

## Diabetes

<b>Citation:</b> Chao M, Wang C, Dong X, et al. The Effects of Tai Chi on Type 2 Diabetes Mellitus: A Meta-Analysis. J Diabetes Res. 2018;2018:7350567. PMID: 30116744. 10.1155/2018/7350567	
<b>Purpose:</b>	<b>Abstract:</b> Objective: To investigate the effects of Tai chi in type 2 diabetes mellitus (type-2 DM) patients using systematic review and meta-analysis. Methods: Seven electronic resource databases were searched, and randomized controlled trials on the role of Tai chi in type-2 DM patients were retrieved. The meta-analysis was performed with RevMan 5.3, and research quality evaluation was conducted with the modified Jadad scale. Results: Fourteen studies, with 798 individuals related to the intervention of Tai chi on diabetes, were included. The results showed that, compared with non-exercise, Tai chi had the effect of lowering fasting blood glucose [MD = -1.39, 95% CI (-1.95, -0.84), P < 0.0001] and the subgroup effect size decreased with the increase of total exercise amount, there is no significant difference between Tai chi and other aerobic exercises [MD = -0.50, 95% CI (-1.02, 0.02), P = 0.06]; compared with non-exercise, Tai chi could reduce HbA1c [MD = -0.21, 95% CI (-0.61, 0.19), P = 0.31], and the group effect size decreased with the increase of total exercise amount. The reducing HbA1c effect of Tai chi was better than that of other aerobic exercises, but the difference was at the margin of statistical significance [MD = -0.19, 95% CI (-0.37, 0.00), P = 0.05]; compared with non-exercise, Tai chi had the effect of reducing 2 h postprandial blood glucose [MD = -2.07, 95% CI (-2.89, -1.26), P = 0.0002], there is no significant difference between Tai chi and other aerobic exercises in reducing 2 h postprandial blood glucose [MD = -0.44, 95% CI (-1.42, 0.54), P = 0.38]. Conclusion: Tai chi can effectively affect the management of blood glucose and HbA1c in type-2 DM patients. Long-term adherence to Tai chi has a better role in reducing blood glucose and HbA1c levels in type 2 DM patients.
<b>Last Search Date:</b> Jun-16	
<b>Total # studies included:</b> 14 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control	
<b>Populations Analyzed:</b> Type-2 DM (no restrictions on age or gender) without serious DM-related complications	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> De Nardi AT, Tolves T, Lenzi TL, et al. High-intensity interval training versus continuous training on physiological and metabolic variables in prediabetes and type 2 diabetes: A meta-analysis. Diabetes Res Clin Pract. 2018;137:149-59. PMID: 29329778. 10.1016/j.diabres.2017.12.017	
<b>Purpose:</b>	<b>Abstract:</b> AIMS: To compare the effects of high-intensity interval training (HIIT) versus moderate-intensity continuous training (MICT) on functional capacity and cardiometabolic markers in individuals prediabetes and type 2 diabetes (T2D). METHODS: The search was performed in PubMed (MEDLINE), EMBASE, PEDro, CENTRAL, Scopus, LILACS database, and Clinical Trials from the inception to July 2017, included randomized clinical trials that compared the use of HIIT and MICT in prediabetes and T2D adults. The risk of bias was defined by Cochrane Handbook and quality of evidence by GRADE. RESULTS: From 818 relevant records, seven studies were included in systematic review (64 prediabetes and 120 T2D patients) and five with T2D were meta-analyzed. HIIT promoted significantly increased of 3.02mL/kg/min (CI95% 1.42-4.61) of VO2max, measured for functional capacity, compared to MICT. No differences were found between two modalities of exercises considering the outcomes HbA1c, systolic and diastolic blood pressure, total cholesterol, HDL and LDL cholesterol, triglycerides, BMI, and waist-to-hip ratio. Most of the studies presented unclear risk of bias, and low and very low quality of evidence. CONCLUSION: HIIT induces cardiometabolic adaptations similar to those of MICT in prediabetes and T2D, and provides greater benefits to functional capacity in patients with T2D. PROSPERO: CRD42016047151.
<b>Last Search Date:</b> Jul-17	
<b>Total # studies included:</b> 7 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, cardiorespiratory fitness, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> T2D adults aged 18+	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Jang JE, Cho Y, Lee BW, et al. Effectiveness of Exercise Intervention in Reducing Body Weight and Glycosylated Hemoglobin Levels in Patients with Type 2 Diabetes Mellitus in Korea: A Systematic Review and Meta-Analysis. Diabetes Metab J. 2019;43(3):302-18. PMID: 30604592. 10.4093/dmj.2018.0062	
<b>Purpose:</b>	<b>Abstract:</b> BACKGROUND: This study aimed to assess the effectiveness of exercise intervention in reducing body weight and glycosylated hemoglobin (HbA1c) level in patients with type 2 diabetes mellitus (T2DM) in Korea. METHODS: Cochrane, PubMed, Embase, KoreaMed, Kmbase, NDSL, KCI, RISS, and DBpia databases were used to search randomized controlled trials and controlled clinical trials that compared exercise with non-exercise intervention among patients with non-insulin-treated T2DM in Korea. The effectiveness of exercise intervention was estimated by the mean difference in body weight changes and HbA1c level. Weighted mean difference (WMD) with its corresponding 95% confidence interval (CI) was used as the effect size. The pooled mean differences of outcomes were calculated using a random-effects model. RESULTS: We identified 7,692 studies through literature search and selected 23 articles (723 participants). Compared with the control group, exercise intervention (17 studies) was associated with a significant decline in HbA1c level (WMD, -0.58%; 95% CI, -0.89 to -0.27; I(2)=73%). Although no significant effectiveness on body weight was observed, eight aerobic training studies showed a significant reduction in body weight (WMD, -2.25 kg; 95% CI, -4.36 to -0.13; I(2)=17%) in the subgroup analysis. CONCLUSION: Exercise significantly improves glycemic control; however, it does not significantly reduce body weight. Aerobic training can be beneficial for patients with non-insulin-treated T2DM in Korea.
