# Supplementary material

**Supplementary to：** Xiankun Chen et al. Taichi and Qigong Practices for Chronic Heart Failure: A Systematic Review and Meta-analysis of Randomized Controlled Trials.

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## Search strategy

**PubMed search strategy**

1. "Heart Failure"[Mesh] OR
2. “heart failure”[Title/Abstract] OR “cardiac failure”[Title/Abstract] OR “Myocardia failure”[Title/Abstract] OR “Ventricular failure”[Title/Abstract] OR “Heart decompensation”[Title/Abstract]
3. or1/2
4. "traditional exercise*"[Text Word] OR "chinese traditional exercise*" [Text Word] OR "traditional chinese exercise*"[Text Word] OR "chinese exercise*"[Text Word]
5. “taiji”[Title/Abstract] OR “tai ji”[Title/Abstract] OR “tai chi”[Title/Abstract] OR “qigong”[Title/Abstract] OR “qi gong”[Title/Abstract] OR “liuzijue”[Title/Abstract] OR “liu zi jue” [Title/Abstract] OR “wuqinxi”[Title/Abstract] OR “wu qin xi”[Title/Abstract] OR “yijinjing”[Title/Abstract] OR “yi jin jing”[Title/Abstract] OR “baduanjin”[Title/Abstract] OR “ba duan jin”[Title/Abstract] OR “eight section brocades”[Title/Abstract] OR “eight section brocades”[Title/Abstract]
6. or/4-5
7. "Randomized Controlled Trial" [Publication Type]
8. "Controlled Clinical Trial" [Publication Type]
9. randomized[Text Word]
10. placebo[Text Word]
11. randomly[Text Word]
12. trial[Text Word]
13. groups[Text Word]
14. or/7-13
15. ("Animals"[Mesh]) NOT (("Animals"[Mesh]) AND "Humans"[Mesh])
16. 14 not 15
17. 3 AND 6 AND 16

CNKI search strategy

1. FT=随机 OR FT=随机分配 OR FT=随机对照 OR FT=对照 OR FT=盲法 OR FT=单盲 OR FT=双盲 OR FT=随机对照试验 OR FT=随机对 照研究 OR FT=临床试验 OR FT=临床观察 OR FT=临床研究
2. SU=太极拳 OR SU=气功 OR SU=六字诀 OR SU=易筋经 OR SU=五禽戏 OR SU=八段锦 OR SU=传统训练 OR SU=中国传统运动训练 OR SU=中国训练(精确匹配)
3. SU=心血管疾病 OR SU=冠心病 OR SU=高血压 OR SU=高血脂 OR SU=心绞痛 OR SU=心肌梗死 OR SU=心律失常 OR SU=心衰 OR SU=心力衰竭 OR SU=心肌缺血 OR SU=动脉粥样硬化 OR SU=冠状动脉疾病 OR SU=高血压
4. AND/1-

