

# Idealism of Physical Activity Interventions in Type 2 Diabetes Mellitus Patients: A Literature Review

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## ABSTRACT

Diabetes Mellitus (DM) could be an inveterate illness related with insufficiency and the failure of the pancreas to create sufficient insulin. WHO predicts that the number of individuals with sort II diabetes mellitus in Indonesia will increment to 12 million in 2030. The ponder pointed to depict Physical Action Intercessions in sort 2 diabetes mellitus patients. Utilizing the online dialy database that gives free afficles and diaries from 2010 -2020 in PDF shape such as: Scinapse, Pubmed, ProQuest, NIDPI and Google Researcher utilizing the catchphrases "Physical Movement", "Effectiveness of Physical Action". Neural physical actions can advance the condition of persistent diabetics in the event that routinely done. Admissions of physical action intercession can control HbA1c levels and blood sugar, body weight and other glycemic control. Physical movement of nerves is able to advance the condition of patients with diabetes mellitus.

**Keywords:** *Physical Activity, Diabetes Mellitus*

## INTRODUCTION

Diabetes mellitus (DM) may be a persistent metabolic malady, which is rising as a major open wellbeing issue. The around the world predominance of diabetes in grown-ups is evaluated at 4.0% in 1995 and is anticipated to reach 5.4% in 2025. The number of adults with diabetes in Indonesia is anticipated to

extend from 6.9 million in 2010 to 12 million in 2030 (1). DM is a built-up hazard figure for a few causes of passing, counting ischemic heart infection, stroke, kidney illness, inescapable infections, and a few cancers (2).

Concurring to the most recent gauges, 18.8 million individuals within the US have been analyzed with diabetes, and an extra 7 million are accepted to live with undiscovered diabetes. At the same time, an estimated 79 million grown-ups have prediabetes, a condition in which blood sugar levels are higher than typical, but not tall sufficient to be analyzed as diabetes, and raises a person's chance of sort 2 diabetes, heart infection, and stroke. Hence, more than 100 million Americans are at chance of creating diabetes complications (3). In 2014, Around 382 million individuals around the world, or 8.3% of grown-ups matured 20-79 a long time, are assessed to have diabetes. (4).

Agreeing to the Universal Diabetes Alliance (IDF), > 382 million individuals around the world have diabetes in 2012 and this number is anticipated to reach 592 million by 2035 (5). During 2015, 415 million grown-ups had sort 2 diabetes mellitus (T2DM), which is anticipated to extend to 642 million by 2040 (6).

The expanded number of diabetes mellitus patients is activated by unfortunate ways of life such as need of physical action, corpulence, devouring unfortunate nourishment, and smoking behavior. The age of the persistent was more of reducing or getting more youthful. One in five individuals with diabetes is still beneath 40 a long time ancient, which is between 20 to 39 a long time, as numerous as 1.671.000 individuals. Whereas those matured 40 to 59 a long time as numerous as 4.651.000 individuals and the rest were matured 60 to 79 a long time. Diabetes may be a extreme risk to people, and it remains the seventh driving cause of passing within the world (7).

Eat less and physical movement are critical hazard components that can be altered which influence the onset, seriousness, and administration of DM (8). Physical movement (Dad) is considered a column of diabetes mellitus administration to avoid complications, in spite of the conclusive prove is missing (Diewertje et.al, 2012).

Physical action can be advanced in essential care in different ways, counting the conveyance of both and unwfitten data, and referral to an work out program. Within the UK, it has been illustrated in a wellbeing referral plot amid the final two decades, but there are concerns that this may not result in a maintained alter in physical action past the conventional program duration of 12 weeks (10).

A great result of physical action ought to qualify that's held at slightest 3 to 4 times a week and inside a period of a least of 30 minutes. Physical action does not get to be a

strenuous activity, just strolling within the moming while getting a charge out of the view for 30 minutes is included within the criteria of a great physical movement (11).