<b>Last Search Date:</b> Aug-17	
<b>Total # studies included:</b> 23 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> HbA1c levels and weight	
<b>Populations Analyzed:</b> Patients with T2DM who are not on insulin therapy	<b>Author-Stated Funding Source:</b>

<b>Citation:</b>	Lauche R, Peng W, Ferguson C, et al. Efficacy of Tai Chi and qigong for the prevention of stroke and stroke risk factors: A systematic review with meta-analysis. <i>Medicine (Baltimore)</i> . 2017;96(45):e8517. PMID: 29137055. 10.1097/md.00000000000008517
<b>Purpose:</b>	<b>Abstract:</b> BACKGROUND: This review aims to summarize the evidence of Tai Chi and qigong interventions for the primary prevention of stroke, including the effects on populations with major stroke risk factors. METHODS: A systematic literature search was conducted on January 16, 2017 using the PubMed, Scopus, Cochrane Library, and CINAHL databases. Randomized controlled trials examining the efficacy of Tai Chi or qigong for stroke prevention and stroke risk factors were included. Risk of bias was assessed using the Cochrane Risk of Bias tool. RESULTS: Twenty-one trials with n = 1604 patients with hypertension, hyperlipidaemia, diabetes, overweight or obesity, or metabolic syndrome were included. No trials were found that examined the effects of Tai Chi/qigong on stroke incidence. Meta-analyses revealed significant, but not robust, benefits of Tai Chi/qigong over no interventions for hypertension (systolic blood pressure: -15.55 mm Hg (95% CI: -21.16; -9.95); diastolic blood pressure: -10.66 mm Hg (95% CI: -14.90, -6.43); the homeostatic model assessment (HOMA) index (-2.86%; 95% CI: -5.35, -0.38) and fasting blood glucose (-9.6 mg/dL; 95% CI: -17.28, -1.91), and for the body mass index compared with exercise controls (-1.65 kg/m; 95% CI: -3.11, -0.20). Risk of bias was unclear or high for the majority of trials and domains, and heterogeneity between trials was high. Only 6 trials adequately reported safety. No recommendation for the use of Tai Chi/qigong for the prevention of stroke can be given. CONCLUSION: Although Tai Chi and qigong show some potential more robust studies are required to provide conclusive evidence on the efficacy and safety of Tai Chi and qigong for reducing major stroke risk factors.
<b>Last Search Date:</b> 1-Jan-17	
<b>Total # studies included:</b> 6 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Stroke incidence, glycemic control, behavioral outcomes, safety	
<b>Populations Analyzed:</b> Diagnosed with type 2 diabetes mellitus	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Lee J, Kim D, Kim C. Resistance Training for Glycemic Control, Muscular Strength, and Lean Body Mass in Old Type 2 Diabetic Patients: A Meta-Analysis. Diabetes Ther. 2017;8(3):459-73. PMID: 28382531. 10.1007/s13300-017-0258-3	
<b>Purpose:</b>	<b>Abstract:</b> INTRODUCTION: Type 2 diabetes (T2D) in elderly patients is associated with accelerated loss of skeletal muscle mass and strength. However, there are few meta-analysis reviews which investigate the effects of resistance training (RT) on glycemic control and skeletal muscle in the patients. METHODS: Three electronic databases were searched (from the earliest date available to November 2016). Studies were included according to the inclusion criteria: T2D patients at least 60 years old, fasting plasma glucose of at least 7.0, and at least 8 weeks of RT. RESULTS: Fifteen cohorts of eight studies (360 patients, average age 66 years) met the inclusion criteria. RT groups lowered glycosylated hemoglobin (HbA1c) (mean ES = -0.37, 95% CI = -0.55 to -0.20, P < 0.01) but did not result in a significant effect on lean body mass (LBM) (mean ES = 0.08, 95% CI = -0.15 to 0.30, P = 0.50). Homogeneity was shown between studies regarding HbA1c and LBM (Q = 15.70, df = 9, P = 0.07 and Q = 0.12, df = 4, P = 0.998, respectively). High-intensity subgroups showed a slight tendency to improve (rather than duration, frequency, and weekly volume) and to decrease HbA1c levels more than low-intensity subgroups (P = 0.37). RT increased muscular strength (mean ES = 1.05, 95% CI = 0.26-1.84, P = 0.01). No training components explained the heterogeneity between studies with changes in muscle strength. CONCLUSION: RT improves glycemic control and muscle strength in elderly patients with T2D. RT with high intensity can be a strategy to treat patients with T2D and sarcopenia associated with aging.