## Supplementary Tables

**eTable 1** Sensitivity analysis of the effect size of Peak $VO_2$, 6MWD, MLHFQ, LVEF, BNP

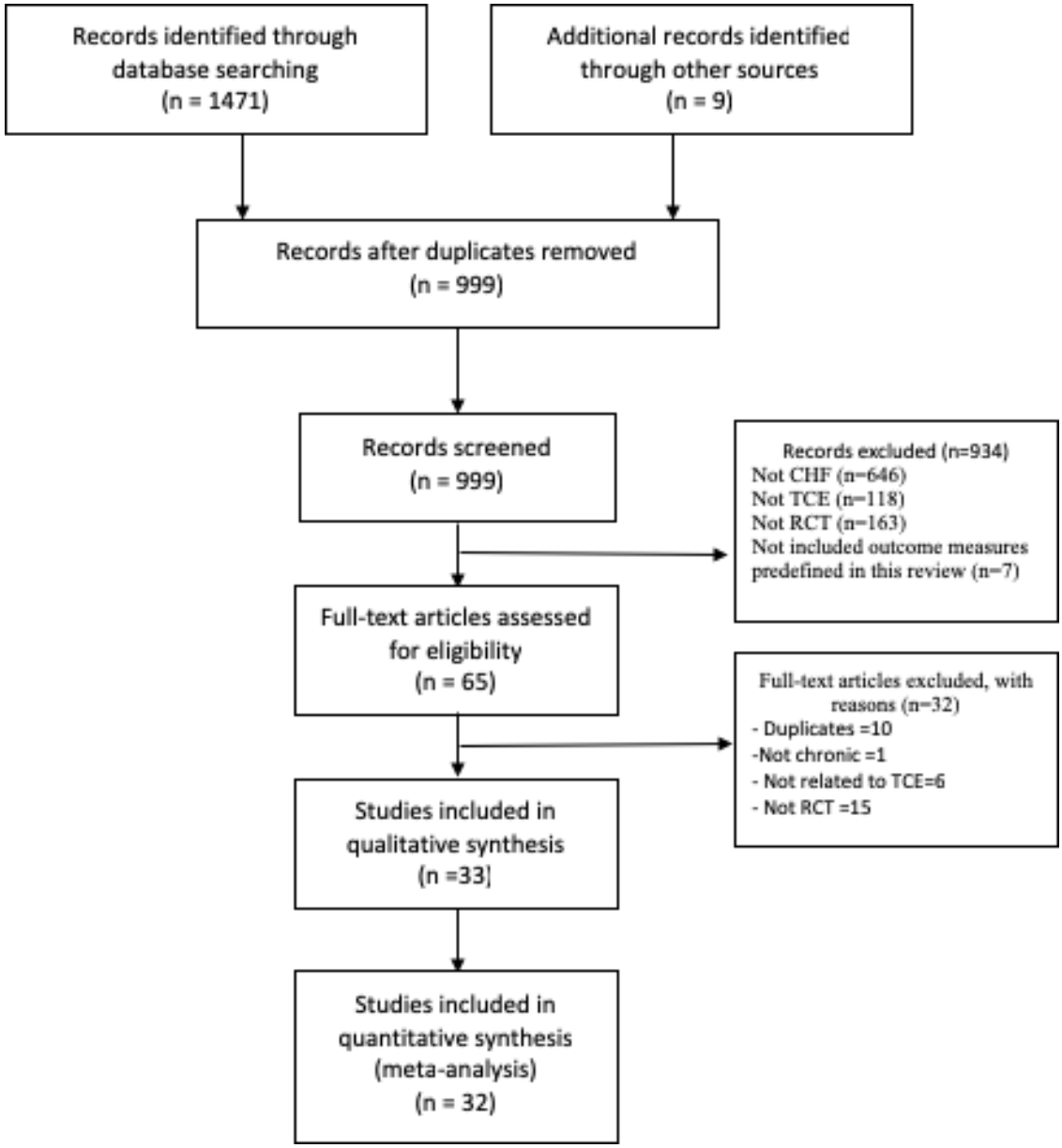
| Outcomes | | Effect size | | Heterogeneity |
|---|---|---|---|---|
| ID | Study removed | Mean difference [95%CI] | (P-value) | (P-value for $I^2$); $I^2$ |
| **MLHFQ, A. TQPs versus no exercise** | | | | |
| **Overall pooled results** | | **-8.63 [-10.60, -6.67]** | **(P < 0.00001)** | **(P < 0.00001); $I^2$ = 94%** |
| 1 | Barrow 2007 | -8.47 [-10.46, -6.47] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 3 | Chen 2017 | -8.88 [-10.91, -6.85] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 4 | Feng 2017 | -8.48 [-10.52, -6.44] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 5 | Huang 2014 | -9.17 [-11.19, -7.15] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 10 | Sang 2015 | -8.28 [-10.24, -6.33] | (P < 0.00001) | (P < 0.00001); $I^2$ = 90% |
| 12 | Xiong 2016 | -8.85 [-11.15, -6.55] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 16 | Yao 2010 | -8.31 [-10.34, -6.28] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 17 | Yeh 2004 | -8.42 [-10.38, -6.46] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 19 | Yeh 2011 | -8.49 [-10.49, -6.50] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 22 | Yuan 2016 | -9.05 [-11.17, -6.94] | (P < 0.00001) | (P < 0.00001); $I^2$ = 93% |
