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Comparative efficacy and acceptability of different exercise patterns for reducing cardiovascular events in pre-diabetes: protocol for a systematic review and network meta-analysis of randomised controlled trials

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ABSTRACT

Introduction Exercise has been used to reverse dysglycaemic states in patients with pre-diabetes. Systematic reviews show that exercise is an effective way to reduce the incidence of diabetes, but there is conflicting evidence for reducing the occurrence of cardiovascular events. Therefore, we present a systematic review and network meta-analysis protocol designed to compare the effectiveness of different forms of exercise in reducing cardiovascular events and their tolerability in different populations.

Methods and analysis We will include all randomised controlled trials and compare one exercise intervention to another. We will compare the following exercise patterns: standard endurance training, strength training, high-intensity interval training, mind-body exercise, and mixed strength and aerobic training. The primary outcomes are the occurrence of major cardiovascular events and the rate of patient attrition during the intervention. We will search major English and Chinese databases as well as trial registry websites for published and unpublished studies. All reference selection and data extraction will be conducted by at least two independent reviewers. We will conduct a random effects model to combine effect sizes and use the surface under the cumulative ranking curve and the mean ranks to rank the effectiveness of interventions. All data will be fitted at WinBUGS in a Bayesian framework and correlation graphs will be plotted using StataSE 14. We will also use the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework to evaluate the quality of evidence for the study results.

Ethics and dissemination This study does not involve a population-based intervention, and therefore, does not require ethical approval. We will publish the findings of this systematic review in a peer-reviewed scientific journal, and the dataset will be made available free of charge. The completed review will be disseminated electronically in print and on social media, where appropriate.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ We will conduct a random-effects network meta-analysis to synthesise all available evidence (either published or unpublished) for each prespecified outcome and obtain a comprehensive ranking of all treatments.
⇒ We will use subgroup analysis to evaluate the population for which the intervention is applicable and we will explore whether treatment effects are robust in network meta-regression.
⇒ There was considerable heterogeneity among studies, such as the intensity and frequency of exercise and the duration of follow-up, which may affect the transferability of evidence.
⇒ Limitations will be addressed through rigorous intervention predefinition and subgroup analysis, and the quality of evidence for network estimates of the primary outcome will be assessed using the GRADE framework.

PROSPERO registration number CRD42023422737.

BACKGROUND

Pre-diabetes is a high-risk state for developing diabetes, including impaire fasting glucose(IFG) and/or impaired glucose tolerance (IGT). 5%–10% of people with pre-diabetes will develop diabetes every year.[1] The global prevalence of pre-diabetes is expected to reach 730 million by 2045.[2] Pre-diabetes is associated with nephropathy, neuropathy, retinopathy, cardiovascular disease (CVD) and death.[1 3–7] Pre-diabetes is an independent risk factor for CVD.[8] Meta-studies have shown that pre-diabetes increases the risk of cardiovascular events and all-cause mortality.[9 10] In particular, compared with patients with

abnormal fasting glucose, patients with IGT are at increased risk of coronary heart disease (CHD), stroke and all-cause mortality.

Exercise has several health benefits, including lowering blood pressure, improving insulin sensitivity, the lipoprotein profile, C reactive protein, and other CHD biomarkers, and helping with weight management.[11] Additionally, it can lower the chance of having a stroke, type 2 diabetes, CHD and several types of cancer. The Daqing study[12] showed that lifestyle interventions (eg, healthy diet and exercises) in people with IGT delayed the onset of type 2 diabetes, reduced the incidence of cardiovascular events, microvascular complications, cardiovascular and all-cause mortality, and increased life expectancy.

Current forms of exercise interventions for diabetes prevention include aerobic exercise, resistance exercise, high-intensity interval training (HIIT) and traditional Chinese exercise.[13 14] However, conclusions on the optimal form of exercise are inconsistent.[14 15] A multicentre randomised trial noted[16] that the combination of moderate-intensity aerobic and resistance training for 24 months reduced the 10-year risk of CVD in patients with pre-diabetes. It is believed that vigorous-intensity exercise is associated with greater risk reductions for CVD and all-cause mortality compared with moderate-intensity activity of similar energy expended.[11] Ma *et al* noted[17] that the Chinese traditional exercise Baduanjin was comparable to moderate-intensity aerobic exercise in reducing cardiovascular complications in patients with pre-diabetes. Also, recommendations for the optimal duration of exercise for different exercise forms are not clear.[13 17]

Previous systematic evaluations have only evaluated the association of exercise with the reduction of diabetes risk,[14 15] and fewer systematic reviews have reviewed the reduction of the risk of developing CVD. Second, the risk of cardiovascular events in patients with IGT is inconsistent with that in patients with IFG,[9 10] and a review of the indications for different forms of exercise is needed. In addition, the risk of CVD in patients with pre-diabetes differs by ethnicity,[9] requiring individualised recommendations for forms of exercise.[18] Therefore, this systematic review and network meta-analysis aimed at comparing the effectiveness of different forms of exercise interventions in preventing the development of CVD in patients with pre-diabetes and their tolerability among different populations, to better guide clinical practice. We used the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) checklist when writing our report.[19]

METHODS AND ANALYSIS

Criteria for considering studies for this review

Types of studies

All reports of randomised controlled trials (RCTs) comparing one mode of exercise to another or no exercise intervention will be included. The duration of the intervention should be at least 4 weeks. Only studies with a single exercise intervention will be included; therefore, RCTs combined with dietary therapy or pharmacological therapy will be excluded. Conference proceedings, case reports, quasi-experimental studies, study protocols, reviews, systematic evaluations and meta-analyses will be excluded. Studies with incomplete data information, studies with no reported data or studies in which the specific incidence of relative risk (RR) values with 95% confidence intervals (CIs) or indices could not be calculated will be excluded. For duplicate publications, we will include only the most informative reports with the most complete data, and the rest will be excluded. Studies with randomisation failure (eg, incorporate patient preferences, no randomisation process and only baseline comparability) and significant differences in baseline data between groups will be excluded.

Types of participants

Patients aged 18 years or older, of both sexes, with a diagnosis of pre-diabetes, will be included according to the diagnostic criteria of the World Health Organization (WHO).[20] Patients with a diagnosis of diabetes in the study, including children and elderly (≥80 years) and pregnant women, will be excluded.

Types of interventions

We grouped exercise patterns into several named exercise categories: standard endurance training, strength training, HIIT, mind-body exercise, and mixed strength and aerobic training. See online supplemental table 1 for more details.

Considering the dose–response correlation between exercise volume and health outcomes, if the study refers to exercise intensity, it will be classified as follows according to Garber[11]: light: the percentages of heart rate reserve (%HRR) or oxygen uptake reserve ($\%VO_2R$) 30%–40%; moderate: %HRR or $\%VO_2R$ 40%–60%; vigorous: %HRR or $\%VO_2R$ 60%–90%; near maximal: %HRR or $\%VO_2R$>90 percent. If the study does not mention %HRR or $\%VO_2R$, we will classify them as moderate-intensity exercise and vigorous-intensity exercise according to MacIntosh *et al*[21] as follows: moderate-intensity exercise, such as walking briskly, dancing, playing doubles tennis, or raking the yard, slow and swimming, and vigorous-intensity such as jogging, running, carrying heavy groceries or other loads upstairs, shovelling snow, or participating in a strenuous fitness class, and fast swimming.

Considering that researchers often compare high-intensity interval exercise with moderate-intensity continuous training (MICT),[22 23] we will also search for MICT in order not to omit some important literature. Figure 1 shows a comparison network of eligible interventions.

Outcome measures

Primary outcomes

- The occurrence of cardiovascular events which is defined as cardiovascular death or major cardiovascular events (for studies ≥1 year), including myocardial infarction, stroke, transient ischaemic attack, coronary interventions (including stent thrombosis),

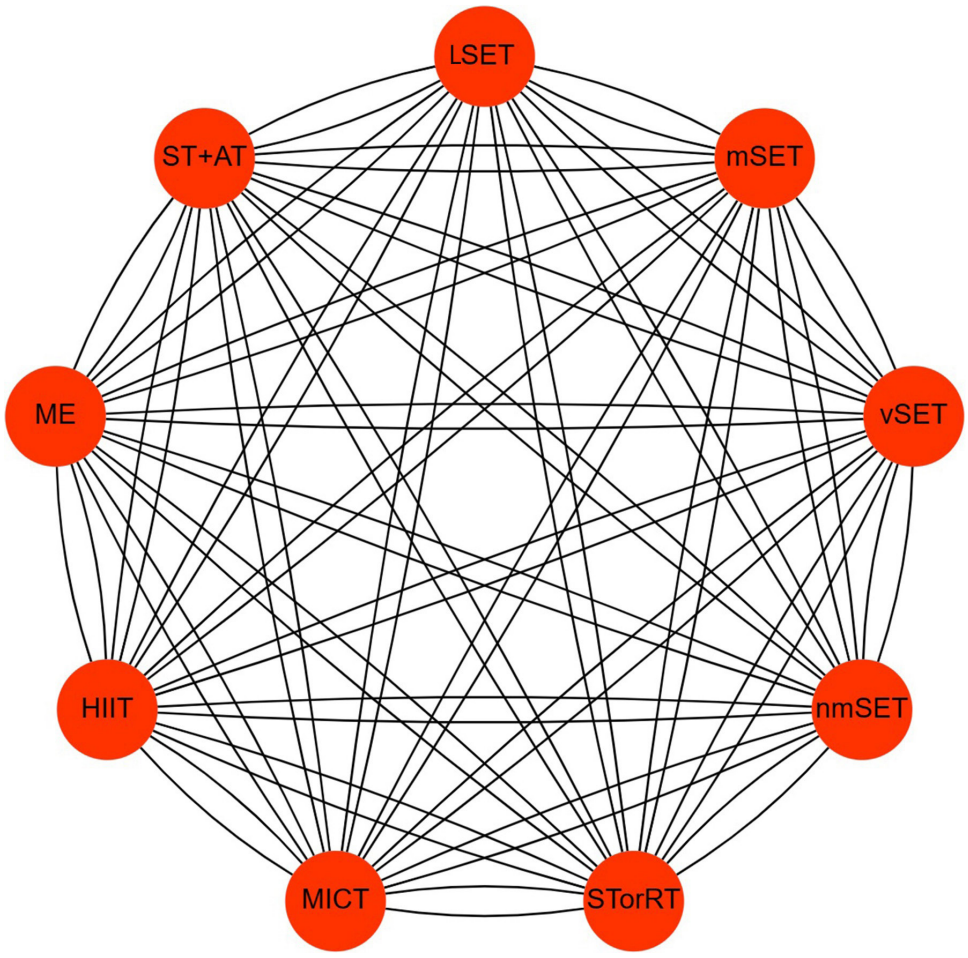

Figure 1 Network diagram of all possible pairwise comparisons. HIIT, high-intensity interval training; LSET, light-intensity standard endurance training; ME, mind-body exercise; MICT, moderate-intensity continuous training; mSET, moderate-intensity standard endurance training; nmSET, near maximal-intensity standard endurance training; ST+AT, mixed strength and aerobic training; STorRT, strength training or resistance training; vSET, vigorous-intensity standard endurance training.

peripheral vascular interventions, hospitalisation for unstable angina and acute heart failure, according to cardiovascular endpoints developed by American College of Cardiology.[24]

- Tolerability of treatment.

The proportion of patients who leave the study early due to any events. (for studies ≥4 weeks).

Secondary outcomes

Total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, systolic blood pressure, diastolic blood pressure, Hemoglobin A1c(HbA1c) levels, fasting glucose, body mass index and waist circumference (for studies ≥3 months).

Search strategy and study selection

We will search in Medline, Cochrane Library, Ovid, Embase, Web of Science, PubMed, China National Knowledge Infrastructure(CNKI), VIP, SinoMed and Wanfang databases from the date of their inception to 1 June 2023. Searches will also be performed on ClinicalTrials.gov and www.chictr.org.cn. Before publication, updated articles will be retrieved again and data will be updated. The languages of the publication are Chinese and English. The search is conducted in Chinese and English. Two reviewers will search and review studies independently and discrepancies will be discussed and judged by a third reviewer. Specific search strategies are described in online supplemental material.