<b>Last Search Date:</b> Nov-16	
<b>Total # studies included:</b> 10 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, muscular strength	
<b>Populations Analyzed:</b> Participants were at least 60 years old and had T2D	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Liao F, An R, Pu F, et al. Effect of Exercise on Risk Factors of Diabetic Foot Ulcers: A Systematic Review and Meta-Analysis. <i>Am J Phys Med Rehabil.</i> 2019;98(2):103-16. PMID: 30020090. 10.1097/phm.0000000000001002	
<b>Purpose:</b>	<b>Abstract:</b> The objectives of this study were to examine the effectiveness of different types of exercise on risk factors of diabetic foot ulcers, including glycated hemoglobin, peripheral arterial disease, and diabetic peripheral neuropathy, in people with type 2 diabetes mellitus. PubMed, Web of Science, Cochrane Library, Scopus, and CINAHL were searched from inception to January 2018 for relevant articles. Eligible studies were randomized controlled trials that examined effects of exercise on the selected risk factors. Twenty randomized controlled trials with 1357 participants were included in the meta-analyses. The differences in postintervention values of glycated hemoglobin and ankle brachial index between exercise and control groups were synthesized, yielding mean differences of -0.45% (P < 0.00001) and 0.03 (P = 0.002), respectively; the differences in within-group changes in glycated hemoglobin were synthesized, yielding mean differences of -0.19% (P = 0.1), -0.25% (P = 0.0006), and -0.64% (P = 0.006) for aerobic versus resistance, combined versus aerobic, and combined versus resistance exercise, respectively. Exercise has a significant effect on reducing glycated hemoglobin, whereas combined exercise is more effective compared with aerobic or resistance exercise alone. Exercise also improves ankle brachial index. However, evidence regarding the association between exercise and peripheral neuropathy and risks of diabetic foot ulcers in people with type 2 diabetes mellitus remains insufficient.
<b>Last Search Date:</b> Jan-18	
<b>Total # studies included:</b> 20 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> HbA1c, peripheral neuropathy, and vascular structure or function or cutaneous microvascular function of the lower limbs	
<b>Populations Analyzed:</b> T2DM 18 yrs and older	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Liu JX, Zhu L, Li PJ, et al. Effectiveness of high-intensity interval training on glycemic control and cardiorespiratory fitness in patients with type 2 diabetes: a systematic review and meta-analysis. Aging Clin Exp Res. 2019;31(5):575-93. PMID: 30097811. 10.1007/s40520-018-1012-z	
<b>Purpose:</b>	<b>Abstract:</b> We investigated the influence of resistance exercise (RE) with different intensities on HbA1c, insulin and blood glucose levels in patients with type 2 diabetes (T2D). Diabetes trials that compared RE group with a control were included in meta-analysis. Exercise intensities were categorized into low-to-moderate-intensity and high-intensity subgroups. Intensity effect on glycemic control was determined by meta-regression analysis, and risk-of-bias was assessed using Cochrane Collaboration tool. 24 trials met the inclusion criteria, comprised of 962 patients of exercise (n = 491) and control (n = 471). Meta-regression analysis showed decreased HbA1c (p = 0.006) and insulin (p = 0.015) after RE was correlated with intensity. Subgroup analysis revealed decreased HbA1c was greater with high intensity (-0.61; 95% CI -0.90, -0.33) than low-to-moderate intensity (-0.23; 95% CI -0.41, -0.05). Insulin levels were significantly decreased only with high intensity (-4.60; 95% CI -7.53, -1.67), not with low-to-moderate intensity (0.07; 95% CI -3.28, 3.42). Notably, values between the subgroups were statistically significant for both HbA1c (p = 0.03) and insulin (p = 0.04), indicative of profound benefits of high-intensity RE. Pooled outcomes of 15 trials showed only a decreased trend in blood glucose with RE (p = 0.09), and this tendency was not associated with intensity. Our meta-analysis provides additional evidence that high-intensity RE has greater beneficial effects than low-to-moderate-intensity in attenuation of HbA1c and insulin in T2D patients.
<b>Last Search Date:</b> Sep-18	
<b>Total # studies included:</b> 24 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control	
<b>Populations Analyzed:</b> Patients with definite T2D	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Liu Y, Ye W, Chen Q, et al. Resistance Exercise Intensity is Correlated with Attenuation of HbA1c and Insulin in Patients with Type 2 Diabetes: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2019;16(1). PMID: 30621076. 10.3390/ijerph16010140	
<b>Purpose:</b>	<b>Abstract:</b> AIMS: The aim of this systematic review and meta-analysis was to quantify the effect of high-intensity interval training (HIIT) on glycemic control and cardiorespiratory fitness compared with moderate-intensity training (MICT) and no training at all in patients with type 2 diabetes (T2D). METHODS: Relevant articles were sourced from PubMed, Embase, the Web of Science, EBSCO, and the Cochrane Library. Randomized-controlled trials were included based upon the following criteria: participants were clinically diagnosed with T2D, outcomes that included glycemic control (e.g., hemoglobin A1c); body composition (e.g., body weight); cardiorespiratory fitness (e.g., VO2peak) are measured at baseline and post-intervention and compared with either a MICT or control group. RESULTS: Thirteen trials involving 345 patients were finally identified. HIIT elicited a significant reduction in BMI, body fat, HbA1c, fasting insulin, and VO2peak in patients with type 2 diabetes. Regarding changes in the body composition of patients, HIIT showed a great improvement in body weight (mean difference: - 1.22 kg, 95% confidence interval [CI] - 2.23 to - 0.18, P = 0.02) and body mass index (mean difference: - 0.40 kg/m(2), 95% CI - 0.78 to - 0.02, P = 0.04) than MICT did. Similar results were also found with respect to HbA1c (mean difference: - 0.37, 95% CI - 0.55 to - 0.19, P < 0.0001); relative VO2peak (mean difference: 3.37 ml/kg/min, 95% CI 1.88 to 4.87, P < 0.0001); absolute VO2peak (mean difference: 0.37 L/min, 95% CI 0.28 to 0.45, P < 0.00001). CONCLUSIONS: HIIT may induce more positive effects in cardiopulmonary fitness than MICT in T2D patients.