Taking care of steps to play down complications of sort II DM can be tired different ways. One of them is administration. The four pnmry columns of administration are counseling, dinner arranging, physical work out, and phannacological mediations. Physical action could be a better than average mediation to extend affront activity on glucose homeostasis in sound people and who have affront resistance, such as sort II diabetes mellitus patients (12).

We conducted a MTiting survey to discover out whether physical action mediations in DM patients were more compelling than other intercessions.

## MATERIAL AND METHODS

Online journal database that provides free articles and jounals both national and international in PDF form such as Scinapse, Pubmed, ProQuest, MDPI, Ebsco, Elsevier, Academia.edu, and Google Scholar as well as other reference sources in the form of text books from the library, National health reports, theses and dissertations as well as abstracts from research results that are included in the proceedings. The data used from this collected

literature are the last 10 years from 2010-2020. Based on the following keyword set: "Physical Activity", "Effectiveness of Physical Activity", "Physical Activity Intervention".

Table 1. List of criteria in the review of the literature articles

No.	Inclusion	Exclusion
1	The literature taken is the literature that discusses Physical Activity in Diabetes Mellitus patients	Abstract only
2	Physical Activity Interventions provide results or impact on people with Diabetes Mellitus	Incomplete text
3	Population studied is clear	Double publication
4	Full Text	Population studied is unclear
5	Jounal published in the last 10 years (2010-2020)	
6	Articles in English and	