| 23.1 | Zheng 201701 (C1) | -8.18 [-10.15, -6.22] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 24 | Shi 2018 | -8.29 [-10.33, -6.26] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 26 | Liu 2017 | -9.01 [-11.34, -6.68] | (P < 0.00001) | (P < 0.00001); $I^2$ = 94% |
| 32 | Lu 2019 | -9.06 [-10.79, -7.33] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| **MLHFQ, B. TQPs versus conventional exercises** | | | | |
| **Overall pooled results** | | **-9.18 [-17.95, -0.41]** | **(P = 0.04)** | **(P = 0.0001); $I^2$ = 86%** |
| 7 | Li 2017 | -5.63 [-11.76, 0.51] | (P = 0.07) | (P = 0.12); $I^2$ = 53% |
| 20 | Yeh 2013 | -10.44 [-20.12, -0.77] | (P = 0.03) | (P < 0.0001); $I^2$ = 90% |
| 23.2 | Zheng 201702 (C2) | -8.29 [-20.69, 4.12] | (P = 0.19) | (P < 0.0001); $I^2$ = 90% |
| 25 | Yu 2018 | -13.02 [-20.57, -5.47] | (P = 0.0007) | (P = 0.12); $I^2$ = 53% |
| **6MWD, A. TQPs versus no exercise** | | | | |
| **Overall pooled results** | | **59.63 [43.35, 75.90]** | **(P < 0.00001)** | **(P < 0.00001); $I^2$ = 88%** |
| 5 | Huang 2014 | 65.04 [48.40, 81.68] | (P < 0.00001) | (P < 0.00001); $I^2$ = 85% |
| 6 | Li 2015 | 58.43 [41.46, 75.41] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 8 | Pan 2016 | 61.22 [43.00, 79.44] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| 10 | Sang 2015 | 61.35 [44.32, 78.38] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| 12 | Xiong 2016 | 58.29 [41.35, 75.23] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |

| Outcomes | | Effect size | | Heterogeneity |
|---|---|---|---|---|
| ID | Study removed | Mean difference [95%CI] | (P-value) | (P-value for $I^2$); $I^2$ |
| 14 | Yan 2016 | 58.41 [41.84, 74.98] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| 15 | Yang 2015 | 58.31 [41.76, 74.86] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| 16 | Yao 2010 | 57.11 [40.55, 73.68] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 17 | Yeh 2004 | 58.33 [41.94, 74.72] | (P < 0.00001) | (P < 0.00001); $I^2$ = 89% |
| 19 | Yeh 2011 | 57.52 [41.87, 73.18] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 21 | Yu 2015 | 54.84 [39.36, 70.32] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 23.1 | Zheng 201701 (C1) | 55.37 [39.89, 70.85] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 26 | Liu 2017 | 59.54 [39.07, 80.01] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 30 | Yu 2019 (2) | 57.48 [40.64, 74.33] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 31 | Deng 2018 | 49.41 [36.34, 62.48] | (P < 0.00001) | (P < 0.00001); $I^2$ = 80% |
| 34.1 | Redwine 2019 (C1) | 59.03 [43.50, 74.56] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| 35 | Zheng 2018 | 58.11 [42.30, 73.91] | (P < 0.00001) | (P < 0.00001); $I^2$ = 88% |
| **6MWD, B. TQPs versus conventional exercises** | | | | |
| **Overall pooled results** | | **46.66 [-18.17, 111.49]** | (P = 0.16) | (P < 0.00001); $I^2$ = 97% |
| 2 | Caminiti 2011 | 51.40 [-30.13, 132.93] | (P = 0.22) | (P < 0.00001); $I^2$ = 98% |
| 7 | Li 2017 | 20.86 [7.40, 34.32] | (P = 0.002) | (P = 0.28); $I^2$ = 20% |
| 20 | Yeh 2013 | 46.83 [-20.55, 114.22] | (P = 0.17) | (P < 0.00001); $I^2$ = 98% |
| 23.2 | Zheng 201702 (C2) | 42.58 [-27.89, 113.06] | (P = 0.24) | (P < 0.00001); $I^2$ = 98% |
| 25 | Yu 2018 | 50.74 [-33.99, 135.48] | (P = 0.24) | (P < 0.00001); $I^2$ = 97% |
| 29 | Yu 201900 | 50.29 [-25.56, 126.13] | (P = 0.19) | (P < 0.00001); $I^2$ = 98% |
| 34.2 | Redwine 2019 (C2) | 62.82 [-6.91, 132.55] | (P = 0.08) | (P < 0.00001); $I^2$ = 98% |
| **Peak VO2, A. TQPs versus no exercise** | | | | |
| **Overall pooled results** | | **1.24 [0.91, 1.57]** | **(P < 0.00001)** | **(P = 0.55); $I^2$ = 0%** |
| 4 | Feng 2017 | 1.26 [0.80, 1.71] | (P < 0.00001) | (P = 0.35); $I^2$ = 5% |
| 17 | Yeh 2004 | 1.25 [0.91, 1.58] | (P < 0.00001) | (P = 0.35); $I^2$ = 5% |
| 19 | Yeh 2011 | 1.29 [0.95, 1.63] | (P < 0.00001) | (P = 0.93); $I^2$ = 0% |
| 24 | Shi 2018 | 1.14 [0.68, 1.61] | (P < 0.00001) | (P = 0.42); $I^2$ = 0% |
| **Peak VO2, B. TQPs versus conventional exercises** | | | | |
| **Overall pooled results** | | **0.14 [-0.43, 0.70]** | **(P = 0.64)** | **(P = 0.42); $I^2$ = 0%** |
| NA | | | | |
| **LVEF, A. TQPs versus no exercise** | | | | |
| **Overall pooled results** | | **3.97 [1.22, 6.72]** | **(P = 0.005)** | **(P < 0.00001); $I^2$ = 96%** |