Data extraction

The EndNote V.X9 file management software will be applied. First, the retrieved articles will be imported into the software for preliminary screening to eliminate duplicate documents. Second, two reviewers will screen the abstracts and titles of the retrieved literature back-to-back according to the inclusion criteria, exclude literature that does not meet the criteria and then cross-check the screening results. Differences will be resolved through discussion and consultation. If agreement cannot be reached, a third reviewer should step in to make the final decision. Finally, the full text of the qualified study will be available, and the reviewer will review the full text again and exclude literature that does not meet the criteria. Two reviewers will read each article independently, assess

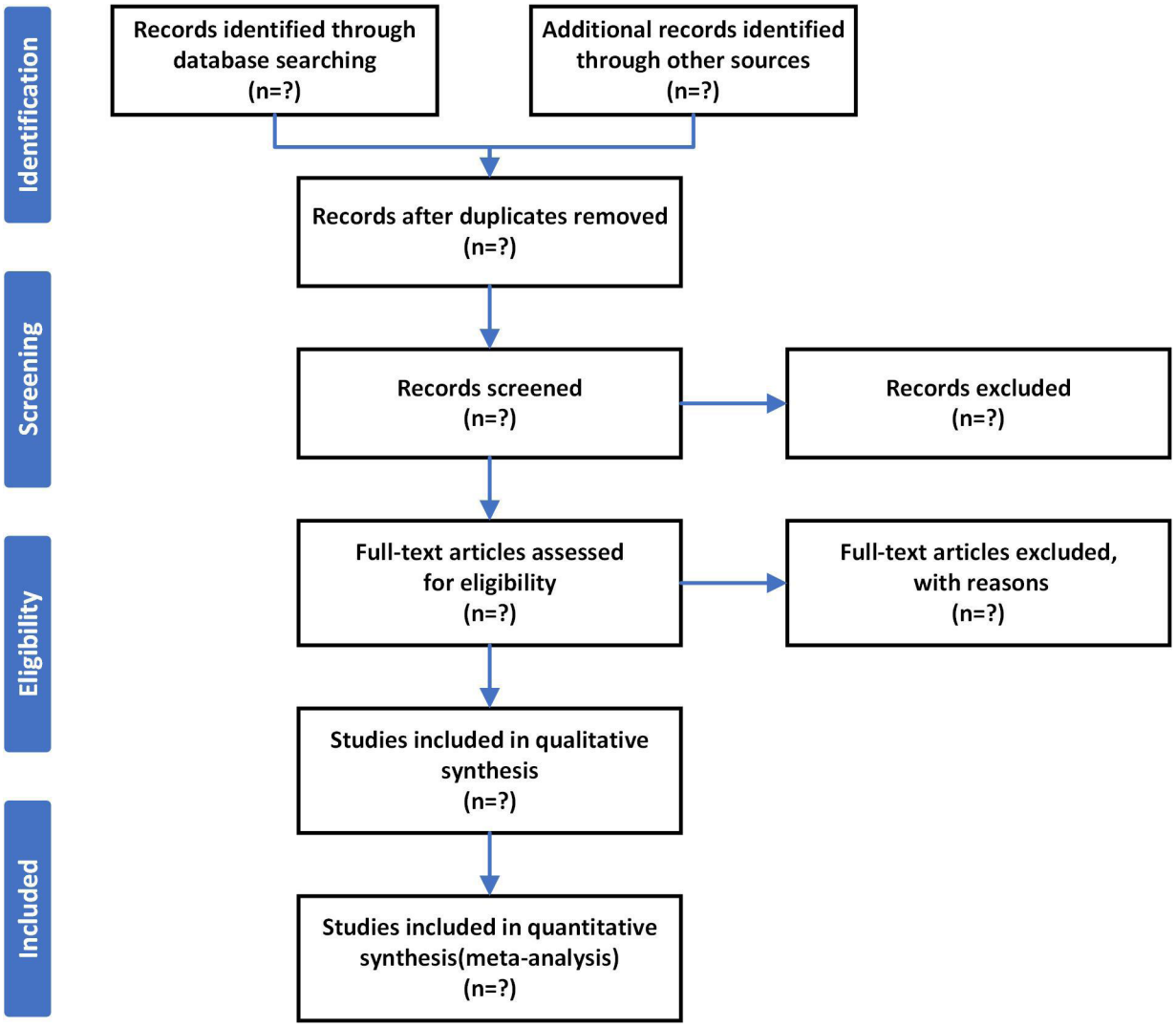

Figure 2 Flow chart for research retrieval and inclusion.

the integrity of the data and give a quality rating. The flow chart (figure 2) outlines the inclusion steps and exclusion reasons for full-text retrieval.

Structured data extraction tables will be designed and used to ensure the consistency of information and assessment for each study. The extracted information will include study characteristics (eg, lead author, year of publication and journal), participant characteristics (eg, pre-diabetes diagnostic criteria, age, sex, region, ethnicity), intervention details (eg, type of exercise, intensity, frequency, duration and monitoring) and the aforementioned outcome measures (see figure 3 for more details). Two reviewers will determine if the data are correctly entered into the final data set.

Dichotomous outcomes

RR value will be used as the effect value. When only odds ratio(OR) values were given in the study, RR=OR/[(1−pRef)+(pRef*OR)] will be used to transform it into no RR value, Where pRef indicates the incidence of the outcome of interest in the control group, and then the effect value will be combined.[25]

Continuous outcomes

Standardized mean difference(SMD) will be used as the effect value. Mean, standard deviation(SD) and randomised patient numbers for each study group will be extracted. If the mean and its SD are not recorded, the author will be asked to provide the data. When standard error (SE), t-statistics or p values are reported, these will be converted to SD. When only the median is given in the study, the Box-Cox method will be used to convert it to the mean.[26]

Missing outcome data

The occurrence of prediabetic cardiovascular events was the result of long-term follow-up.[9] Therefore, for the dichotomous outcome, that is, the occurrence of cardiovascular events, we will treat different missing values based on the study follow-up time: (1) For studies with a follow-up time of <3 years, we will apply the impute missing=no event (0) scenario (Imputed case analysis-0,I-CA-0), assuming that all missing participants did not experience this event in both the experimental and control groups. (2) For studies with follow-up time >3 years, we

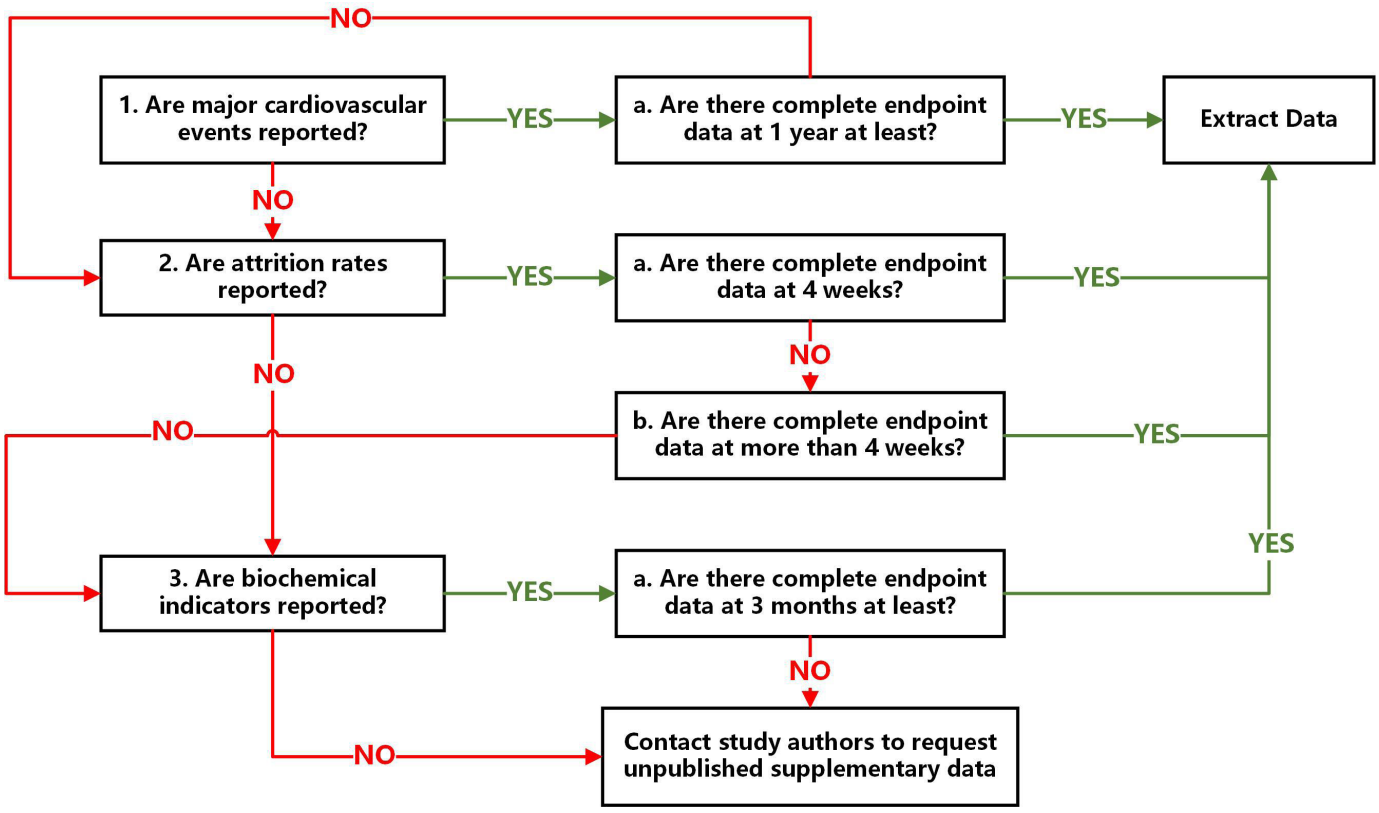

Figure 3 Decision-tree for data extraction.

will apply the impute missing=event (1) scenario (ICA-1), assuming that all missing participants experienced this event in both the experimental and control groups.[27] For continuity variables, missing data will be processed using the last observation carried forward[28] and filled in based on the last observation or baseline data.

Length of trial

It is believed that the occurrence of cardiovascular events depends on long-term follow-up.[12] Therefore, this systematic review will combine studies with long-term follow-up conditions (≥1 year) to determine the incidence of cardiovascular events, and if the studies have large variability in follow-up time, we will eliminate the direct combination or use subgroup analysis.

Risk of bias and quality appraisal

We will assess the risk of bias using the Cochrane Risk of Bias tool (2011).[29] The assessment will be conducted by two independent researchers. If the researchers disagree, the final rating will be made by consensus with the involvement (if necessary) of another member of the review group. We will assess the risk of bias in the following domains: generation of allocation sequence, allocation concealment, blinding of study personnel and participants, blinding of outcome assessor, attrition, selective outcome reporting and other domains, including sponsorship bias. If adequate details of the trial assignment, withholding and other characteristics are not provided, the trial author may be contacted for further information. The risk of bias can be divided into low bias risk, high bias risk or uncertain bias risk. The overall bias risk of the study should be evaluated according to the influence of the bias risk items on the outcome indicators.

We will also assess the quality of evidence with the GRADE approach extended to network meta-analysis.[30] The GRADE approach leads to judgements about the confidence with which an estimate of treatment effect for a particular outcome can be believed, using four levels: high, moderate, low and very low. The GRADE framework characterises the quality of evidence in terms of study limitations, inconsistency, indirectness, imprecision and publication bias. For each component, the quality of the evidence can be maintained or downgraded by up to two levels, subject to a maximum downgrade by three levels (to very low quality) across the five components.

Statistical synthesis of study data

Characteristics of included studies and information flow in the network

It is necessary to generate descriptive statistics of the trials, and study population characteristics in all eligible trials, describing the type of comparison and some important variables, either clinical or methodological (eg, year of publication, mean age difference of subjects, gender, sponsorship and clinical setting, and journal of publication).

The available evidence will be presented in the network plot. The size of the nodes will reflect the amount of

evidence accumulated for each treatment (total number of patients), the width of each edge will be proportional to the inverse of the variance of the summary effect for each direct treatment comparison and the colour of each edge will represent the risk of bias (low, moderate or high, as defined in the Risk of bias and quality appraisal section).