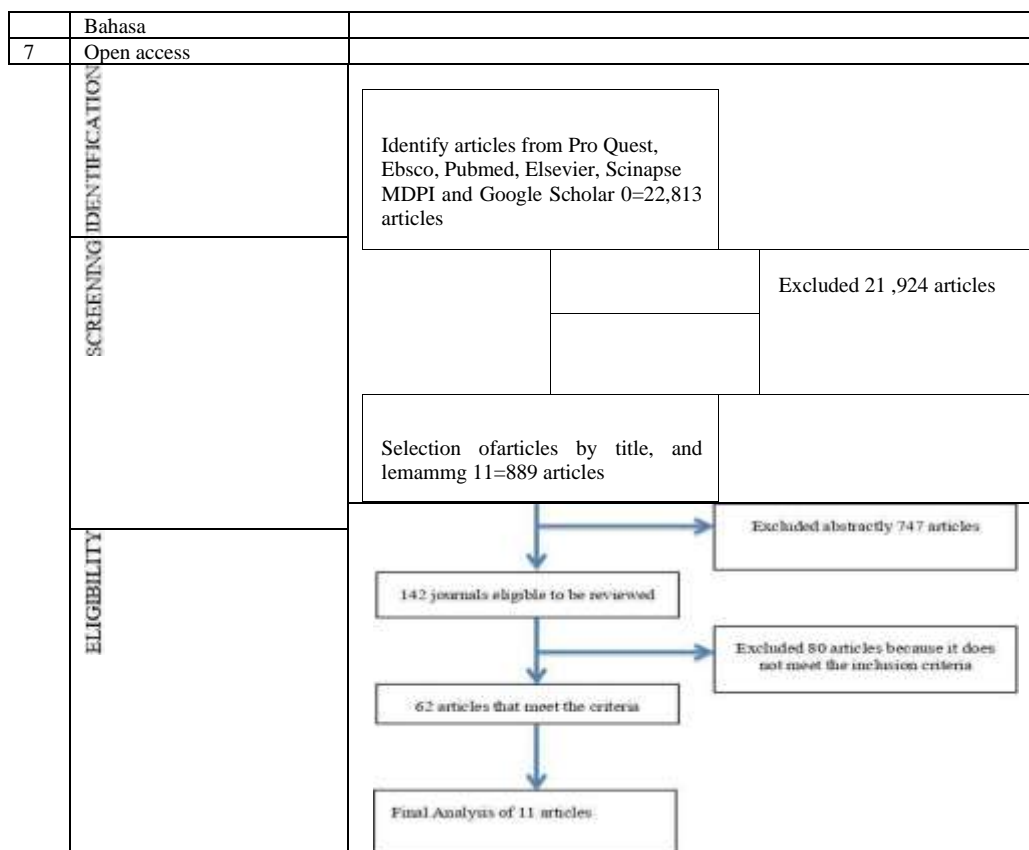


Figure 1. Review Process

Writing a literature review follows the writing guidelines of Preferred Reporting Items for Systematic Reviews (PRISMA). The stages in the review consist of identifying articles from the article source database (Identification), After that, the articles were filtered according to the inclusion criteria and exclusion criteria (screening), after that, all articles that match the inclusion (eligibility) and exclusions criteria were then assigned to suitable articles according to the design of the Physical Activity Effectiveness research plan (included). The total articles obtained from Scinapse, Pubmed and Google Scholar are 22,813 articles.

## RESULTS

Based on the review results of several articles related to physical activity interventions, it can be explained that the research conducted by Desveaux et al. with the research design used was prospective, cross-sectional, repeated measures, and the study subjects of Diabetes Mellitus patients

aged over 40 years. This journal determines whether adults with diabetes and Transtibial Amputation (TTA) meet the recommended guidelines to the intensity of physical activity and the number of daily steps. The results obtained regarding physical activity are the physical activity levels for adults with diabetes and TTA remained stable after discharge from prosthetic rehabilitation but far below the recommended guidelines of 6,500 steps per day and 150 minutes of moderate to high physical activity per week (13).

Research conducted by Anjana et al to assess the pattern of physical activity in Diabetes Mellitus patients across India using a cross-sectional study method, result that that the majority of people in India are not active in physical activity, which is less than 10%. Thus, it is necessary to do physical activity to prevent the epidemic of diabetes and obesity in India (14).

According to Mynarski et al., (2012), researching by doing physical activity to analyze glycemic control (HbA1c) and body

mass index (BMI), in patients with type 2 diabetes mellitus in a randomized and controlled design. This study found that the IPAQ could serve as a potential tool for physical activity assessment without further requirements for more sophisticated methods. The results showed that habitual physical activity has no impact on glycemic control and BMI in type 2 diabetes patients. However, further studies of larger populations are necessary to explore this issue.

Other results from the articles reviewed regarding physical activity were carried out by Spaltano et al. to determine the cross-sectional relationship of physical activity with circulating concentrations of IGF-I, VEGF, and BDNF in individuals with and without diabetes, with a prospective cohort study design. Results showed that physical activity was associated with higher circulating IGF-I and BDNF in participants with Diabetes Mellitus. These results, distinguishing interaction based on age and diabetes status, may also help explain some inconsistent results in studies related to physical activity with growth and neurotrophic factors (16).

Research result by Joseph et al. assessed the relationship between physical activity, sedentary behavior, and the incidence of diabetes in the Multi-Ethnic Study of Atherosclerosis using an observational study design. This study found results that confirm the importance of physical activity and sedentary behavior on the risk of diabetes in a multiethnic population and show the potential variation across racial/ethnic groups (17).

The next review journal related to research conducted by Hjerkind, Stenehjem dan Nilsen to determine whether physical activity can compensate for the adverse effects of adiposity at risk of diabetes. The design used is the data from the prospective populationbased HUNT study. The results of this study show that overweight and obesity are associated with increased risk of diabetes, especially among those who also reported being physically inactive. High

levels of physical activity are associated with a lower risk of diabetes in all body mass index categories but there is no clear evidence that being physically active can fully offset the adverse effects of adiposity on diabetes risk (18).

Journal review results by Sanabria-Maltinez et al were performed on pregnant women, This journal assessed the effectiveness of exercise intervention during pregnancy to prevent gestational diabetes mellitus and excessive maternal weight gain by using a meta-analysis of randomized controlled design, and it was found that a structured moderate physical exercise program during pregnancy reduced the risk of gestational diabetes mellitus and reduced maternal weight gain, and it seems safe for mother and baby. However, further studies are necessary to establish recommendations (19).

According to research Van Rooijen, Viviers dan Becker, the aim of the study is to determine the effectiveness of educational intervention programs as walking and daily diet with the study design randomized controlled trial and found the results that the physical activity intervention HbA1c results can be increased for four months. Required more frequent contact with patients (20).