<b>Last Search Date:</b> Apr-18	
<b>Total # studies included:</b> 13 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, cardiorespiratory fitness	
<b>Populations Analyzed:</b> Clinically diagnosed with type 2 diabetes	<b>Author-Stated Funding Source:</b>



<b>Citation:</b> Meng D, Chunyan W, Xiaosheng D, et al. The Effects of Qigong on Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis. Evid Based Complement Alternat Med. 2018;2018:8182938. PMID: 29507593. 10.1155/2018/8182938	
<b>Purpose:</b>	<b>Abstract:</b> Objective. The purpose of this study was to investigate the effects of Qigong on type 2 diabetes mellitus (DM) using the systematic review and meta-analysis. Methods. All prospective, randomized, controlled clinical trials published in English or Chinese and involving the use of Qigong by patients with DM were searched in 7 electronic databases from their respective inception to June 2016. The meta-analysis was conducted using the Revman 5.2. The quality of the included trials was assessed using the Jadad rating scale. Two researchers independently completed the inclusion, data extraction, and quality assessment. Results. Twenty-one trials with 1326 patients met the inclusion criteria and were reviewed. The meta-analysis demonstrated that, compared with no exercise, the Qigong had significant effects on fasting blood glucose (MD = -0.99, 95% CI (-1.23, 0.75), P<0.0001), HbA1c (MD = -0.84, 95% CI (-1.02, -0.65), P<0.0001), and postprandial blood glucose (MD = -1.55, 95% CI (-2.19, -0.91), P<0.00001). Conclusion. The Qigong training can improve the blood glucose status of the type 2 DM patients and has positive effects on the management of type 2 DM. However, future research with better quality still needs to be conducted to address the effects of Qigong on type 2 DM.
<b>Last Search Date:</b> Jun-16	
<b>Total # studies included:</b> 21 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control	
<b>Populations Analyzed:</b> Diabetic patients (assume T2DM) without serious DM related complications.	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Pan B, Ge L, Xun YQ, et al. Exercise training modalities in patients with type 2 diabetes mellitus: a systematic review and network meta-analysis. Int J Behav Nutr Phys Act. 2018;15(1):72. PMID: 30045740. 10.1186/s12966-018-0703-3	
<b>Purpose:</b>	<b>Abstract:</b> INTRODUCTION: Current international guidelines recommend aerobic, resistance, and combined exercises for the management of type 2 diabetes mellitus (T2DM). In our study, we conducted a network meta-analysis to assess the comparative impact of different exercise training modalities on glycemic control, cardiovascular risk factors, and weight loss in patients with T2DM. METHODS: We searched five electronic databases to identify randomized controlled trials (RCTs) that compared the differences between different exercise training modalities for patients with T2DM. The risk of bias in the included RCTs was evaluated according to the Cochrane tool. Network meta-analysis was performed to calculate mean difference the ratio of the mean and absolute risk differences. Data were analyzed using R-3.4.0. RESULTS: A total of 37 studies with 2208 patients with T2DM were included in our study. Both supervised aerobic and supervised resistance exercises showed a significant reduction in HbA1c compared to no exercise (0.30% lower, 0.30% lower, respectively), however, there was a less reduction when compared to combined exercise (0.17% higher, 0.23% higher). Supervised aerobic also presented more significant improvement than no exercise in fasting plasma glucose (9.38 mg/dl lower), total cholesterol (20.24 mg/dl lower), triacylglycerol (19.34 mg/dl lower), and low-density lipoprotein cholesterol (11.88 mg/dl lower). Supervised resistance showed more benefit than no exercise in improving systolic blood pressure (3.90 mmHg lower] and total cholesterol (22.08 mg/dl lower]. In addition, supervised aerobic exercise was more powerful in improving HbA1c and weight loss than unsupervised aerobic (HbA1c: 0.60% lower; weight loss: 5.02 kg lower) and unsupervised resistance (HbA1c: 0.53% lower) exercises. CONCLUSION: Compared with either supervised aerobic or supervised resistance exercise alone, combined exercise showed more pronounced improvement in HbA1c levels; however, there was a less marked improvement in some cardiovascular risk factors. In terms of weight loss, there were no significant differences among the combined, supervised aerobic, and supervised resistance exercises. TRIAL REGISTRATION: Our study protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO); registration number: CRD42017067518 .