| Outcomes | | Effect size | | Heterogeneity |
|---|---|---|---|---|
| ID | Study removed | Mean difference [95%CI] | (P-value) | (P-value for $I^2$); $I^2$ |
| 4 | Feng 2017 | 4.58 [1.72, 7.45] | (P = 0.002) | (P < 0.00001) $I^2$ = 96% |
| 5 | Huang 2014 | 4.19 [1.21, 7.17] | (P = 0.006) | (P < 0.00001) $I^2$ = 96% |
| 8 | Pan 2016 | 4.11 [1.20, 7.02] | (P = 0.006) | (P < 0.00001) $I^2$ = 96% |
| 10 | Sang 2015 | 2.92 [1.07, 4.77] | (P = 0.002) | (P < 0.00001) $I^2$ = 88% |
| 12 | Xiong 2016 | 3.93 [0.93, 6.92] | (P = 0.01) | (P < 0.00001) $I^2$ = 97% |
| 16 | Yao 2010 | 3.43 [0.49, 6.36] | (P = 0.02) | (P < 0.00001) $I^2$ = 96% |
| 23.1 | Zheng 201701 (C1) | 4.20 [1.42, 6.99] | (P = 0.003) | (P < 0.00001) $I^2$ = 96% |
| 24 | Shi 2018 | 4.54 [1.64, 7.43] | (P = 0.002) | (P < 0.00001) $I^2$ = 96% |
| 26 | Liu 2017 | 3.74 [-0.32, 7.79] | (P = 0.07) | (P < 0.00001) $I^2$ = 96% |
| 30 | Yu 2019 (2) | 3.81 [0.75, 6.87] | (P = 0.01) | (P < 0.00001) $I^2$ = 97% |
| 31 | Deng 2018 | 4.05 [0.97, 7.12] | (P = 0.010) | (P < 0.00001) $I^2$ = 96% |
| **LVEF, B. TQPs versus conventional exercises** | | | | |
| **Overall pooled results** | | **3.17 [-1.25, 7.59]** | **(P = 0.14)** | **(P = 0.60); $I^2$ = 0%** |
| 20 | Yeh 2013 | 1.84 [-0.33, 4.01] | (P = 0.10) | (P = 0.60); $I^2$ = 0% |
| 23.2 | Zheng 201702 (C2) | 1.74 [-0.39, 3.88] | (P = 0.11) | (P = 0.55); $I^2$ = 0% |
| 25 | Yu 2018 | 1.65 [-1.14, 4.45] | (P = 0.25) | (P = 0.40); $I^2$ = 0% |
| 29 | Yu 201900 | 0.72 [-2.11, 3.55] | (P = 0.62) | (P = 0.58); $I^2$ = 0% |
| **BNP, A. TQPs versus no exercise** | | | | |
| **Overall pooled results** | | **-76.12 [-134.61, -17.62]** | **(P = 0.01)** | **(P < 0.00001); $I^2$ = 95%** |
| 5 | Huang 2014 | -89.86 [-154.23, -25.48] | (P = 0.006) | (P < 0.00001); $I^2$ = 96% |
| 6 | Li 2015 | -80.84 [-154.47, -7.21] | (P = 0.03) | (P < 0.00001); $I^2$ = 96% |
| 8 | Pan 2016 | -41.57 [-62.44, -20.70] | (P < 0.0001) | (P = 0.13); $I^2$ = 39% |
| 14 | Yan 2016 | -69.96 [-131.96, -7.96] | (P = 0.03) | (P < 0.00001); $I^2$ = 96% |
| 15 | Yang 2015 | -71.19 [-132.84, -9.55] | (P = 0.02) | (P < 0.00001); $I^2$ = 96% |
| 17 | Yeh 2004 | -75.52 [-135.27, -15.78] | (P = 0.01) | (P < 0.00001); $I^2$ = 96% |
| 19 | Yeh 2011 | -84.45 [-148.96, -19.94] | (P = 0.01) | (P < 0.00001); $I^2$ = 96% |
| 28 | Li 2019 | -84.09 [-156.82, -11.37] | (P = 0.02) | (P < 0.00001); $I^2$ = 94% |
| **BNP, B. TQPs versus conventional exercises** | | | | |
| **Overall pooled results** | | **61.29 [-52.22, 174.79]** | **(P = 0.29)** | **(P = 0.04); $I^2$ = 77%** |
| NA | | | | |