## **DISCUSSION**

This study examines physical activity in adults with diabetes with lower extremity amputations. Despite improved functional mobility (Test L) for six months, physical activity remains well below 6500 steps per day, and 150 minutes per week of moderate to high physical activity are recommended for individuals with diabetes. The level of physical activity showed a good to excellent with functional exercise capacity and a good relationship with mobility and balance confidence (13).

Daily physical activity was defined as body movement continuously through the contraction of skeletal muscle resulting in increased energy expenditure in daily life (21).

Physical activity (PA) is one of the excellent treatment options for people with prediabetes or diabetes. However, some of the increased risks occur with increased physical activity, and certain precautions are necessary to reduce this risk, especially if these people are not used to exercising. We performed a standard search for all additional events associated with increased physical activity in people with prediabetes or diabetes (type I or type 2), and provide evidence-based guidelines on screening physical activity in these high-risk individuals (22).

Exercising under hypobaric conditions poses several unique challenges for diabetics and has the potential to lead to dangerous situations such as unanticipated hypoglycemia and hyperglycemia. (23).

In a study conducted by Desveaux et al physical activity was assessed using the Godin Leisure-Time Physical Activity Questionnaire (GLTEQ) (11). Participants were asked to report the frequency and duration of light-intensity (easy walking, yoga, golf), moderate-intensity (brisk walking, cycling, tennis), and high-intensity (aerobics, jogging, lap swimming) leisure-time physical activities carried out in a typical week. The number of minutes is calculated by multiplying the frequency of weekly physical activity with the duration in minutes (13).

Most patients with type 2 diabetes mellitus are sedentary despite the clear benefits of regular physical activity, including better glucose control and improved quality of life (24). Another study aimed at evaluating the cost-effectiveness of healthy eating and physical activity intervention compared to usual care among pregnant women at increased risk of GDM from a social perspective. (25).

Lifestyle interventions remain the cornerstone of the management of type 2 diabetes mellitus (T2DM). However, adherence to physical activity (PA) and its impact on cardiorespiratory fitness in this population has been poorly described (26). Physical activity can have a significant

effect on glucose metabolism in individuals with and without type I diabetes mellitus (T1DM) (27). In people who are at high risk of diabetes, interventions aimed at promoting healthy behavior change that can prevent or delay the development of diabetes and retinopathy and can lead to sustainable health benefits (28). The frequency and intensity of physical activity in the absence of a supportive environment that will allow the achievement of daily MVPA recommendations is not optimal (29).

Physical activity exercise is recommended as an adjunct therapy to diet in the management of type 2 diabetes mellitus (non-insulin-dependent). The latest review shows the potential of exercise to improve insulin sensitivity, glucose tolerance, and long-term glycemic control as measured by HbA1c in diabetes patients. In addition, data are showing that regular physical activity leads to beneficial changes in serum lipid profiles. However, the benefits in clinical trials are simple from a clinical viewpoint.

## CONCLUSIONS

Physical Activity Interventions can improve the condition of DM patients if done regularly and according to recommendations such as improving glycemic control, lose weight, and prevent further complications. Further research is necessary to assess the effectiveness of physical activity.

### *Declaration by Authors*

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## REFERENCE

1. Soewondo P, Soegondo S, Suastika K, Pranoto A, Soeatmadji DW. The DiabCare Asia 2008 study Outcomes on control and complications of type 2 diabetic patients in Indonesia. *Med J Indones*. 2010;19(4):235–44.
2. Brownrigg JRW, Griffin M, Hughes CO, Jones KG, Patel N, Thompson MM, et al.