<b>Last Search Date:</b> Apr-17	
<b>Total # studies included:</b> 37 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> T2DM aged ≥18 years	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Qiu S, Cai X, Sun Z, et al. Aerobic Interval Training and Cardiometabolic Health in Patients with Type 2 Diabetes: A Meta-Analysis. Front Physiol. 2017;8:957. PMID: 29218018. 10.3389/fphys.2017.00957	
<b>Purpose:</b>	<b>Abstract:</b> Vigorous to maximal aerobic interval training (INT) has received remarkable interest in improving cardiometabolic outcomes for type 2 diabetes patients recently, yet with inconsistent findings. This meta-analysis was aimed to quantify its effectiveness in type 2 diabetes. Randomized controlled trials (RCTs) were identified by searches of 3 databases to October 2017, which evaluated the effects of INT with a minimal training duration of 8 weeks vs. moderate-intensity continuous training (MICT) or non-exercise training (NET) among type 2 diabetes patients on outcomes including cardiorespiratory fitness, glycemic control, body composition, blood pressure, and lipid profiles. Weighted mean differences with 95% confidence intervals (CIs) were calculated with the random-effects model. Nine datasets from 7 RCTs with 189 patients were included. Compared with MICT, INT improved maximal oxygen consumption (VO2max) by 2.60 ml/kg/min (95% CI: 1.32 to 3.88 ml/kg/min, P <0.001) and decreased hemoglobin A1c (HbA1c) by 0.26% (95% CI: -0.46% to -0.07%, P = 0.008). These outcomes for INT were also significant vs. energy expenditure-matched MICT, with VO2max increased by 2.18 ml/kg/min (P = 0.04) and HbA1c decreased by 0.28% (P = 0.01). Yet their magnitudes of changes were larger compared with NET, with VO2max increased by 6.38 ml/kg/min (P <0.001) and HbA1c reduced by 0.83% (P = 0.004). Systolic blood pressure could be lowered by INT compared with energy expenditure-matched MICT or NET (both P <0.05), but other cardiometabolic markers and body composition were not significantly altered in general. In conclusion, despite a limited number of studies, INT improves cardiometabolic health especially for VO2max and HbA1c among patients with type 2 diabetes, and might be considered an alternative to MICT. Yet the optimal training protocols still require to be established.
<b>Last Search Date:</b> Oct-17	
<b>Total # studies included:</b> 9 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Cardiorespiratory fitness, glycemic control, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> Patients with T2DM	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Rees JL, Johnson ST, Boule NG. Aquatic exercise for adults with type 2 diabetes: a meta-analysis. Acta Diabetol. 2017;54(10):895-904. PMID: 28691156. 10.1007/s00592-017-1023-9	
<b>Purpose:</b>	<b>Abstract:</b> AIMS: The purpose of this systematic review and meta-analysis was to examine the effects of aquatic exercise (AquaEx) on indicators of glycemic control (i.e., glycated hemoglobin [A1c] and fasting plasma glucose) in adults with type 2 diabetes mellitus (T2DM). It was hypothesized that AquaEx would improve glycemic control to a similar extent as land-based exercise (LandEx), but to a greater extent than non-exercise control (Ctrl). METHODS: A literature search was completed in February 2017 for studies examining AquaEx training in adults with T2DM. Assessment of glycemic control was necessary for inclusion, while secondary outcomes such as quality of life and cardiometabolic risk factors (i.e., blood pressure, triglycerides and total cholesterol) were considered, but not required for inclusion. Outcomes were measured before and after at least 8 weeks of AquaEx, and data were analyzed using weighted mean differences (WMDs) and fixed effect models, when appropriate. RESULTS: Nine trials including 222 participants were identified. Three trials compared AquaEx to LandEx, two compared AquaEx to Ctrl, and four had a pre-/post-design without a comparison group. Results indicate no difference in A1c between LandEx and AquaEx (WMD = -0.02%, 95% confidence interval = [-0.71, 0.66]). Post-intervention A1c was lower in AquaEx when compared to Ctrl (WMD = -0.96%, [-1.87, -0.05]). Post-AquaEx A1c was lower compared to baseline (WMD = -0.48%, [-0.66, -0.30]). CONCLUSIONS: A1c can be reduced after eight-twelve weeks of AquaEx. However, at this time few studies have examined whether changes in A1c are different from LandEx or Ctrl.
