 diabetes can lower their blood sugar levels using Tai Chi and Diabetes Mellitus Gymnastics. According to, elderly individuals with Diabetes Mellitus can effectively lower their blood sugar levels by engaging in ergonomic workouts. Fundamental gymnastics that aligns its movements with the physiological structure and function of the body is known as ergonomic gymnastics. Breathing and muscle movement are combined in ergonomics. Because completing ergonomic exercises lowers blood sugar levels, they can be used to cure and prevent a number of ailments. Because the muscles are optimally worked during ergonomic exercises to absorb more blood sugar for the combustion process, this drop in blood sugar levels may occur. A gymnastic technique called ergonomic exercise is used to correct or restore blood flow and the position and flexibility of the nervous system. Optimizing the flow of oxygen to the brain activates the body's immunological system, sweat glands, body heat system, uric acid burning system, intelligence system, and freshness system. Exercises performed in an ergonomic manner can lower blood sugar levels. Utilizing five fundamental and one closing ergonomic gymnastic motions. If all the movements are performed flawlessly, it would be best to perform this exercise consistently, at least twice or three times a week, for a total of fifteen to twenty minutes in order to obtain adequate results. Regularly performing ergonomic training for a minimum of two weeks can help the body become more adept at performing physical tasks. Skeletal muscle contractions that take place during ergonomic exercises will result in mechanical and chemical reactions. The venous valves function ideally as a result of the mechanical response that occurs when the muscles contract and relax, increasing the amount of blood that returns to the right ventricle. States that this ergonomic workout comprises of five core movements (wide chest, bowing with appreciation, sitting mighty, sitting scorching, and lying down resignedly) and one opening action (perfectly standing). Additionally, every exercise offers advantages for healthcare and illness prevention. As a result, continuous practice of this exercise will help develop ideal endurance, especially for senior citizens who are approaching old age.

Ergonomic exercise helps control blood sugar levels in those with diabetes mellitus. Ergonomic exercise will alter metabolism, which is affected by blood glucose, plasma insulin levels, body fluid balance, gymnastic motions, and fitness level. The body uses energy during exercise to cause an increase in glucose, which causes dormant muscles to contract. When performing ergonomic workouts, blood flow will increase, making more insulin receptors available and activating the receptors, which will increase the amount of glucose that active muscles require. In order to increase the amount of sugar that is absorbed for burning, the muscles are stretched, tightened, and relaxed. Energy will be produced by burning or using glucose. Ergonomic workouts can also improve insulin function and facilitate blood circulation Suparwati, *et al.* (2017) <sup>[23]</sup>.

## Conclusions and Recommendations

### The knot

#### Drawing on the findings of the conducted research, the following conclusions have been reached

1. Among older adults with type 2 Diabetes Mellitus, Tai Chi and Diabetes workouts both lower blood sugar levels.
2. When added to an elderly person's type 2 Diabetes Mellitus regimen, ergonomic workouts are a highly effective way to lower blood sugar levels.
3. Three exercises-Tai Chi, Diabetes Mellitus, and Ergonomic—have been modified. The Ergonomic exercise consists of two warm-up, twelve core, and two cool-down movements.
4. With simple, safe, and enjoyable signs, older adults with type 2 diabetes can embrace this exercise modification.
5. It has been demonstrated that performing these three workouts twice a week for six weeks will lower blood glucose levels.
6. Exercise and regular physical activity can raise insulin receptor activity, which makes insulin more sensitive to blood sugar and lowers blood sugar levels.



**Suggestion**

1. Regarding Academic Establishments It
2. It is intended to spread knowledge regarding how exercise and physical activity affect blood sugar levels in older adults with type 2 diabetes mellitus.
3. Regarding Health Service Establishments
4. It is expected to be able to counsel seniors with type 2 diabetes mellitus on the value of comprehensive physical activity and exercise in order to inspire them to engage in it.
5. For Additional Researchers
6. It is anticipated to carry out experimental studies on the blood sugar levels of older individuals suffering from type 2 diabetes.
7. Regarding the Respondents
8. In order to control blood sugar, it is expected to regulate daily physical activity, daily dietary intake, take medication as directed by a doctor, and perform Tai Chi, Diabetes Mellitus, and Ergonomics exercises on a regular basis.

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