- Influence of foot ulceration on cause-specific mortality in patients with diabetes mellitus. *J Vasc surg.* 2014;60(4):982-986.e3.
3. Haas L, Maryniuk M, Beck J, Cox CE, I1Wær P, Edwards L, et al. National standards for diabetes self-management education and support. *Diabetes Care.* 2012;35(11):2393-401.
  4. Riedl R, Robausch M, Berghold A. The evaluation of the effectiveness of austrians disease management program in patients with tne 2 diabetes mellitus - A populationbased retrospective cohort study. *PLoS One.* 2016; 1 1(8):1-14.
  5. Ghafoor E, Riaz M, Eichorst B, Fawwad A, Basit A. Evaluation of diabetes conversation map education tools for diabetes self-management education. *Diabetes Spectr.* 2015;28(
  6. Cradock KA, ÖLaighin G, Finucane FM, Gainf01th HL, Quinlan LR, Gillis KAM. Behaviour change techniques targeting both diet and physical activity in type 2 diabetes: A systematic review and meta-analysis. *Int J Behav Nutr Phys Act.* 2017;14(1).
  7. Noviani W. Laporan pengabdian masyarakat. 2015;(20120320065).
  8. Ranasinghe P, Pigera ASAD, Ishara MH, Jayasekara LMDT, Jayawardena R, Katulanda P. Knowledge and perceptions about diet and physical activity among Sri Lankan adults with diabetes mellitus: A qualitative study Health behavior, health promotion and society. *BMC Public Health.* 2015;15(1)I-10.
  9. Dieweffje Sluik, MSc; Brian Buijsse, PhD; Rebecca Muckelbauer, PhD; Rudolf Kaaks, PhD; Birgit Teucher, PhD; Nina Føns Johnsen, PhD; Anne Tjønneland, PID; Kim
  10. Overvad, PhD; Jane Nautmp Østergaard P, Pilar Amiano, MSc; Eva Ardanaz, PhD Benedetta Bendinelli, PharmD; Valeria Pala, PhD; Rosario Tumino, MD; Fulvio Ricceli, MSc; Amalia Mattiello, MD; Annemieke M. W. Spijkerman, PhD; Evelyn M. Monninkhof, PhD; Anne M. May, PID; Paul W. Franks, PhD; Peter M P, Olov Rolandsson, MD, PhD; Guy Fagherazzi, PID; Marie-Christine Boutron-Ruault, MD, PhD; Franc oise Clavel-Chapelon, PhD; Jose Man a Huerta Castan o, PhD; Valentina Gallo, PID; Heiner Boeing, PID; Ute No thlings D. Physical Activity and Mortality in Individuals With Diabetes Mellitus. *Arch Intem Med.* 2012;172(17): 1285-95.
  11. OITOW G, Kinmonth AL, Sanderson S, Sutton S. Effectiveness of physical activity promotion based in primary care: Systematic review and meta-analysis of randomised controlled trials. *BMJ.* 2012;344(7850):16.
  12. Ramadhanisa A, Larasati TA, Mayasari Di. Hubungan Aktivitas Fisik Dengan Kadar HbalC Pasien Diabetes Melitus Tipe 2 Di Laboratorium Patologi Klinik Rsud DL H.Abdul Moeloek Bandar Lampung. *Med J Lampung Univ.* 2013;2(4):44-
  13. Anggraeni I, Alfarisi R. Hubungan Aktifitas Fisik Dengan Kadar Gula Darah Puasa Pada Penderita Diabetes Melitus Tipe Ii Di Rumah Sakit Umum Daerah Dr. H. Abdul Moeloek. *J Dunia Kesmas vol.* 2018;7(9):1689-99.
  14. Desveaux L, Goldstein RS, Mathur S, Hassan A, Devlin M, Pauley T, et al. Physical Activity in Adults with Diabetes Following Prosthetic Rehabilitation. *Can J Diabetes.* 2016;40(4):336-41.
  15. Anjana RM, Pradeepa R, Das AK, Deepa M, Bhansali A, Joshi SR, et al. Physical activity and inactivity patterns in India - results from the ICMR-NDIAB study (Phase1) [ICMR-INDIAB-5]. *Int J Behav Nutr Phys Act.* 2014;11(1):1-1
  16. Mynarski W, Psurek A, Borek Z, Rozpara M, Grabara M, Strojek K. Declared and real physical activity in patients with type 2 diabetes mellitus as assessed by the Intemational Physical Activity Questionnaire and Caltrac accelerometer monitor: A potential tool for physical activity assessment in patients with type 2 dia. *Diabetes Res Clin Pract.* 2012;98(1):46-50.
  17. Spaltano NL, Davis-Piourde KL, Himali JJ, Murabito JM, Vasani RS, Beiser AS, et al. Self-reported physical activity and relations to growth and neurotrophic factors in diabetes mellitus: The framingham offspring study. *J Diabetes Res.* 2019;2019.
  18. Joseph JJ, Echouffo-Tcheugui JB, Golden SH, Chen H, Jenny NS, Camethon MR, et al. Physical activity, sedentary behaviors and the incidence of type 2 diabetes mellitus• The multi-ethnic study of atherosclerosis (MESA). *BMJ Open Diabetes Res Care.* 2016;4(1):1-12.