<b>Last Search Date:</b> Feb-17	
<b>Total # studies included:</b> 9	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> HBA1c	
<b>Populations Analyzed:</b> Adults with T2DM	
<b>Author-Stated Funding Source:</b>	

<b>Citation:</b> Sampath Kumar A, Maiya AG, Shastri BA, et al. Exercise and insulin resistance in type 2 diabetes mellitus: A systematic review and meta-analysis. Ann Phys Rehabil Med. 2019;62(2):98-103. PMID: 30553010. 10.1016/j.rehab.2018.11.001	
<b>Purpose:</b>	<b>Abstract:</b> BACKGROUND: Insulin resistance is a determining factor in the pathophysiology of type 2 diabetes mellitus (T2DM). Exercise is known to improve insulin resistance, but a systematic review of the literature is lacking. OBJECTIVE: This systematic review and meta-analysis focused on identifying evidence for the effectiveness of a structured exercise intervention program for insulin resistance in T2DM. METHODS: We searched MEDLINE via PubMed, CINAHL, Scopus and Web of Science, and the Cochrane Central Register of Controlled Trials for reports of studies on fasting insulin, homeostatic model assessment for insulin resistance (Homa-IR), fasting blood sugar, glycated hemoglobin and body mass index in patients with T2DM and healthy controls that were published between 1990 and 2017. Data are reported as the standardized mean difference or mean difference with 95% confidence intervals (CIs). RESULTS: Among 2242 records retrieved, only 11 full-text articles were available for meta-analysis. Data for 846 participants were analyzed, 440 in the intervention group, and 406 in the control group. The mean difference for fasting insulin level was -1.64 (95% CI; -3.38 to 0.10), Homa-IR 0.14 (-1.48 to 1.76), fasting blood sugar -5.12 (-7.78 to -2.45), hemoglobin A1c 0.63 (-0.82 to 2.08) and body mass index -0.36 (-1.51 to 0.79). CONCLUSION: The evidence highlights the effectiveness of a structured exercise intervention program for insulin resistance in T2DM with a moderate level 2 of evidence.
<b>Last Search Date:</b> Jun-17	
<b>Total # studies included:</b> 11 RCT or CCT	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, BMI	
<b>Populations Analyzed:</b> T2DM in people 18 years or older	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Song G, Chen C, Zhang J, et al. Association of traditional Chinese exercises with glycemic responses in people with type 2 diabetes: A systematic review and meta-analysis of randomized controlled trials. J Sport Health Sci. 2018;7(4):442-52. PMID: 30450253. 10.1016/j.jshs.2018.08.004	
<b>Purpose:</b>	<b>Abstract:</b> Background: There is increasing evidence showing the health benefits of various forms of traditional Chinese exercises (TCEs) on the glycemic profile in people with type 2 diabetes. However, relatively little is known about the combined clinical effectiveness of these traditional exercises. This study was designed to perform a systematic review and meta-analysis of the overall effect of 3 common TCEs (Tai Ji Quan, Qigong, Ba Duan Jin) on glycemic control in adults with type 2 diabetes. Methods: We conducted an extensive database search in Cochrane Library, EMBASE, PubMed, Web of Science, EBSCO, and China National Knowledge Infrastructure on randomized controlled trials published between April 1967 and September 2017 that compared any of the 3 TCEs with a control or comparison group on glycemic control. Data extraction was performed by 2 independent reviewers. Study quality was evaluated using the Cochrane Handbook for Systematic Reviews of Interventions, which assessed the risk of bias, including sequence generation, allocation concealment, blinding, completeness of outcome data, and selective outcome reporting. The resulting quality of the reviewed studies was characterized in 3 grades representing the level of bias: low, unclear, and high. All analyses were performed using random effects models and heterogeneity was quantified. We a priori specified changes in biomarkers of hemoglobin A1c (in percentage) and fasting blood glucose (mmol/L) as the main outcomes and triglycerides, total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein-cholesterol, 2-h plasma glucose, and fasting plasma glucose as secondary outcomes. Results: A total of 39 randomized, controlled trials (Tai Ji Quan=11; Qigong=6; Ba Duan Jin=22) with 2917 type 2 diabetic patients (aged 41-80 years) were identified. Compared with a control or comparison group, pooled meta-analyses of TCEs showed a significant decrease in hemoglobin A1c (mean difference (MD)=-0.67%; 95% confidence interval (CI): -0.86% to -0.48%; p < 0.00001) and fasting blood glucose (MD=-0.66 mmol/L; 95%CI: -0.95 to -0.37 mmol/L; p < 0.0001). The observed effect was more pronounced for interventions that were medium range in duration (i.e., >3-<12 months). TCE interventions also showed improvements in the secondary outcome measures. A high risk of bias was observed in the areas of blinding (i.e., study participants and personnel, and outcome assessment). Conclusion: Among patients with type 2 diabetes, TCEs were associated with significantly lower hemoglobin A1c and fasting blood glucose. Further studies to better understand the dose and duration of exposure to TCEs are warranted.
<b>Last Search Date:</b> Sep-17	
<b>Total # studies included:</b> 39 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> Adults with type 2 diabetes	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Thind H, Lantini R, Balletto BL, et al. The effects of yoga among adults with type 2 diabetes: A systematic review and meta-analysis. Prev Med. 2017;105:116-26. PMID: 28882745. 10.1016/j.ypmed.2017.08.017	
<b>Purpose:</b>	<b>Abstract:</b> The purpose of this meta-analysis was to examine the effects of yoga for glycemic control among adults with type 2 diabetes (T2DM). Comprehensive electronic databases searches located 2559 unique studies with relevant key terms. Studies were included if they (1) evaluated a yoga intervention to promote T2DM management, (2) used a comparison group, (3) reported an objective measure of glycemic control at post-intervention, and (4) had follow-up length or post-test of at least 8weeks from baseline. Independent raters coded participant, design and methodological characteristics and intervention content. Summary effect sizes and 95% confidence intervals (CI) were calculated. Twenty-three studies with 2473 participants (mean age=53years; 43% women) met eligibility criteria. Compared with controls, yoga participants were successful in improving their HbA1c (d+=0.36, 95% CI=0.16, 0.56; k=16), FBG (d+=0.58, 95% CI=0.40, 0.76; k=20), and PPBG (d+=0.40, 95% CI=0.23, 0.56; k=14). Yoga was also associated with significant improvements in lipid profile, blood pressure, body mass index, waist/hip ratio and cortisol levels. Overall, studies satisfied an average of 41% of the methodological quality (MQ) criteria; MQ score was not associated with any outcome (Ps >0.05). Yoga improved glycemic outcomes and other risk factors for complications in adults with T2DM relative to a control condition. Additional studies with longer follow-ups are needed to determine the long-term efficacy of yoga for adults with T2DM.