Model implementation

We will perform all analyses within WinBUGS and StataSE 14. Our study will synthesise evidence through Bayesian network meta-analysis in a random effect model, and Markov Chain Monte Carlo sampling will be performed by using WinBUGS. We will check convergence evaluating the mixing of two chains, after discarding the first 10 000 iterations. Analyses for statistical evaluation of the inconsistency and production of network graphs and result figures will be carried out in Stata using the network command[31] and mvmeta command.[32]

Pairwise meta-analyses

In network meta-analysis, we will use group-level data. The binomial likelihood will be used for dichotomous outcomes and the normal likelihood for continuous outcomes. For all direct comparisons, when two or more RCTs are available, we will perform a conventional pairwise meta-analysis using a DerSimonian and Laird random effects model.[33] For dichotomous outcome indicators, the effect value RR will be used for evaluation, and for continuous outcome indicators, the SMD will be used for evaluation. The forest graph will show the effect value and 95% Credible interval (CrI).

Assessment of the transitivity assumption

The assumption of transitivity that indirect comparison validly estimates the unobserved head-to-head comparison cannot be tested statistically, but its plausibility can be evaluated conceptually and epidemiologically.[34] We will ensure that the treatment protocols as nodes are similar in terms of intervention settings, such as the type, duration and frequency of exercise. Also, some effect modifiers, such as gender distribution and age distribution of the study population, will be fully considered to improve transitivity.

Assessment of statistical heterogeneity and inconsistency

To evaluate the presence of heterogeneity and inconsistency in the entire network, we will use the I^2 statistic and visual inspection of the forest plots to assess heterogeneity in direct comparisons. The assumption of consistency that the direct and indirect estimates are in agreement is a prerequisite to calculating a valid mixed estimate.[34] We will apply the 'node-splitting' method suggested by Dias *et al*.[35]

Exploring heterogeneity and inconsistency and sensitivity analyses

We will evaluate the presence of clinical and methodological heterogeneity through subgroup and sensitivity analyses. We will explore whether treatment effects for the two primary outcomes are robust in subgroup analyses and network meta-regression using the following characteristics: (1) different diagnostic criteria for pre-diabetes: The group with IFG, the group with IGT,and the group with both (IFG and IGT); (2) duration of intervention: short-term intervention (≤3 months), medium-term intervention (3 months to 1 year), long-term intervention (≥1 year); (3) ethnicity: Asians versus non-Asians; (4) follow-up duration: ≤3 years vs ≥3 years. We will conduct sensitivity analyses on (1) only studies with reported RR and SD rather than imputed; (2) only studies with low risk of bias (as defined in the Risk of bias and quality appraisal section) and (3) only head-to-head studies. When the heterogeneity of the study is high and the cause can not be found by subgroup analysis or meta-regression, we will abandon the integration and conduct a descriptive analysis of the study.

Selection bias

We will search trial registry websites to identify completed trials not published elsewhere to minimise or identify publication bias. For all direct comparisons informed by 10 studies or more, we will assess small study effects using Harbord's test,[36] and we will use the comparison-adjusted and contour-enhanced funnel plots to investigate whether results in imprecise trials differ from those in more precise trials.

Network meta-analyses

The Markov Chain Monte Carlo method based on the Bayesian framework will be used for calculation and statistics, and WinBUGS will be used for implementation. For all outcomes, the analysis will generate RRs with 95% CrI as the summary measure. To estimate ranking probabilities, we will use the surface under the cumulative ranking curve and the mean ranks. In general, the largest contribution to each network estimate is provided by the respective direct evidence, but when direct evidence is missing or imprecise, more information is obtained indirectly. Therefore, to understand which are the most influential comparisons in the network and how direct and indirect evidence influences the final pooled data, we will use a contribution matrix that describes the percentage contribution of each direct meta-analysis to the overall body of evidence. All graphs will be implemented in StataSE 14.

Patient and public involvement

None.

Ethics and dissemination

This study does not involve a population-based intervention, and therefore, does not require ethical approval. We will publish the findings of this systematic review in a peer-reviewed scientific journal, and the dataset will be made available free of charge. The completed review will be disseminated electronically in print and on social media, where appropriate.

Contributors YZhong designed the study and drafted the protocol, designed and will conduct the literature search with YZhang; YC and HC will conduct the literature exclusion and assist with data extraction and analysis, and YZhong and YC will draft the results and discussion section. ML provided input to the work on the manuscript, designed the analysis plan and will conduct the statistical analysis.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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Supplementary T1 Description of named exercise patterns category used in this systematic review	
Named exercise pattern category	**Description**
Standard endurance training	It is often considered aerobic exercise and includes any activity that develops cardiovascular and lung health. Moreover, if there is not enough literature on moderate-intensity continuous training (MICT), it will be included under this category. **Examples** include walking, incline treadmill walking, jogging, running, cycling, swimming, and hiking.
	Frequency ≥5 d/wk of moderate exercise, or ≥3d/wk of vigorous exercise, or a combination of moderate and vigorous exercise on ≥3-5 d/wk **Time** 30–60min/d (150 min/wk) of purposeful moderate exercise, or 20–60 min/d (75 min/wk) of vigorous exercise, or a combination of moderate and vigorous exercise per day
Strength or resistance training	Strength training is often referred to in medical and exercise physiology literature as resistance training. Any form of exercise that challenges the muscles' ability to produce force can serve as a form of strength training. Examples Bodyweight training, like push-ups, pull-ups, crunches, uploaded squats (squats), lunges, dips, and back extensions; resistance bands; Weight training machines (machine-based training); Dumbbells and kettlebells and Barbell training.
	Frequency Each major muscle group should be trained on 2–3 d/wk **Time** No specific duration of training
High-intensity interval training (HIIT)	High-intensity interval training (HIIT) consists of intermittent, usually regularly timed, bouts of high-intensity activity alternating with short recovery periods of lower exercise intensity or complete rest[1]. The goal of HIIT is to obtain a high overall training load with a low total exercise volume. **Examples** A full HIIT routine usually consists of a 5-10 minute warm-up, 4*4 HIIT, and a cool-down period. Heart rate should be 80-90% HR_{max} during 1-4 minutes of high-intensity exercise, followed by a 3-minute interval when heart rate should be 60% HR_{max}. It ends with a 3-5 minute cool-down period. HIIT can be integrated into various forms of exercise such as running, dancing, rowing, biking, or stair climbing. Intervals are timed by using a one to five-minute music track for the intervals.
	Intensity 80%-95%HR_{max}(HR_{max} =211-(0.64*age)) **Frequency** ≥3 d/wk **Time** ≥30min/d
Mind-body exercise* (or Flexibility training and balance exercise)	Flexibility exercise and balance exercise are two of the four types of exercise along with strength and endurance. Flexibility exercises stretch your muscles and can help your body stay flexible. Balance exercises can help prevent falls. In research, the two kinds are often difficult to distinguish. For example, yoga and tai chi can improve balance as well as flexibility. Tai Chi is one of the Chinese traditional exercises. Some studies categorize both types of exercise as mind-body activities[2]. Therefore, in this study, mind-body exercise is used instead of flexibility training and balance exercise. Examples Including yoga, Pilates, tai chi, Zumba, and similar types of activity that

	focus on improving mobility and muscular endurance.
	Frequency ≥2-3 d/wk **Time** ≥20-30 min/d
Mixed strength and aerobic training	This method is sometimes referred to as "circuit training". The main part of each mixed session was divided into two stages, including resistance training for all major muscle groups while using short recovery periods and sustained activity to work the aerobic system[3]. **Examples** The strength exercises are designed to train the whole-body muscle groups for about 30-40 seconds each, interspersed with 30 seconds of aerobic exercise, as described above. Participants move quickly from one exercise to the next, with 15-30 seconds of rest between stations.
	Frequency ≥2 d/wk **Time** 30-50min/d

* Chinese traditional exercises (TCEs) originating from ancient dance, is a gentle aerobic exercise and also reflects the traditional mind-body understanding. Therefore, it was included in the classification of Mind-body exercise in this study. TCEs mainly include Qigong, Taiji, Baduanjin, Wuqinxi and Yijinjing.[4]

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3. Romero-Arenas S, Martínez-Pascual M, Alcaraz PE. Impact of Resistance Circuit Training on Neuromuscular, Cardiorespiratory and Body Composition Adaptations in the Elderly. *Aging Dis*. 2013;4(5):256-263. doi:10.14336/AD.2013.0400256
4. Yu DD, You LZ, Huang WQ, et al. Effects of traditional Chinese exercises on blood glucose and hemoglobin A1c levels in patients with prediabetes: A systematic review and meta-analysis. *J Integr Med*. 2020;18(4):292-302. doi:10.1016/j.joim.2020.04.003

Databases and related search strategies

1.Pubmed

#1	Prediabetic State [mh] OR Prediabetic States[tiab] OR State, Prediabetic[tiab] OR States, Prediabetic[tiab] OR Prediabetes[tiab] OR prediabetic[tiab] OR prediabetics[tiab] OR pre-diabetes[tiab] OR prediabetic state[tiab] OR pre diabetes[tiab] OR impaired fasting glucose[tiab] OR impaired glucose tolerance[tiab] OR impaired glucose regulation[tiab] OR IGT[tiab] OR IFG[tiab] OR IGR[tiab]
#2	glucose intolerance [mh] OR Glucose Intolerances[tiab] OR Intolerance, Glucose[tiab] OR Intolerances, Glucose[tiab] OR Impaired Glucose Tolerance[tiab] OR Glucose Tolerance, Impaired[tiab] OR Glucose Tolerances, Impaired[tiab] OR Impaired Glucose Tolerances[tiab] OR Tolerance, Impaired Glucose[tiab] OR Tolerances, Impaired Glucose [tiab]
#3	#1 OR #2