## Supplementary Figures: Flow chart

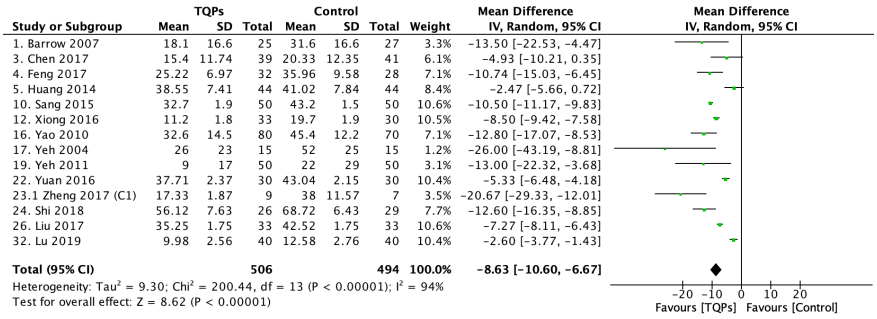
**eFig. 1** Flow chart of study identification and selection



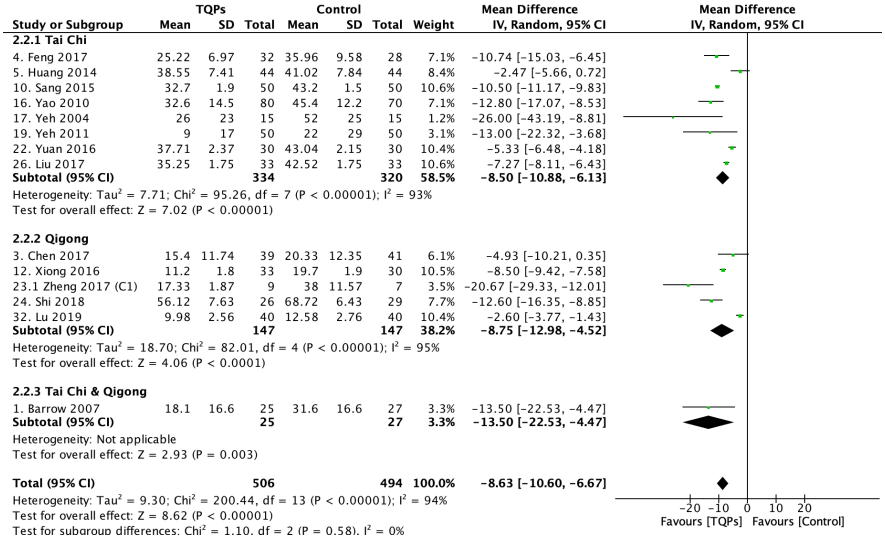
# Supplementary Figures: Meta-analysis results