<b>Last Search Date:</b> Feb-16	
<b>Total # studies included:</b> 23	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> T2DM adults ≥18 years of age	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Xia TW, Yang Y, Li WH, et al. Different training durations and styles of tai chi for glucose control in patients with type 2 diabetes: a systematic review and meta-analysis of controlled trials. BMC Complement Altern Med. 2019;19(1):63. PMID: 30871517. 10.1186/s12906-019-2475-y	
<b>Purpose:</b>	<b>Abstract:</b> BACKGROUND: Physical activity is an important part of the diabetes management plan. However, the effects caused by different training durations and styles of Tai Chi have not been evaluated. We conducted an updated systematic review of the effects of Tai Chi on patients with type 2 diabetes based on different training durations and styles. METHODS: We performed a search for Chinese and English studies in 8 databases. Two reviewers independently selected the eligible trials and conducted a critical appraisal of the methodological quality. RESULTS: Seventeen trials were included. Tai Chi was found to have reduced fasting blood glucose (FBG) [SMD = - 0.54, 95% CI (- 0.91, - 0.16), P = 0.005] and HbA1c [SMD = - 0.68, 95% CI (- 1.17, - 0.19), P = 0.006] overall, compared with a control group. Considering the subgroup analysis, the pooled results showed that 24 movements or Yang-style Tai Chi did not significantly reduce FBG after a duration of $\leq$ 3 months [SMD = - 0.46, 95% CI (- 1.42, 0.50), P = 0.35] or > 3 months [SMD = - 0.50, 95% CI (- 1.49, 0.49), P = 0.32], nor did it reduce HbA1c [SMD = - 1.22, 95% CI (- 2.90, 0.47), P = 0.16] after a duration > 3 months in all studies. However, other styles of Tai Chi significantly reduced FBG [SMD = - 0.90, 95% CI (- 1.28, - 0.52), P < 0.00001] and HbA1c [SMD = - 0.90, 95% CI (- 1.28, - 0.52), P < 0.00001] after a duration > 3 months, while no significant reduction in FBG [SMD = - 0.34, 95% CI (- 0.76, 0.08), P = 0.12] or HbA1c [SMD = - 0.34, 95% CI (- 0.76, 0.08), P = 0.12] was found after a duration $\leq$ 3 months. CONCLUSIONS: Tai Chi seems to be effective in treating type 2 diabetes. Different training durations and styles result in variable effectiveness. The evidence was insufficient to support whether long-term Tai Chi training was more effective.
<b>Last Search Date:</b> Apr-18	
<b>Total # studies included:</b> 17 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles	
<b>Populations Analyzed:</b> Clear diagnosis of T2D	<b>Author-Stated Funding Source:</b>



<b>Citation:</b> Yu X, Chau JPC, Huo L. The effectiveness of traditional Chinese medicine-based lifestyle interventions on biomedical, psychosocial, and behavioral outcomes in individuals with type 2 diabetes: A systematic review with meta-analysis. Int J Nurs Stud. 2018;80:165-80. PMID: 29471267. 10.1016/j.ijnurstu.2018.01.009	
<b>Purpose:</b>	<b>Abstract:</b> BACKGROUND: Integrative diabetes care, which combines conventional diabetes therapy with traditional Chinese medicine (TCM)-based interventions, has gained popularity worldwide. Numerous TCM-based lifestyle modification approaches have been proposed for individuals with type 2 diabetes (T2DM). OBJECTIVES: To synthesize and present the best available evidence on the effectiveness of TCM-based lifestyle interventions in individuals with T2DM. DESIGN: We undertook a systematic review of randomized controlled trials or controlled clinical trials. DATA SOURCES: Six English and four Chinese electronic databases were searched from their inceptions to December 2016. REVIEW METHODS: Trials investigating the effectiveness of various TCM-based lifestyle interventions among adults with T2DM were reviewed. Studies were excluded if TCM-based lifestyle interventions were only part of the intervention regimen. Two reviewers independently selected studies according to pre-specified inclusion and exclusion criteria and appraised the risk of bias of the included studies. One reviewer extracted details of the included studies and the second reviewer checked the extracted data critically. When feasible, data were statistically pooled for meta-analysis. Otherwise, narrative summaries were used. RESULTS: Twenty-four studies were included. The pooled analysis of the eight studies on tai chi showed tai chi practice for at least 150min per week was beneficial in lowering glycosylated hemoglobin (mean difference, -1.48%; 95%CI, -2.58% to -0.39%; p<0.001). Tai chi was effective in reducing fasting blood glucose (mean difference, -1.14mmol/L; 95%CI, -1.78 to -0.50mmol/L; p<0.001) and body mass index (mean difference, -0.62; 95%CI, -1.14 to -0.11; p=0.02), and improving quality of life. The effects of tai chi on blood pressure and waist circumference were inconclusive due to the limited number of studies. The meta-analysis of the 12 studies on ba duan jin demonstrated beneficial effects on glycosylated hemoglobin (mean difference, -0.77%; 95%CI, -0.97% to -0.56%; p<0.001), fasting blood glucose (mean difference, -0.82mmol/L; 95%CI, -1.05 to -0.59mmol/L; p<0.001), body mass index (mean difference, -2.77; 95%CI, -4.11 to -1.43; p<0.001), and depression (mean difference, -4.53; 95%CI, -7.12 to -1.94; p<0.001). Conclusions on the effects of ba duan jin on quality of life cannot be drawn because only two studies measured the outcome. Evidence regarding the effectiveness of other TCM-based lifestyle interventions is limited. CONCLUSIONS: Tai chi and ba duan jin are potentially effective options for individuals with T2DM to improve biomedical and psychosocial well-being. Further well-designed studies are needed to explore the optimal intervention dose and to investigate the effectiveness of other TCM-based lifestyle interventions.