#4	Exercise[mh] OR Physical Activity[tiab] OR Activities, Physical[tiab] OR Activity, Physical[tiab] OR Physical Activities[tiab] OR Exercise, Physical[tiab] OR Exercises, Physical[tiab] OR Physical Exercise[tiab] OR Physical Exercises[tiab] OR Acute Exercise[tiab] OR Acute Exercises[tiab] OR Exercise, Acute[tiab] OR Exercises, Acute[tiab] OR Exercise, Isometric[tiab] OR Exercises, Isometric[tiab] OR Isometric Exercises[tiab] OR Isometric Exercise[tiab] OR Exercise, Aerobic[tiab] OR Aerobic Exercise[tiab] OR Aerobic Exercises[tiab] OR Exercises, Aerobic[tiab] OR Exercise Training[tiab] OR Exercise Trainings[tiab] OR Training, Exercise[tiab] OR Trainings, Exercise[tiab]
#5	Muscle Stretching Exercises[mh] OR Exercise, Muscle Stretching[tiab] OR Muscle Stretching Exercise[tiab] OR Static Stretching[tiab] OR Stretching, Static[tiab] OR Active Stretching[tiab] OR Stretching, Active[tiab] OR Static-Active Stretching[tiab] OR Static Active Stretching[tiab] OR Stretching, Static-Active[tiab] OR Isometric Stretching[tiab] OR Stretching, Isometric[tiab] OR Ballistic Stretching[tiab] OR Stretching, Ballistic[tiab] OR Dynamic Stretching[tiab] OR Stretching, Dynamic[tiab] OR Proprioceptive Neuromuscular Facilitation (PNF) Stretching[tiab] OR PNF Stretching[tiab] OR PNF Stretchings[tiab] OR Stretching, PNF[tiab] OR PNF Stretching Exercise[tiab] OR Exercise, PNF Stretching[tiab] OR PNF Stretching Exercises[tiab] OR Stretching Exercise, PNF[tiab] OR Proprioceptive Neuromuscular Facilitation[tiab] OR Neuromuscular Facilitation, Proprioceptive[tiab] OR Proprioceptive Neuromuscular Facilitations[tiab] OR Passive Stretching[tiab] OR Stretching, Passive[tiab] OR Relaxed Stretching[tiab] OR Stretching, Relaxed[tiab] OR Static-Passive Stretching[tiab] OR Static Passive Stretching[tiab] OR Stretching, Static-Passive[tiab]
#6	Physical Conditioning, Human[mh] OR Conditioning, Human Physical[tiab] OR Human Physical Conditioning[tiab] OR Physical Training, Human[tiab] OR Human Physical Training[tiab] OR Training, Human Physical[tiab]
#7	Circuit-Based Exercise[mh] OR Circuit Based Exercise[tiab] OR Circuit-Based Exercises[tiab] OR Exercise, Circuit-Based[tiab] OR Exercises, Circuit-Based[tiab] OR Circuit Training[tiab] OR Training, Circuit[tiab]
#8	Endurance Training[mh] OR Training, Endurance[tiab]
#9	Plyometric Exercise[mh][tiab] OR Exercise, Plyometric[tiab] OR Exercises, Plyometric[tiab] OR Plyometric Exercises[tiab] OR Plyometric Drill[tiab] OR Drill, Plyometric[tiab] OR Drills, Plyometric[tiab] OR Plyometric Drills[tiab] OR Plyometric Training[tiab] OR Plyometric Trainings[tiab] OR Training, Plyometric[tiab] OR Trainings, Plyometric[tiab] OR Stretch-Shortening Exercise[tiab] OR Exercise, Stretch-Shortening[tiab] OR Exercises, Stretch-Shortening[tiab] OR Stretch Shortening Exercise[tiab] OR Stretch-Shortening Exercises[tiab] OR Stretch-Shortening Cycle Exercise[tiab] OR Cycle Exercise, Stretch-Shortening[tiab] OR Cycle Exercises, Stretch-Shortening[tiab] OR Exercise, Stretch-Shortening Cycle[tiab] OR Exercises, Stretch-Shortening Cycle[tiab] OR Stretch Shortening Cycle Exercise[tiab] OR Stretch-Shortening Cycle Exercises[tiab] OR Stretch-Shortening Drill[tiab] OR Drill, Stretch-Shortening[tiab] OR Drills, Stretch-Shortening[tiab] OR Stretch Shortening Drill[tiab] OR Stretch-Shortening Drills[tiab]
#10	High-Intensity Interval Training[mh] OR High Intensity Interval Training[tiab] OR High-Intensity Interval Trainings[tiab] OR Interval Training, High-Intensity[tiab] OR Interval Trainings, High-Intensity[tiab] OR Training, High-Intensity Interval[tiab] OR Trainings, High-Intensity Interval[tiab] OR High-Intensity Intermittent Exercise[tiab] OR Exercise, High-Intensity Intermittent[tiab] OR Exercises, High-Intensity Intermittent[tiab] OR High-Intensity Intermittent Exercises[tiab] OR Sprint Interval Training[tiab] OR Sprint Interval Trainings[tiab]
#11	Resistance Training[mh] OR Training, Resistance[tiab] OR Strength Training[tiab] OR Training,

	Strength[tiab] OR Weight-Lifting Strengthening Program[tiab] OR Strengthening Program, Weight-Lifting[tiab] OR Strengthening Programs, Weight-Lifting[tiab] OR Weight Lifting Strengthening Program[tiab] OR Weight-Lifting Strengthening Programs[tiab] OR Weight-Lifting Exercise Program[tiab] OR Exercise Program, Weight-Lifting[tiab] OR Exercise Programs, Weight-Lifting[tiab] OR Weight Lifting Exercise Program[tiab] OR Weight-Lifting Exercise Programs[tiab] OR Weight-Bearing Strengthening Program[tiab] OR Strengthening Program, Weight-Bearing[tiab] OR Strengthening Programs, Weight-Bearing[tiab] OR Weight Bearing Strengthening Program[tiab] OR Weight-Bearing Strengthening Programs[tiab] OR Weight-Bearing Exercise Program[tiab] OR Exercise Program, Weight-Bearing[tiab] OR Exercise Programs, Weight-Bearing[tiab] OR Weight Bearing Exercise Program[tiab] OR Weight-Bearing Exercise Programs[tiab]
#12	Running[mh] OR Runnings[tiab]
#13	Jogging[mh] OR joggings[tiab]
#14	Marathon Running[mh] OR Running, Marathon[tiab] OR Marathons[tiab] OR Marathon[tiab] OR Ultramarathon Running[tiab] OR Running, Ultramarathon[tiab]
#15	Swimming[mh]
#16	Walking[mh] OR Ambulation[tiab]
#17	Nordic Walking[mh] OR Walking, Nordic[tiab] OR Pole Walking[tiab] OR Walking, Pole[tiab]
#18	Exercise Therapy[mh] OR Remedial Exercise[tiab] OR Exercise, Remedial[tiab] OR Exercises, Remedial[tiab] OR Remedial Exercises[tiab] OR Therapy, Exercise[tiab] OR Exercise Therapies[tiab] OR Therapies, Exercise[tiab] OR Rehabilitation Exercise[tiab] OR Exercise, Rehabilitation[tiab] OR Exercises, Rehabilitation[tiab] OR Rehabilitation Exercises[tiab]
#19	Sports[mh] OR Sport[tiab] OR Athletics[tiab] OR Athletic[tiab]
#20	Martial Arts[mh] OR Arts, Martial[tiab] OR Hap Ki Do[tiab] OR Judo[tiab] OR Karate[tiab] OR Jujitsu[tiab] OR Tae Kwon Do[tiab] OR Aikido[tiab] OR Wushu[tiab] OR Kung Fu[tiab] OR Gong Fu[tiab] OR Fu, Gong[tiab] OR Gongfu[tiab]
#21	Tai Ji[mh] OR Tai-ji[tiab] OR Tai Chi[tiab] OR Chi, Tai[tiab] OR Tai Ji Quan[tiab] OR Ji Quan, Tai[tiab] OR Quan, Tai Ji[tiab] OR Taiji[tiab] OR Taijiquan[tiab] OR T'ai Chi[tiab] OR Tai Chi Chuan [tiab]
#22	Mind-Body Therapies[mh] OR Mind Body Therapies[tiab] OR Mind-Body Therapy[tiab] OR Therapies, Mind-Body[tiab] OR Therapy, Mind-Body[tiab] OR Mind-Body Medicine[tiab] OR Mind Body Medicine[tiab] OR mind-body exercise*[tiab]
#23	Breathing Exercises[mh] OR Exercise, Breathing[tiab] OR Respiratory Muscle Training[tiab] OR Muscle Training, Respiratory[tiab] OR Training, Respiratory Muscle [tiab]
#24	Qigong[mh] OR Qi Gong[tiab] OR Ch'i Kung[tiab]
#25	Yoga[mh]
#26	Bicycle[tiab] OR cycling[tiab] OR aquagym[tiab] OR brisk walking[tiab] OR setting-up exercise[tiab] OR square dance[tiab] OR indoor cycle ergometer[tiab] OR treadmill exercise[tiab] OR brisk walking[tiab] equipment training[tiab] OR dumbbell exercise[tiab] OR resistance band[tiab] OR elastic resistance band[tiab] OR elastic band[tiab] OR Thera-band[tiab] OR bodyweight training[tiab] OR combined strength training[tiab] OR total resistance exercise[tiab] OR Aggravate exercise[tiab] OR Pilates[tiab] OR Traditional Chinese exercises[tiab] OR TCE[tiab] OR TCEs[tiab] OR transitional exercises[tiab] OR Traditional Chinese exercise[tiab] OR traditional Chinese health exercise[tiab] OR traditional Chinese medical skills[tiab] OR Chinese traditional sports[tiab] OR traditional Kungfu[tiab] OR Kungfu[tiab] OR Gong[tiab] OR Shadowboxing[tiab] OR Taijiquan[tiab] OR Five-animal exercises[tiab] OR Wuqinxi[tiab] OR Five mimic-animal boxing[tiab] OR Five-animal boxing[tiab] OR Baduanjin[tiab] OR Baduanjin

	exercise[tiab] OR Yijinjing[tiab] OR Shaolin Neigong[tiab] OR Yijinjing[tiab] OR tendon exercise[tiab] OR Liuzijue[tiab]
#27	continuous training[tiab] OR continuous exercise[tiab] OR continuous-type exercise[tiab] OR continuous-type training[tiab] OR continuous training[tiab] OR moderate intensity continuous training[tiab] OR continuous medium intensity training[tiab] OR continuous moderate intensity exercise[tiab] OR continuous moderate intensity training[tiab] OR medium intensity continuous training[tiab] OR MICT (training)[tiab] OR moderate intensity continuous exercise[tiab] OR moderate intensity continuous training[tiab] OR moderate intensity exercise[tiab] OR medium intensity exercise[tiab] OR medium intensity physical activity[tiab] OR medium intensity training[tiab] OR medium intensity work-out[tiab] OR medium intensity workout[tiab] OR moderate intensity physical activity[tiab] OR moderate intensity training[tiab] OR moderate intensity work-out'[tiab] OR moderate intensity workout[tiab] OR moderate intensity exercise[tiab]
#28	OR/#4-#27
#29	(randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR drug therapy[sh] OR randomly[tiab] OR trial[tiab] OR groups[tiab]) NOT (animals[mh] NOT humans[mh])
#30	#3 AND #27 AND #28

2.Embase

#1	'impaired glucose tolerance'/exp OR (‘Prediabetic State’ OR ‘State, Prediabetic’ OR ‘States, Prediabetic’ OR ‘Prediabetes’):ti,ab,kw
#2	‘glucose intolerance’/exp OR (‘Glucose Intolerances’ OR ‘Intolerance, Glucose’ OR ‘Intolerances, Glucose’ OR ‘Impaired Glucose Tolerance’ OR ‘Glucose Tolerance, Impaired’ OR ‘Glucose Tolerances, Impaired’ OR ‘Impaired Glucose Tolerances’ OR ‘Tolerance, Impaired Glucose’ OR ‘Tolerances, Impaired Glucose’):ti,ab,kw
#3	(‘prediabetic’ OR ‘prediabetics’ OR ‘pre-diabetes’ OR ‘prediabetic state’ OR ‘pre diabetes’ OR ‘impaired fasting glucose’ OR ‘impaired glucose tolerance’ OR ‘impaired glucose regulation’ OR ‘IGT’ OR ‘IFG’ OR ‘IGR’ OR ‘Glucose Intolerances’ OR ‘Intolerance, Glucose’ OR ‘Intolerances, Glucose’ OR ‘Impaired Glucose Tolerance’ OR ‘Glucose Tolerance, Impaired’ OR ‘Glucose Tolerances, Impaired’ OR ‘Impaired Glucose Tolerances’ OR ‘Tolerance, Impaired Glucose’ OR ‘Tolerances, Impaired Glucose’):ti,ab,kw
#4	#1 OR #2 OR #3
#5	‘exercise’/exp OR ('biometric exercise' OR 'effort' OR 'exercise capacity' OR 'exercise performance' OR 'exercise training' OR 'exertion' OR 'fitness training' OR 'fitness workout' OR 'physical conditioning, human' OR 'physical effort' OR 'physical exercise' OR 'physical exertion' OR 'physical work-out' OR 'physical workout' OR 'exercise'):ti,ab,kw
#6	'aerobic exercise'/exp OR ('aerobic dance' OR 'aerobic dancing' OR 'aerobics' OR 'aerobics exercise' OR 'dancing, aerobic' OR 'exercise, aerobic' OR 'low impact aerobic exercise' OR 'low impact aerobics' OR 'step aerobics' OR 'aerobic exercise'):ti,ab,kw
#7	‘kinesiotherapy’/exp OR ('corrective exercise' OR 'exercise movement techniques' OR 'exercise therapy' OR 'exercise treatment' OR 'kinesiotherapeutic intervention' OR 'kinesiotherapeutic method' OR 'kinesiotherapeutic procedure' OR 'kinesiotherapeutic technique' OR 'kinesiotherapeutical treatment' OR 'kinesitherapeutic exercises' OR 'kinesitherapeutic intervention' OR 'kinesitherapeutic method' OR 'kinesitherapeutic methodology' OR 'kinesitherapeutic procedure' OR 'kinesitherapeutic technique' OR