19. Hjerkind KV, Stenehjem JS, Nilsen TIL. Adiposity, physical activity and risk of diabetes mellitus: Prospective data from the population-based HUNT study, Norway. *BW open*. 2017;7(1)
20. Sanabria-Maltinez G, Garcia-Hennoso A, Poyatos-León R, Alvarez-Bueno C, Sánchez-López M, Martínez-Vizcaino V. Effectiveness of physical activity interventions on preventing gestational diabetes mellitus and excessive maternal weight gain: A meta-analysis. *BJOG An Int J Obstet Gynaecol*. 2015;122(9):1167–74.
21. Van Rooijen AJ, Viviers CM, Becker PJ. A daily physical activity and diet intervention for individuals with type 2 diabetes mellitus: a randomized controlled trial. *South African J Physiother*. 2010;66(2):9–16.
22. Hamasaki H. Daily physical activity and type 2 diabetes: A review. *World J Diabetes*. 2016;7(12):243.
23. Riddell MC, Bun J. Evidence-based risk assessment and recommendations for physical activity clearance: Diabetes mellitus and related comorbidities. *Appl Physiol Nutr Metab*. 2011;36(SUPPL.1): 154-89.
24. De Mol P, De Vries ST, De Koning EJP, Gans ROB, Bilo HJG, Tack CJ. Physical activity at altitude: Challenges for people with diabetes. *Diabetes Care*. 2014;37(8):2404–13.
25. Hochberg I, Feram G, Kozdoba M, Mannor S, Tennenholtz M, Yom-Tov E. Encouraging physical activity in patients with diabetes through automatic personalized feedback via reinforcement learning Improves glycemic control. *Diabetes Care*. 2016;39(4):e59–60.
26. Broekhuizen K, Simmons D, Devlieger R, van Assche A, Jans G, Galjaard S, et al. Cost-effectiveness of healthy eating and/or physical activity promotion in pregnant women at increased risk of gestational diabetes mellitus: Economic evaluation alongside the DALI study, a European multicenter randomized controlled trial. *Int J Behav Nutr Phys Act*. 2018;15(1): 1-12.
27. Jalvie JL, Pandey A, Ayers CR, McGavock JM, Sénéchal M, Berly JD, et al. Aerobic fitness and adherence to guideline-recommended minimum physical activity among ambulatory patients with type 2 diabetes mellitus. *Diabetes Care*. 2019;42(7): 1333-9.
28. Dasanayake IS, Bevier WC, Castorino K, Pinsker JE, Seborg DE, Doyle FJ, et al. Early Detection of Physical Activity for People With Type I Diabetes Mellitus. *J Diabetes Sci Technol*. 2015;9(6):1236–45.
29. Long GH, Cooper AJM, Wareham NJ, Griffin SJ, Simmons RK. Healthy behavior change and cardiovascular outcomes in newly diagnosed type 2 diabetic patients: A cohort analysis of the addition-Cambridge study. *Diabetes Care*. 2014;37(6): 1712-20.
30. Johnson ST, Lynch B, Vallance J, Davenport NIH, Gardiner PA, Butalia S. Sedentary behavior, gestational diabetes mellitus, and type 2 diabetes risk: where do we stand? *Endocrine*. 2016;52(1):5–10.

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