<b>Last Search Date:</b> Dec-16	
<b>Total # studies included:</b> 20 RCTs or CCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles; QOL and depression measures; behavioral outcomes	
<b>Populations Analyzed:</b> Adults (≥18 years old) with a clinical diagnosis of T2DM	<b>Author-Stated Funding Source:</b>

<b>Citation:</b> Zhou Z, Zhou R, Li K, et al. Effects of tai chi on physiology, balance and quality of life in patients with type 2 diabetes: A systematic review and meta-analysis. J Rehabil Med. 2019;51(6):405-17. PMID: 30968941. 10.2340/16501977-2555	
<b>Purpose:</b>	<b>Abstract:</b>
<b>Last Search Date:</b> Mar-18	<p>OBJECTIVE: To systematically synthesize and critically evaluate evidence on the effects of tai chi for patients with type 2 diabetes mellitus. DATA SOURCES: Seven electronic databases (Wan Fang, SinoMed, China National Knowledge Infrastructure, VIP, PubMed, Embase, and Cochrane Library) were systematically searched from their inception to March 2018. STUDY SELECTION: Randomized controlled trials investigating the effects of tai chi on individuals with type 2 diabetes mellitus were eligible. DATA EXTRACTION: Biomedical outcomes (fasting plasma glucose, glycosylated haemoglobin (HbA1c), fasting insulin, insulin resistance, body mass index, total cholesterol, blood pressure) as well as balance and quality of life-related outcomes were extracted independently by 2 reviewers. Stata 12.0 software was used to synthesize data if there was no or moderate heterogeneity across studies. Otherwise, narrative summaries were performed. DATA SYNTHESIS: A total of 23 studies (25 articles) involving 1,235 patients were included in this meta-analysis. Significant changes in tai chi-related effects were observed in lowering fasting plasma glucose (standardized mean difference; SMD -0.67; 95% confidence interval (95% CI) -0.87 to -0.47; p &lt;0.001), HbA1c (mean difference; MD-0.88%; 95% CI -1.45% to -0.31%; p =0.002) and insulin resistance (MD -0.41; 95% CI -0.78 to -0.04; p = 0.029). Beneficial effects of tai chi were also found in decreasing body mass index (MD -0.82 kg/m<sup>2</sup>; 95% CI -1.28 to -0.37 kg/m<sup>2</sup>; p &lt; 0.001) and total cholesterol (SMD -0.59; 95% CI -0.90 to -0.27; p &lt; 0.001). In addition, tai chi reduced blood pressure (systolic blood pressure (MD -10.03 mmHg; 95% CI -15.78 to -4.29 mmHg; p = 0.001), diastolic blood pressure (MD -4.85 mmHg; 95% CI -8.23 to -1.47 mmHg; p = 0.005)) and improved quality of life-related outcomes (physical function (MD 7.07; 95% CI 0.79-13.35; p = 0.027), bodily pain (MD 4.30; 95% CI 0.83-7.77; p = 0.015) and social function (MD 13.84; 95% CI 6.22-21.47; p &lt; 0.001)). However, no impact was exerted on fasting insulin (SMD -0.32; 95% CI -0.71 to 0.07; p = 0.110) or balance (MD 2.71 s; 95% CI -3.29 to 8.71 s; p = 0.376). CONCLUSION: Tai chi is effective in controlling biomedical outcomes and improving quality of life-related outcomes in individuals with type 2 diabetes mellitus, although no effects were observed on balance and fasting insulin. Further high-quality research is needed to elucidate the effects of different types of tai chi, the long-term effects of tai chi, the impact on respiratory function, and the association between tai chi and the risk of developing type 2 diabetes mellitus in healthy individuals.</p>
<b>Total # studies included:</b> 23 RCTs	
<b>Other details (e.g. definitions used, exclusions etc)</b>	
<b>Outcomes addressed:</b> Glycemic control, body composition, blood pressure, or lipid profiles, QOL	
<b>Populations Analyzed:</b> Patients diagnosed with T2DM age > 18 years	<b>Author-Stated Funding Source:</b>