	'kinesitherapeutic treatment' OR 'kinesitherapeutical treatment' OR 'kinesitherapy' OR 'SKTM (specialized kinesitherapeutic methodology)' OR 'specialised kinesitherapeutic methodology' OR 'specialized kinesitherapeutic methodology' OR 'therapeutic exercise' OR 'therapy, exercise' OR 'treatment, exercise' OR 'kinesiotherapy'):ti,ab,kw
#8	'Sport'/exp OR ('competitive gymnastics' OR 'competitive sport' OR 'sports' OR 'sport'):ti,ab,kw
#9	'breathing exercise'/exp OR ('breathing exercises' OR 'breathing therapy' OR 'chest physical therapy' OR 'chest physiotherapy' OR 'exercise, breathing' OR 'exercise, respiratory' OR 'respiration exercise' OR 'respiration therapy' OR 'respiratory exercise' OR 'respiratory physiotherapy' OR 'breathing exercise'):ti,ab,kw
#10	'Pranayama'/exp OR ('yoga breathing' OR 'yogic breathing' OR 'pranayama'):ti,ab,kw
#11	'yoga'/exp OR 'hatha yoga'/exp OR 'hot yoga'/exp OR 'iyengar yoga'/exp OR 'pranayama'/exp OR 'yoga nidra'/exp OR ('yogic meditation' OR 'yoga' OR 'hatha yogic exercise' OR 'hathayoga' OR 'hatha yoga' OR 'bikram yoga' OR 'heat yoga' OR 'hot yoga' OR 'iyengar yoga' OR 'yoga breathing' OR 'yogic breathing' OR 'pranayama' OR 'nidra yoga' OR 'sleep yoga' OR 'yogic sleep' OR 'yoga nidra'):ti,ab,kw
#12	'circuit training'/exp OR ('circuit-based exercise' OR 'circuit-based training' OR 'circuit-type exercise' OR 'circuit-type training' OR 'circuit training'):ti,ab,kw
#13	'continuous training'/exp OR ('continuous exercise' OR 'continuous-type exercise' OR 'continuous-type training' OR 'continuous training'):ti,ab,kw
#14	'moderate intensity continuous training'/exp OR ('continuous medium intensity training' OR 'continuous moderate intensity exercise' OR 'continuous moderate intensity training' OR 'medium intensity continuous training' OR 'MICT (training)' OR 'moderate intensity continuous exercise' OR 'moderate intensity continuous training'):ti,ab,kw
#15	'endurance training'/exp OR ('endurance exercise' OR 'endurance exercise training' OR 'endurance workout' OR 'endurance-type exercise' OR 'endurance-type training' OR 'endurance training'):ti,ab,kw
#16	'high intensity interval training'/exp OR ('high-intensity intermittent exercise' OR 'high-intensity intermittent training' OR 'high-intensity interval exercise' OR 'high-intensity interval training' OR 'HIIE (exercise)' OR 'HIIT' OR 'intermittent high-intensity training' OR 'interval high-intensity training' OR 'high intensity interval training'):ti,ab,kw
#17	'high intensity interval training'/exp OR ('high-intensity intermittent exercise' OR 'high-intensity intermittent training' OR 'high-intensity interval exercise' OR 'high-intensity interval training' OR 'HIIE (exercise)' OR 'HIIT' OR 'intermittent high-intensity training' OR 'interval high-intensity training' OR 'high intensity interval training'):ti,ab,kw
#18	'interval training'/exp OR ('intermittent exercise' OR 'intermittent exercise training' OR 'intermittent training' OR 'intermittent workout' OR 'intermittent-type exercise' OR 'interval exercise' OR 'interval work-out' OR 'interval workout' OR 'interval-type exercise' OR 'interval-type training' OR 'interval training'):ti.ab.kw
#19	'high intensity interval training'/exp OR ('high-intensity intermittent exercise' OR 'high-intensity intermittent training' OR 'high-intensity interval exercise' OR 'high-intensity interval training' OR 'HIIE (exercise)' OR 'HIIT' OR 'intermittent high-intensity training' OR 'interval high-intensity training' OR 'high intensity interval training'):ti,ab,kw
#20	'intermittent hypoxic training'/exp OR ('hypoxia interval training' OR 'hypoxic interval training' OR 'intermittent hypoxia therapy' OR 'intermittent hypoxia training' OR 'intermittent hypoxic exercise' OR 'intermittent hypoxic therapy' OR 'interval hypoxia training' OR 'interval hypoxic exercise' OR 'interval hypoxic training' OR 'intermittent hypoxic training'):ti,ab,kw

#21	‘sprint interval training’/exp OR ('interval sprint exercise' OR 'interval sprint training' OR 'sprint interval exercise' OR 'sprint interval training'):ti,ab,kw
#22	‘moderate intensity exercise’/exp OR ('medium intensity exercise' OR 'medium intensity physical activity' OR 'medium intensity training' OR 'medium intensity work-out' OR 'medium intensity workout' OR 'moderate intensity physical activity' OR 'moderate intensity training' OR 'moderate intensity work-out' OR 'moderate intensity workout' OR 'moderate intensity exercise'):ti,ab,kw
#23	‘pilates’/exp OR ('pilates exercise' OR 'pilates'):ti,ab,kw
#24	‘plyometrics’/exp OR ('plyometric exercise' OR 'plyometric jump training' OR 'plyometric training' OR 'plyometry' OR 'plyometrics'):ti,ab,kw
#25	'resistance training'/exp OR ('resistance exercise' OR 'resistance exercise training' OR 'resistance-type exercise' OR 'resistance-type training' OR 'strength training' OR 'strength-type exercise' OR 'strength-type training' OR 'resistance training'):ti,ab,kw
#26	‘weight training’/exp OR ('free weight exercise' OR 'weight bearing exercise' OR 'weight lifting exercise' OR 'weight-bearing training' OR 'weightbearing exercise' OR 'weightlifting exercise' OR 'weight training'):ti,ab,kw
#27	'stretching exercise'/exp OR ('muscle stretching exercises' OR 'stretching exercises' OR 'stretching exercise'):ti,ab,kw
#28	‘physical activity’/exp OR ('activity, physical' OR 'physical activity'):ti,ab,kw
#29	‘running’/exp OR ('running'):ti,ab,kw
#30	‘marathon running’/exp OR ('ultra running' OR 'ultramarathon running' OR 'ultrarunning' OR 'marathon running'):ti,ab,kw
#31	‘cycling’/exp OR ('bicycling' OR 'cycling'):ti,ab,kw
#32	‘jogging’/exp OR (jogging):ti,ab,kw
#33	‘nordic walking’/exp OR ('nordic walker' OR 'nordic walking'):ti,ab,kw
#34	‘racewalking’/exp OR ('race walking' OR 'racewalking'):ti,ab,kw
#35	‘swimming’/exp OR ('bathing beaches' OR 'swimmer' OR 'swimming test' OR 'swimming'):ti,ab,kw
#36	‘Walking’/exp OR (' Ambulation ' OR 'walking'):ti,ab,kw
#37	‘martial art’/exp OR ('martial arts' OR 'martial sport' OR 'martial art'):ti,ab,kw
#38	‘kung fu’/exp OR ('kungfu' OR 'kung fu'):ti,ab,kw
#39	‘qigong’/exp OR ('chi kung' OR 'chigung' OR 'qi gong' OR 'qigong'):ti,ab,kw
#40	‘Tai Chi’/exp OR ('Tai Chi Chuan' OR 'Tai Ji' OR 'Taiji quan' OR 'Taijiquan' OR 'Tai Chi'):ti,ab,kw
#41	(‘bicycle’ OR ‘walking’ OR ‘aquagym’ OR ‘brisk walking’ OR ‘jogging’ OR ‘setting-up exercise’ OR ‘square dance’ OR ‘indoor cycle ergometer’ OR ‘treadmill exercise’ OR ‘brisk walking’ OR ‘swimming’ OR ‘running’ OR ‘Nordic Walking’ OR ‘dance’ OR ‘equipment training’ OR ‘dumbbell exercise’ OR ‘resistance band’ OR ‘elastic resistance band’ OR ‘elastic band’ OR ‘Thera-band’ OR ‘bodyweight training’ OR ‘combined strength training’ OR ‘total resistance exercise’ OR ‘Aggravate exercise’ OR ‘Mind-body exercise’ OR ‘Yoga’ OR ‘Pilates’ OR ‘Traditional Chinese exercises’ OR ‘TCE’ OR ‘TCEs’ OR ‘transitional exercises’ OR ‘Traditional Chinese exercise’ OR ‘traditional Chinese health exercise’ OR ‘traditional Chinese medical skills’ OR ‘Chinese traditional sports’ OR ‘traditional Kungfu’ OR ‘Kungfu’ OR ‘Gong’ OR ‘Qi Gong’ OR ‘Qigong’ OR ‘Tai Chi’ OR ‘Taiji’ OR ‘Tai Chi Chuan’ OR ‘Shadowboxing’ OR ‘Taijiquan’ OR ‘Five-animal exercises’ OR ‘Wuqinxi’ OR ‘Five mimic-animal boxing’ OR ‘Five-animal boxing’ OR ‘ Baduanjin’ OR ‘Baduanjin exercise’ OR ‘Yijinjing’ OR ‘Shaolin Neigong’ OR ‘Yijinjing’ OR ‘tendon exercise’ OR ‘Liuzijue’):ti,ab,kw
#42	OR/#5-#41

#43	'crossover procedure':de OR 'double-blind procedure':de OR 'randomized controlled trial':de OR 'single-blind procedure':de OR (random* OR factorial* OR crossover* OR cross NEXT/1 over* OR placebo* OR doubl* NEAR/1 blind* OR singl* NEAR/1 blind* OR assign* OR allocat* OR volunteer*):de,ab,ti
#44	#4 AND #42 AND #43

3. Ovid (+Medline)

#1	Prediabetic States.ab. OR State, Prediabetic.ab. OR States, Prediabetic.ab. OR Prediabetes.ab. OR prediabetic.ab. OR prediabetics.ab. OR pre-diabetes.ab. OR prediabetic state.ab. OR pre diabetes.ab. OR impaired fasting glucose.ab. OR impaired glucose tolerance.ab. OR impaired glucose regulation.ab. OR IGT.ab. OR IFG.ab. OR IGR.ab. OR glucose metabolism disorders.ab. OR glucose alterations.ab. OR dysglycemia.ab. OR hyperglycemia.ab. OR dysglycemias.ab. OR Intermediate hyperglycemia.ab.
#2	Exercises.ab. OR Physical Activity.ab. OR Activities, Physical.ab. OR Activity, Physical.ab. OR Physical Activities.ab. OR Exercise, Physical.ab. OR Exercises, Physical.ab. OR Physical Exercise.ab. OR Physical Exercises.ab. OR Acute Exercise.ab. OR Acute Exercises.ab. OR Exercise, Acute.ab. OR Exercises, Acute.ab. OR Exercise, Isometric.ab. OR Exercises, Isometric.ab. OR Isometric Exercises.ab. OR Isometric Exercise.ab. OR Exercise, Aerobic.ab. OR Aerobic Exercise.ab. OR Aerobic Exercises.ab. OR Exercises, Aerobic.ab. OR Exercise Training.ab. OR Exercise Trainings.ab. OR Training, Exercise.ab. OR Trainings, Exercise.ab. OR Endurance Training.ab. OR Training, Endurance.ab.
#3	Muscle Stretching Exercises.ab. OR Exercise, Muscle Stretching.ab. OR Muscle Stretching Exercise.ab. OR Static Stretching.ab. OR Stretching, Static.ab. OR Active Stretching.ab. OR Stretching, Active.ab. OR Static-Active Stretching.ab. OR Static Active Stretching.ab. OR Stretching, Static-Active.ab. OR Isometric Stretching.ab. OR Stretching, Isometric.ab. OR Ballistic Stretching.ab. OR Stretching, Ballistic.ab. OR Dynamic Stretching.ab. OR Stretching, Dynamic.ab. OR Proprioceptive Neuromuscular Facilitation (PNF) Stretching.ab. OR PNF Stretching.ab. OR PNF Stretchings.ab. OR Stretching, PNF.ab. OR PNF Stretching Exercise.ab. OR Exercise, PNF Stretching.ab. OR PNF Stretching Exercises.ab. OR Stretching Exercise, PNF.ab. OR Proprioceptive Neuromuscular Facilitation.ab. OR Neuromuscular Facilitation, Proprioceptive.ab. OR Proprioceptive Neuromuscular Facilitations.ab. OR Passive Stretching.ab. OR Stretching, Passive.ab. OR Relaxed Stretching.ab. OR Stretching, Relaxed.ab. OR Static-Passive Stretching.ab. OR Static Passive Stretching.ab. OR Stretching, Static-Passive.ab.
#4	Physical Conditioning, Human.ab. OR Conditioning, Human Physical.ab. OR Human Physical Conditioning.ab. OR Physical Training, Human.ab. OR Human Physical Training.ab. OR Training, Human Physical.ab.
#5	Circuit-Based Exercise.ab. OR Circuit Based Exercise.ab. OR Circuit-Based Exercises.ab. OR Exercise, Circuit-Based.ab. OR Exercises, Circuit-Based.ab. OR Circuit Training.ab. OR Training, Circuit.ab.
#6	Endurance Training.ab. OR Training, Endurance.ab.
#7	High-Intensity Interval Training.ab. OR High Intensity Interval Training.ab. OR High-Intensity Interval Trainings.ab. OR Interval Training, High-Intensity.ab. OR Interval Trainings, High-Intensity.ab. OR Training, High-Intensity Interval.ab. OR Trainings, High-Intensity Interval.ab. OR High-Intensity Intermittent Exercise.ab. OR Exercise, High-Intensity Intermittent.ab. OR Exercises, High-Intensity Intermittent.ab. OR High-Intensity Intermittent Exercises.ab. OR Sprint Interval Training.ab. OR Sprint Interval Trainings.ab.
#8	Plyometric Exercise.ab. OR Exercise, Plyometric.ab. OR Exercises, Plyometric.ab. OR Plyometric Exercises.ab. OR Plyometric Drill.ab. OR Drill, Plyometric.ab. OR Drills, Plyometric.ab. OR Plyometric

	Drills.ab. OR Plyometric Training.ab. OR Plyometric Trainings.ab. OR Training, Plyometric.ab. OR Trainings, Plyometric.ab. OR Stretch-Shortening Exercise.ab. OR Exercise, Stretch-Shortening.ab. OR Exercises, Stretch-Shortening.ab. OR Stretch Shortening Exercise.ab. OR Stretch-Shortening Exercises.ab. OR Stretch-Shortening Cycle Exercise.ab. OR Cycle Exercise, Stretch-Shortening.ab. OR Cycle Exercises, Stretch-Shortening.ab. OR Exercise, Stretch-Shortening Cycle.ab. OR Exercises, Stretch-Shortening Cycle.ab. OR Stretch Shortening Cycle Exercise.ab. OR Stretch-Shortening Cycle Exercises.ab. OR Stretch-Shortening Drill.ab. OR Drill, Stretch-Shortening.ab. OR Drills, Stretch-Shortening.ab. OR Stretch Shortening Drill.ab. OR Stretch-Shortening Drills.ab.
#9	Resistance Training.ab. OR Training, Resistance.ab. OR Strength Training.ab. OR Training, Strength.ab. OR Weight-Lifting Strengthening Program.ab. OR Strengthening Program, Weight-Lifting.ab. OR Strengthening Programs, Weight-Lifting.ab. OR Weight Lifting Strengthening Program.ab. OR Weight-Lifting Strengthening Programs.ab. OR Weight-Lifting Exercise Program.ab. OR Exercise Program, Weight-Lifting.ab. OR Exercise Programs, Weight-Lifting.ab. OR Weight Lifting Exercise Program.ab. OR Weight-Lifting Exercise Programs.ab. OR Weight-Bearing Strengthening Program.ab. OR Strengthening Program, Weight-Bearing.ab. OR Strengthening Programs, Weight-Bearing.ab. OR Weight Bearing Strengthening Program.ab. OR Weight-Bearing Strengthening Programs.ab. OR Weight-Bearing Exercise Program.ab. OR Exercise Program, Weight-Bearing.ab. OR Exercise Programs, Weight-Bearing.ab. OR Weight Bearing Exercise Program.ab. OR Weight-Bearing Exercise Programs.ab.
#10	Running.ab. OR Runnings.ab.
#11	Jogging.ab. OR joggings.ab.
#12	Marathon Running.ab. OR Running, Marathon.ab. OR Marathons.ab. OR Marathon.ab. OR Ultramarathon Running.ab. OR Running, Ultramarathon.ab.
#13	Swimming.ab.
#14	Walking.ab. OR Ambulation.ab.
#15	Nordic Walking.ab. OR Walking, Nordic.ab. OR Pole Walking.ab. OR Walking, Pole.ab.
#16	Exercise Therapy.ab. OR Remedial Exercise.ab. OR Exercise, Remedial.ab. OR Exercises, Remedial.ab. OR Remedial Exercises.ab. OR Therapy, Exercise.ab. OR Exercise Therapies.ab. OR Therapies, Exercise.ab. OR Rehabilitation Exercise.ab. OR Exercise, Rehabilitation.ab. OR Exercises, Rehabilitation.ab. OR Rehabilitation Exercises.ab.
#17	Sports.ab. OR Sport.ab. OR Athletics.ab. OR Athletic.ab.
#18	Martial Arts.ab. OR Arts, Martial.ab. OR Hap Ki Do.ab. OR Judo.ab. OR Karate.ab. OR Jujitsu.ab. OR Tae Kwon Do.ab. OR Aikido.ab. OR Wushu.ab. OR Kung Fu.ab. OR Gong Fu.ab. OR Fu, Gong.ab. OR Gongfu.ab.
#19	Tai Ji.ab. OR Tai-ji.ab. OR Tai Chi.ab. OR Chi, Tai.ab. OR Tai Ji Quan.ab. OR Ji Quan, Tai.ab. OR Quan, Tai Ji.ab. OR Taiji.ab. OR Taijiquan.ab. OR T'ai Chi.ab. OR Tai Chi Chuan.ab.
#20	Mind-Body Therapies.ab. OR Mind Body Therapies.ab. OR Mind-Body Therapy.ab. OR Therapies, Mind-Body.ab. OR Therapy, Mind-Body.ab. OR Mind-Body Medicine.ab. OR Mind Body Medicine.ab. OR mind-body exercise*.ab.
#21	Breathing Exercises.ab. OR Exercise, Breathing.ab. OR Respiratory Muscle Training.ab. OR Muscle Training, Respiratory.ab. OR Training, Respiratory Muscle.ab.
#22	Qigong.ab. OR Qi Gong.ab. OR Ch'i Kung.ab.
#23	Yoga.ab.
#24	aquagym.ab. OR brisk walking.ab. OR setting-up exercise.ab. OR square dance.ab. OR indoor cycle

	ergometer.ab. OR treadmill exercise.ab. OR brisk walking.ab.
#25	equipment training.ab. OR dumbbell exercise.ab. OR resistance band.ab. OR elastic resistance band.ab. OR elastic band.ab. OR Thera-band.ab. OR bodyweight training.ab. OR combined strength training.ab. OR total resistance exercise.ab. OR Aggravate exercise.ab. OR Pilates.ab. OR Traditional Chinese exercises.ab. OR TCE.ab. OR TCEs.ab. OR transitional exercises.ab. OR Traditional Chinese exercise.ab. OR traditional Chinese health exercise.ab. OR traditional Chinese medical skills.ab. OR Chinese traditional sports.ab. OR traditional Kungfu.ab. OR Kungfu.ab. OR Gong.ab. OR Shadowboxing.ab. OR Taijiquan.ab. OR Five-animal exercises.ab. OR Wuqinxi.ab. OR Five mimic-animal boxing.ab. OR Five-animal boxing.ab. OR Baduanjin.ab. OR Baduanjin exercise.ab. OR Yijinjing.ab. OR Shaolin Neigong.ab. OR Yijinjing.ab. OR tendon exercise.ab. OR Liuzijue.ab.
#26	continuous training.ab. OR continuous exercise.ab. OR continuous-type exercise.ab. OR continuous-type training.ab. OR continuous training.ab. OR moderate intensity continuous training.ab. OR continuous medium intensity training.ab. OR continuous moderate intensity exercise.ab. OR continuous moderate intensity training.ab. OR medium intensity continuous training.ab. OR MICT (training).ab. OR moderate intensity continuous exercise.ab. OR moderate intensity continuous training.ab. OR moderate intensity exercise.ab. OR medium intensity exercise.ab. OR medium intensity physical activity.ab. OR medium intensity training.ab. OR medium intensity work-out.ab. OR medium intensity workout.ab. OR moderate intensity physical activity.ab. OR moderate intensity training.ab. OR moderate intensity work-out'.ab. OR moderate intensity workout.ab. OR moderate intensity exercise.ab.
#27	OR/#2-#26
#28	((randomized controlled trial.pt..ab. OR controlled clinical trial.pt..ab. OR randomized.ab..ab. OR placebo.ab..ab. OR drug therapy.fs..ab. OR randomly.ab..ab. OR trial.ab..ab. OR groups.ab.) not (exp animals/ not humans.sh.))
#29	#1 AND #27 AND #28

4.Cochrane Library

#1	MeSH descriptor: [Prediabetic State] explode all trees
#2	(State, Prediabetic OR States, Prediabetic OR Prediabetes OR prediabetic OR prediabetics OR pre-diabetes OR prediabetic state OR pre diabetes OR impaired fasting glucose OR impaired glucose tolerance OR impaired glucose regulation OR IGT OR IFG OR IGR OR glucose metabolism disorders OR glucose alterations OR dysglycemia OR hyperglycemia OR dysglycemias OR Intermediate hyperglycemia):ti,ab,kw
#3	MeSH descriptor: [glucose intolerance] explode all trees
#4	(Glucose Intolerances OR Intolerance, Glucose OR Intolerances, Glucose OR Impaired Glucose Tolerance OR Glucose Tolerance, Impaired OR Glucose Tolerances, Impaired OR Impaired Glucose Tolerances OR Tolerance, Impaired Glucose OR Tolerances, Impaired Glucose):ti,ab,kw
#5	#1 OR #2 OR #3 OR #4
#6	MeSH descriptor: [Exercise] explode all trees
#7	(Isometric Exercise; Exercise, Isometric; Exercises, Isometric; Isometric Exercises; Exercise Trainings; Training, Exercise; Exercise Training; Trainings, Exercise; Physical Exercises; Exercises, Physical; Physical Activity; Activity, Physical; Exercise, Physical; Exercises; Activities, Physical; Physical Exercise; Physical Activities; Exercise, Aerobic; Aerobic Exercise; Exercises, Aerobic; Aerobic

	Exercises; Acute Exercises; Exercise, Acute; Exercises, Acute; Acute Exercise):ti,ab,kw
#8	MeSH descriptor: [Muscle Stretching Exercises] explode all trees
#9	(Exercise, Muscle Stretching OR Muscle Stretching Exercise OR Static Stretching OR Stretching, Static OR Active Stretching OR Stretching, Active OR Static-Active Stretching OR Static Active Stretching OR Stretching, Static-Active OR Isometric Stretching OR Stretching, Isometric OR Ballistic Stretching OR Stretching, Ballistic OR Dynamic Stretching OR Stretching, Dynamic OR Proprioceptive Neuromuscular Facilitation (PNF) Stretching OR PNF Stretching OR PNF Stretchings OR Stretching, PNF OR PNF Stretching Exercise OR Exercise, PNF Stretching OR PNF Stretching Exercises OR Stretching Exercise, PNF OR Proprioceptive Neuromuscular Facilitation OR Neuromuscular Facilitation, Proprioceptive OR Proprioceptive Neuromuscular Facilitations OR Passive Stretching OR Stretching, Passive OR Relaxed Stretching OR Stretching, Relaxed OR Static-Passive Stretching OR Static Passive Stretching OR Stretching, Static-Passive):ti,ab,kw
#10	MeSH descriptor: [Physical Conditioning, Human] explode all trees
#11	(Conditioning, Human Physical OR Human Physical Conditioning OR Physical Training, Human OR Human Physical Training OR Training, Human Physical):ti,ab,kw
#12	MeSH descriptor: [Circuit-Based Exercise] explode all trees
#13	(Circuit Based Exercise OR Circuit-Based Exercises OR Exercise, Circuit-Based OR Exercises, Circuit-Based OR Circuit Training OR Training, Circuit):ti,ab,kw
#14	MeSH descriptor: [Endurance Training] explode all trees
#15	(Training, Endurance):ti,ab,kw
#16	MeSH descriptor: [High Intensity Interval Training] explode all trees
#17	(High Intensity Interval Training OR High-Intensity Interval Trainings OR Interval Training, High-Intensity OR Interval Trainings, High-Intensity OR Training, High-Intensity Interval OR Trainings, High-Intensity Interval OR High-Intensity Intermittent Exercise OR Exercise, High-Intensity Intermittent OR Exercises, High-Intensity Intermittent OR High-Intensity Intermittent Exercises OR Sprint Interval Training OR Sprint Interval Trainings):ti,ab,kw
#18	MeSH descriptor: [Plyometric Exercise] explode all trees
#19	(Exercise, Plyometric OR Exercises, Plyometric OR Plyometric Exercises OR Plyometric Drill OR Drill, Plyometric OR Drills, Plyometric OR Plyometric Drills OR Plyometric Training OR Plyometric Trainings OR Training, Plyometric OR Trainings, Plyometric OR Stretch-Shortening Exercise OR Exercise, Stretch-Shortening OR Exercises, Stretch-Shortening OR Stretch Shortening Exercise OR Stretch-Shortening Exercises OR Stretch-Shortening Cycle Exercise OR Cycle Exercise, Stretch-Shortening OR Cycle Exercises, Stretch-Shortening OR Exercise, Stretch-Shortening Cycle OR Exercises, Stretch-Shortening Cycle OR Stretch Shortening Cycle Exercise OR Stretch-Shortening Cycle Exercises OR Stretch-Shortening Drill OR Drill, Stretch-Shortening OR Drills, Stretch-Shortening OR Stretch Shortening Drill OR Stretch-Shortening Drills):ti,ab,kw
#20	MeSH descriptor: [Resistance Training] explode all trees
#21	(Training, Resistance OR Strength Training OR Training, Strength OR Weight-Lifting Strengthening Program OR Strengthening Program, Weight-Lifting OR Strengthening Programs, Weight-Lifting OR Weight Lifting Strengthening Program OR Weight-Lifting Strengthening Programs OR Weight-Lifting Exercise Program OR Exercise Program, Weight-Lifting OR Exercise Programs, Weight-Lifting OR Weight Lifting Exercise Program OR Weight-Lifting Exercise Programs OR Weight-Bearing Strengthening Program OR Strengthening Program, Weight-Bearing OR Strengthening Programs, Weight-Bearing OR Weight Bearing Strengthening Program OR Weight-Bearing Strengthening

	Programs OR Weight-Bearing Exercise Program OR Exercise Program, Weight-Bearing OR Exercise Programs, Weight-Bearing OR Weight Bearing Exercise Program OR Weight-Bearing Exercise Programs):ti,ab,kw
#22	MeSH descriptor: [running] explode all trees
#23	(Runnings):ti,ab,kw
#24	MeSH descriptor: [jogging] explode all trees
#25	(joggings):ti,ab,kw
#26	MeSH descriptor: [Marathon running] explode all trees
#27	(Running, Marathon OR Marathons OR Marathon OR Ultramarathon Running OR Running, Ultramarathon):ti,ab,kw
#28	MeSH descriptor: [swimming] explode all trees
#29	(Swimming):ti,ab,kw
#30	MeSH descriptor: [walking] explode all trees
#31	(Ambulation):ti,ab,kw
#32	MeSH descriptor: [Nordic Walking] explode all trees
#33	(Walking, Nordic OR Pole Walking OR Walking, Pole):ti,ab,kw
#34	MeSH descriptor: [Exercise Therapy] explode all trees
#35	(Remedial Exercise OR Exercise, Remedial OR Exercises, Remedial OR Remedial Exercises OR Therapy, Exercise OR Exercise Therapies OR Therapies, Exercise OR Rehabilitation Exercise OR Exercise, Rehabilitation OR Exercises, Rehabilitation OR Rehabilitation Exercises):ti,ab,kw
#36	MeSH descriptor: [Sports] explode all trees
#37	(Sport OR Athletics OR Athletic):ti,ab,kw
#38	MeSH descriptor: [Martial Arts] explode all trees
#39	(Arts, Martial OR Hap Ki Do OR Judo OR Karate OR Jujitsu OR Tae Kwon Do OR Aikido OR Wushu OR Kung Fu OR Gong Fu OR Fu, Gong OR Gongfu):ti,ab,kw
#40	MeSH descriptor: [Tai ji] explode all trees
#41	(Tai-ji OR Tai Chi OR Chi, Tai OR Tai Ji Quan OR Ji Quan, Tai OR Quan, Tai Ji OR Taiji OR Taijiquan OR T'ai Chi OR Tai Chi Chuan):ti,ab,kw
#42	MeSH descriptor: [Mind-Body Therapies] explode all trees
#43	(Mind Body Therapies OR Mind-Body Therapy OR Therapies, Mind-Body OR Therapy, Mind-Body OR Mind-Body Medicine OR Mind Body Medicine OR mind-body exercise*):ti,ab,kw
#44	MeSH descriptor: [Breathing Exercises] explode all trees
#45	(Exercise, Breathing OR Respiratory Muscle Training OR Muscle Training, Respiratory OR Training, Respiratory Muscle):ti,ab,kw
#46	MeSH descriptor: [Qi Gong] explode all trees
#47	(Qi Gong OR Ch'i Kung):ti,ab,kw
#48	MeSH descriptor: [Yoga] explode all trees
#49	(Yoga):ti,ab,kw
#50	(aquagym OR brisk walking OR setting-up exercise OR square dance OR indoor cycle ergometer OR treadmill exercise OR brisk walking):ti,ab,kw
#51	(equipment training OR dumbbell exercise OR resistance band OR elastic resistance band OR elastic band OR Thera-band OR bodyweight training OR combined strength training OR total resistance exercise OR Aggravate exercise OR Pilates OR Traditional Chinese exercises OR TCE or TCEs OR transitional

	exercises OR Traditional Chinese exercise OR traditional Chinese health exercise OR traditional Chinese medical skills OR Chinese traditional sports OR traditional Kungfu OR Kungfu OR Gong OR Shadowboxing OR Taijiquan OR Five-animal exercises OR Wuqinxi OR Five mimic-animal boxing OR Five-animal boxing OR Baduanjin OR Baduanjin exercise OR Yijinjing OR Shaolin Neigong OR Yijinjing OR tendon exercise OR Liuzijue):ti,ab,kw
#52	(continuous training OR continuous exercise OR continuous-type exercise OR continuous-type training OR continuous training OR moderate intensity continuous training OR continuous medium intensity training OR continuous moderate intensity exercise OR continuous moderate intensity training OR medium intensity continuous training OR MICT (training) OR moderate intensity continuous exercise OR moderate intensity continuous training OR moderate intensity exercise OR medium intensity exercise OR medium intensity physical activity OR medium intensity training OR medium intensity work-out OR medium intensity workout OR moderate intensity physical activity OR moderate intensity training OR moderate intensity work-out' OR moderate intensity workout OR moderate intensity exercise):ti,ab,kw
#53	OR/#6-#52
#54	(#5 AND #53) AND (Trials)filter

5.Web of Science

#1	MH=Prediabetic State OR TS=(Prediabetic States OR State, Prediabetic OR States, Prediabetic OR Prediabetes OR prediabetic OR prediabetics OR pre-diabetes OR prediabetic state OR pre diabetes OR impaired fasting glucose OR impaired glucose tolerance OR impaired glucose regulation OR IGT OR IFG OR IGR OR glucose metabolism disorders OR glucose alterations OR dysglycemia OR hyperglycemia OR dysglycemias OR Intermediate hyperglycemia)
#2	MH=glucose intolerance OR TS=(Glucose Intolerances OR Intolerance, Glucose OR Intolerances, Glucose OR Impaired Glucose Tolerance OR Glucose Tolerance, Impaired OR Glucose Tolerances, Impaired OR Impaired Glucose Tolerances OR Tolerance, Impaired Glucose OR Tolerances, Impaired Glucose)
#3	#1 OR #2
#4	MH=Exercises OR TS=(Physical Activity OR Activities, Physical OR Activity, Physical OR Physical Activities OR Exercise, Physical OR Exercises, Physical OR Physical Exercise OR Physical Exercises OR Acute Exercise OR Acute Exercises OR Exercise, Acute OR Exercises, Acute OR Exercise, Isometric OR Exercises, Isometric OR Isometric Exercises OR Isometric Exercise OR Exercise, Aerobic OR Aerobic Exercise OR Aerobic Exercises OR Exercises, Aerobic OR Exercise Training OR Exercise Trainings OR Training, Exercise OR Trainings, Exercise OR Endurance Training OR Training, Endurance)
#5	MH=Muscle Stretching Exercises OR TS=(Exercise, Muscle Stretching OR Muscle Stretching Exercise OR Static Stretching OR Stretching, Static OR Active Stretching OR Stretching, Active OR Static-Active Stretching OR Static Active Stretching OR Stretching, Static-Active OR Isometric Stretching OR Stretching, Isometric OR Ballistic Stretching OR Stretching, Ballistic OR Dynamic Stretching OR Stretching, Dynamic OR Proprioceptive Neuromuscular Facilitation (PNF) Stretching OR PNF Stretching OR PNF Stretchings OR Stretching, PNF OR PNF Stretching Exercise OR Exercise, PNF Stretching OR PNF Stretching Exercises OR Stretching Exercise, PNF OR Proprioceptive Neuromuscular Facilitation OR Neuromuscular Facilitation, Proprioceptive OR Proprioceptive Neuromuscular Facilitations OR Passive Stretching OR Stretching, Passive OR Relaxed Stretching OR

	Stretching, Relaxed OR Static-Passive Stretching OR Static Passive Stretching OR Stretching, Static-Passive)
#6	MH=Physical Conditioning, Human OR TS=(Conditioning, Human Physical OR Human Physical Conditioning OR Physical Training, Human OR Human Physical Training OR Training, Human Physical)
#7	MH=Circuit-Based Exercise OR TS=(Circuit Based Exercise OR Circuit-Based Exercises OR Exercise, Circuit-Based OR Exercises, Circuit-Based OR Circuit Training OR Training, Circuit)
#8	MH=Endurance Training OR TS=(Training, Endurance)
#9	MH=High-Intensity Interval Training OR TS=(High Intensity Interval Training OR High-Intensity Interval Trainings OR Interval Training, High-Intensity OR Interval Trainings, High-Intensity OR Training, High-Intensity Interval OR Trainings, High-Intensity Interval OR High-Intensity Intermittent Exercise OR Exercise, High-Intensity Intermittent OR Exercises, High-Intensity Intermittent OR High-Intensity Intermittent Exercises OR Sprint Interval Training OR Sprint Interval Trainings)
#10	MH=Plyometric Exercise OR TS=(Exercise, Plyometric OR Exercises, Plyometric OR Plyometric Exercises OR Plyometric Drill OR Drill, Plyometric OR Drills, Plyometric OR Plyometric Drills OR Plyometric Training OR Plyometric Trainings OR Training, Plyometric OR Trainings, Plyometric OR Stretch-Shortening Exercise OR Exercise, Stretch-Shortening OR Exercises, Stretch-Shortening OR Stretch Shortening Exercise OR Stretch-Shortening Exercises OR Stretch-Shortening Cycle Exercise OR Cycle Exercise, Stretch-Shortening OR Cycle Exercises, Stretch-Shortening OR Exercise, Stretch-Shortening Cycle OR Exercises, Stretch-Shortening Cycle OR Stretch Shortening Cycle Exercise OR Stretch-Shortening Cycle Exercises OR Stretch-Shortening Drill OR Drill, Stretch-Shortening OR Drills, Stretch-Shortening OR Stretch Shortening Drill OR Stretch-Shortening Drills)
#11	MH=Resistance Training OR TS=(Training, Resistance OR Strength Training OR Training, Strength OR Weight-Lifting Strengthening Program OR Strengthening Program, Weight-Lifting OR Strengthening Programs, Weight-Lifting OR Weight Lifting Strengthening Program OR Weight-Lifting Strengthening Programs OR Weight-Lifting Exercise Program OR Exercise Program, Weight-Lifting OR Exercise Programs, Weight-Lifting OR Weight Lifting Exercise Program OR Weight-Lifting Exercise Programs OR Weight-Bearing Strengthening Program OR Strengthening Program, Weight-Bearing OR Strengthening Programs, Weight-Bearing OR Weight Bearing Strengthening Program OR Weight-Bearing Strengthening Programs OR Weight-Bearing Exercise Program OR Exercise Program, Weight-Bearing OR Exercise Programs, Weight-Bearing OR Weight Bearing Exercise Program OR Weight-Bearing Exercise Programs)
#12	MH=Running OR TS=Runnings
#13	MH=Jogging OR TS=joggings
#14	MH=Marathon Running OR TS=(Running, Marathon OR Marathons OR Marathon OR Ultramarathon Running OR Running, Ultramarathon)
#15	MH=Swimming
#16	MH=Walking OR TS=Ambulation
#17	MH=Nordic Walking OR TS=(Walking, Nordic OR Pole Walking OR Walking, Pole)
#18	MH=Exercise Therapy OR TS=(Remedial Exercise OR Exercise, Remedial OR Exercises, Remedial OR Remedial Exercises OR Therapy, Exercise OR Exercise Therapies OR Therapies, Exercise OR Rehabilitation Exercise OR Exercise, Rehabilitation OR Exercises, Rehabilitation OR Rehabilitation Exercises)
#19	MH=Sports OR TS=(Sport OR Athletics OR Athletic)

#20	MH=Martial Arts OR TS=(Arts, Martial OR Hap Ki Do OR Judo OR Karate OR Jujitsu OR Tae Kwon Do OR Aikido OR Wushu OR Kung Fu OR Gong Fu OR Fu, Gong OR Gongfu)
#21	MH=Tai Ji OR TS=(Tai-ji OR Tai Chi OR Chi, Tai OR Tai Ji Quan OR Ji Quan, Tai OR Quan, Tai Ji OR Taiji OR Taijiquan OR T'ai Chi OR Tai Chi Chuan)
#22	MH=Mind-Body Therapies OR TS=(Mind Body Therapies OR Mind-Body Therapy OR Therapies, Mind-Body OR Therapy, Mind-Body OR Mind-Body Medicine OR Mind Body Medicine OR mind-body exercise*)
#23	MH=Breathing Exercises OR TS=(Exercise, Breathing OR Respiratory Muscle Training OR Muscle Training, Respiratory OR Training, Respiratory Muscle)
#24	MH=Qigong OR TS=(Qi Gong OR Ch'i Kung)
#25	MH=Yoga
#26	TS=(aquagym OR brisk walking OR setting-up exercise OR square dance OR indoor cycle ergometer OR treadmill exercise OR brisk walking)
#27	TS=(equipment training OR dumbbell exercise OR resistance band OR elastic resistance band OR elastic band OR Thera-band OR bodyweight training OR combined strength training OR total resistance exercise OR Aggravate exercise OR Pilates OR Traditional Chinese exercises OR TCE or TCEs OR transitional exercises OR Traditional Chinese exercise OR traditional Chinese health exercise OR traditional Chinese medical skills OR Chinese traditional sports OR traditional Kungfu OR Kungfu OR Gong OR Shadowboxing OR Taijiquan OR Five-animal exercises OR Wuqinxi OR Five mimic-animal boxing OR Five-animal boxing OR Baduanjin OR Baduanjin exercise OR Yijinjing OR Shaolin Neigong OR Yijinjing OR tendon exercise OR Liuzijue)
#28	TS=(continuous training OR continuous exercise OR continuous-type exercise OR continuous-type training OR continuous training OR moderate intensity continuous training OR continuous medium intensity training OR continuous moderate intensity exercise OR continuous moderate intensity training OR medium intensity continuous training OR MICT (training) OR moderate intensity continuous exercise OR moderate intensity continuous training OR moderate intensity exercise OR medium intensity exercise OR medium intensity physical activity OR medium intensity training OR medium intensity work-out OR medium intensity workout OR moderate intensity physical activity OR moderate intensity training OR moderate intensity work-out' OR moderate intensity workout OR moderate intensity exercise)
#29	OR/#4-#28
#30	TS= clinical trial* OR TS=research design OR TS=comparative stud* OR TS=evaluation stud* OR TS=controlled trial* OR TS=follow-up stud* OR TS=prospective stud* OR TS=random* OR TS=placebo* OR TS=(single blind*) OR TS=(double blind*)
#31	#3 AND #29 AND #30

6.CNKI

#1	SU=糖尿病前期 + 葡糖耐受不良 + 糖耐量异常 + 高血糖证糖尿病风险 + 糖耐量异常 + 糖耐量受损 + 糖耐量减低 + 空腹血糖异常 + 空腹血糖升高 + 中度高血糖状态 + 高血糖状态 + 血糖升高
#2	SU=运动 + 有氧运动 + 锻炼 + 运动训练 + 肌肉牵张？+ 体能锻炼, 人 + 体能训练 + 循环运动 + 循环训练 + 耐力训练 + 耐力运动 + 增强式运动 + 高强度间歇？ + 中等强度持续训练 + 间歇训练法 + 间歇式高强度运动训练 + 抗阻训练 + 弹力带 + 跑 + 慢跑 + 游泳 + 步行 + 北

	欧式健步走 + 运动疗法 + 体育运动 + 体育锻炼 + 武术 + 武术(中医) + 太极 + 太极(中医) + 身心疗法 + 呼吸锻炼 + 气功 + 中医传统功法 + 五禽戏 + 八段锦 + 六字诀 + 易筋经 + 养生术 + 少林内功 + 气功(中医) + 瑜伽 + 自行车运动 + 自行车 + 踏车运动 + 舞蹈疗法 + 广场舞 + 快走 + 健身操 + 保健操
#3	#1 AND #2

7.SinoMed

#1	SU=糖尿病前期 OR 葡糖耐受不良 OR 糖耐量异常 OR 高血糖证糖尿病风险 OR 糖耐量异常 OR 糖耐量受损 OR 糖耐量减低 OR 空腹血糖异常 OR 空腹血糖升高 OR 中度高血糖状态 OR 高血糖状态 OR 血糖升高
#2	SU=运动 OR 有氧运动 OR 锻炼 OR 运动训练 OR 肌肉牵张？OR 体能锻炼, 人 OR 体能训练 OR 循环运动 OR 循环训练 OR 耐力训练 OR 耐力运动 OR 增强式运动 OR 高强度间歇？OR 中等强度持续训练 OR 间歇训练法 OR 间歇式高强度运动训练 OR 抗阻训练 OR 弹力带 OR 跑 OR 慢跑 OR 游泳 OR 步行 OR 北欧式健步走 OR 运动疗法 OR 体育运动 OR 体育锻炼 OR 武术 OR 武术(中医) OR 太极 OR 太极(中医) OR 身心疗法 OR 呼吸锻炼 OR 气功 OR 中医传统功法 OR 五禽戏 OR 八段锦 OR 六字诀 OR 易筋经 OR 养生术 OR 少林内功 OR 气功(中医) OR 瑜伽 OR 自行车运动 OR 自行车 OR 踏车运动 OR 舞蹈疗法 OR 广场舞 OR 快走 OR 健身操 OR 保健操
#3	#1 AND #2

8.WANFANG DATA

#1	主题:(糖尿病前期 OR 葡糖耐受不良 OR 糖耐量异常 OR 高血糖证糖尿病风险 OR 糖耐量异常 OR 糖耐量受损 OR 糖耐量减低 OR 空腹血糖异常 OR 空腹血糖升高 OR 中度高血糖状态 OR 高血糖状态 OR 血糖升高)
#2	主题:(运动 OR 有氧运动 OR 锻炼 OR 运动训练 OR 肌肉牵张？OR 体能锻炼, 人 OR 体能训练 OR 循环运动 OR 循环训练 OR 耐力训练 OR 耐力运动 OR 增强式运动 OR 高强度间歇？OR 中等强度持续训练 OR 间歇训练法 OR 间歇式高强度运动训练 OR 抗阻训练 OR 弹力带 OR 跑 OR 慢跑 OR 游泳 OR 步行 OR 北欧式健步走 OR 运动疗法 OR 体育运动 OR 体育锻炼 OR 武术 OR 武术(中医) OR 太极 OR 太极(中医) OR 身心疗法 OR 呼吸锻炼 OR 气功 OR 中医传统功法 OR 五禽戏 OR 八段锦 OR 六字诀 OR 易筋经 OR 养生术 OR 少林内功 OR 气功(中医) OR 瑜伽 OR 自行车运动 OR 自行车 OR 踏车运动 OR 舞蹈疗法 OR 广场舞 OR 快走 OR 健身操 OR 保健操)
#3	#1 AND #2

9. VIP

#1	M=(糖尿病前期 OR 葡糖耐受不良 OR 糖耐量异常 OR 高血糖证 OR 糖尿病风险 OR 糖耐量异常 OR 糖耐量受损 OR 糖耐量减低 OR 空腹血糖异常 OR 空腹血糖升高 OR 中度高血糖状态 OR 高血糖状态 OR 血糖升高)
#2	M=(运动 OR 有氧运动 OR 锻炼 OR 运动训练 OR 肌肉牵张？OR 体能锻炼, 人 OR 体能训练 OR 循环运动 OR 循环训练 OR 耐力训练 OR 耐力运动 OR 增强式运动 OR 高强度间歇？OR 中等强度持续训练 OR 间歇训练法 OR 间歇式高强度运动训练 OR 抗阻训练 OR 弹力带

	OR 跑 OR 慢跑 OR 游泳 OR 步行 OR 北欧式健步走 OR 运动疗法 OR 体育运动 OR 体育锻炼 OR 武术 OR 太极 OR 身心疗法 OR 呼吸锻炼 OR 气功 OR 中医传统功法 OR 五禽戏 OR 八段锦 OR 六字诀 OR 易筋经 OR 养生术 OR 少林内功 OR 气功 OR 瑜伽 OR 自行车运动 OR 自行车 OR 踏车运动 OR 舞蹈疗法 OR 广场舞 OR 快走 OR 健身操 OR 保健操)
#3	#1 AND #2

10. www.chictr.org.cn

研究疾病名词：糖尿病前期 OR 糖耐量异常 OR 糖耐量受损 OR 糖耐量减低 OR 空腹血糖异常

11. clinicaltrials.gov

Condition or disease: Prediabetes OR glucose intolerance OR Impaired Fasting Glucose \(IFG\)
Study type: Interventional Studies(Clinical Trials)

Reporting checklist for protocol of a systematic review and meta analysis.

Based on the PRISMA-P guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the PRISMA-Preporting guidelines, and cite them as:

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1.

		Reporting Item	Page Number
Title			
Identification	#1a	Identify the report as a protocol of a systematic review	1
Update	#1b	If the protocol is for an update of a previous systematic review, identify as such	n/a

Registration			
	#2	If registered, provide the name of the registry (such as PROSPERO) and registration number	1
Authors			
Contact	#3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contribution	#3b	Describe contributions of protocol authors and identify the guarantor of the review	8
Amendments			
	#4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	n/a
Support			
Sources	#5a	Indicate sources of financial or other support for the review	8
Sponsor	#5b	Provide name for the review funder and / or sponsor	8
Role of sponsor or funder	#5c	Describe roles of funder(s), sponsor(s), and / or institution(s), if any, in developing the protocol	8
Introduction			
Rationale	#6	Describe the rationale for the review in the context of what	2、3

		is already known	
Objectives	#7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	3
Methods			
Eligibility criteria	#8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	3、4、5
Information sources	#9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	4
Search strategy	#10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Supplementary materials
Study records - data management	#11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	4、5
Study records - selection process	#11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	4、5
Study records -	#11c	Describe planned method of extracting data from reports	5

data collection process		(such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	
Data items	#12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	4、5、6
Outcomes and prioritization	#13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	5
Risk of bias in individual studies	#14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	6
Data synthesis	#15a	Describe criteria under which study data will be quantitatively synthesised	6、7
Data synthesis	#15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	6、7、8
Data synthesis	#15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	6、7、8
Data synthesis	#15d	If quantitative synthesis is not appropriate, describe the type of summary planned	7

Meta-bias(es)	#16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	7、8
Confidence in cumulative evidence	#17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	6