## **eFig. 2** MLHFQ total scores, TQPs plus RMs versus RMs (supplements to Fig. 2A)

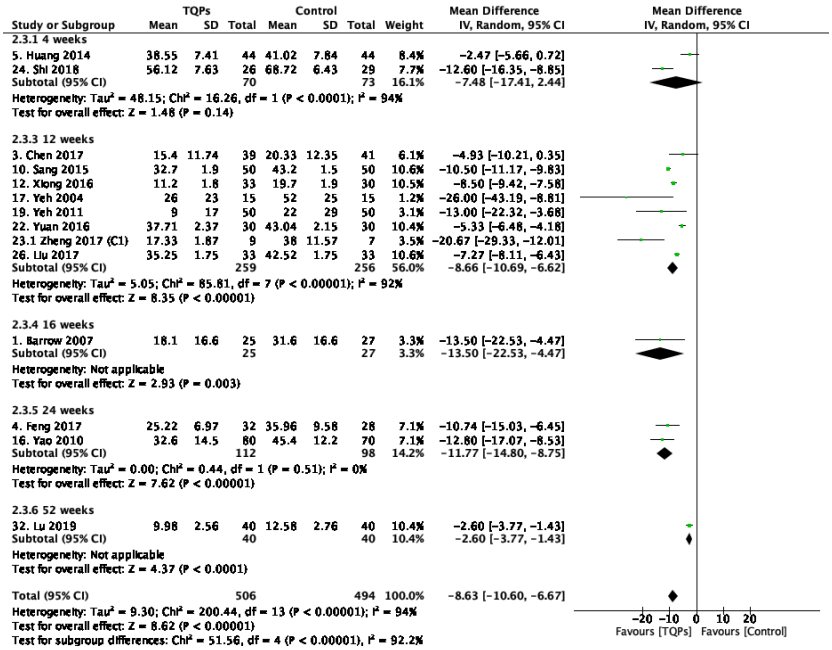
### a. The overall pooled results




### b. Subgroup analysis based on TQPs type

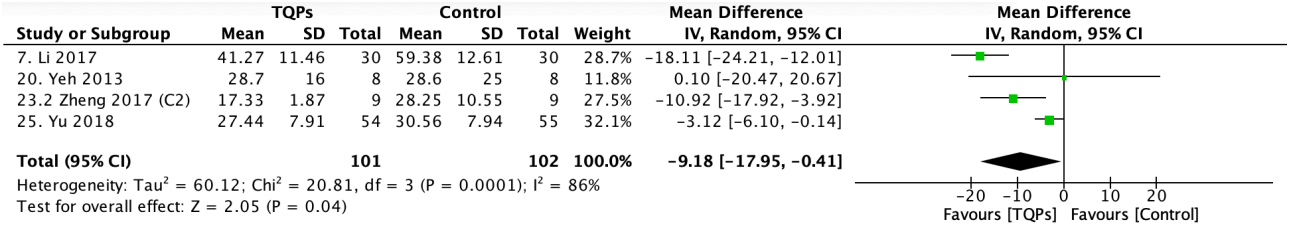



### c. Subgroup analysis based on program durations

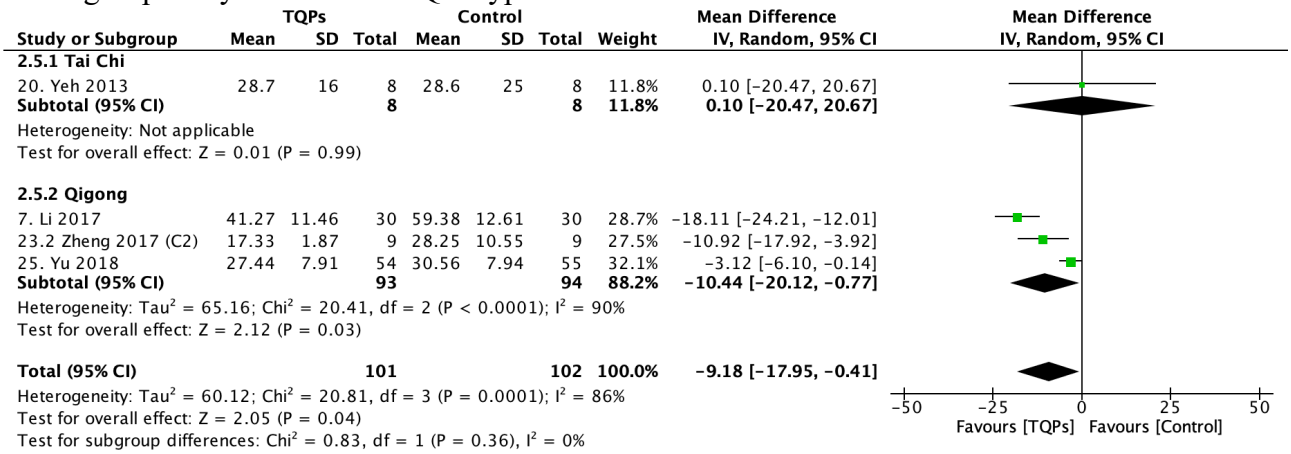


**eFig. 3** MLHFQ total scores, TQPs plus RMs versus general exercises plus RMs (supplements to Fig. 2B)

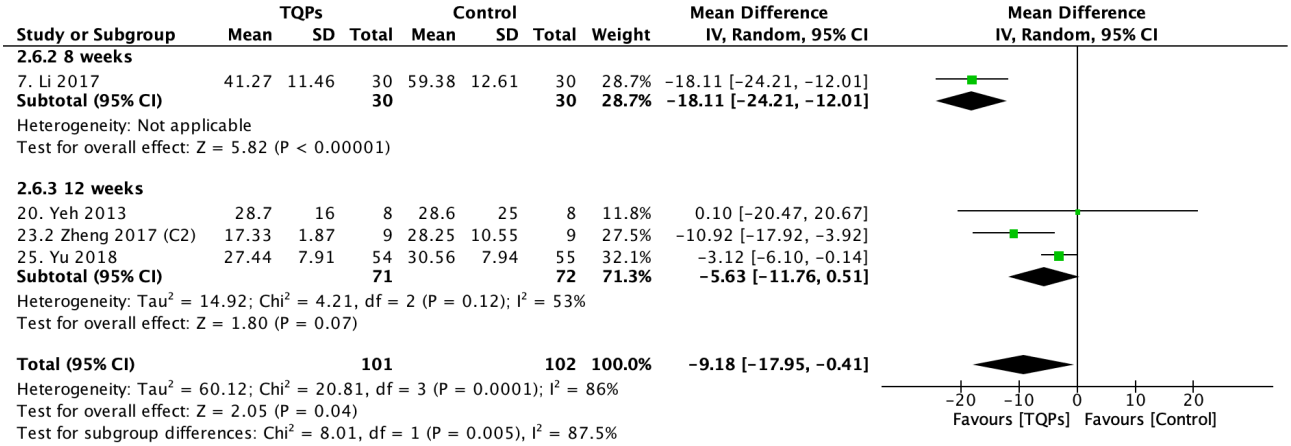
a. The overall pooled results




b. Subgroup analysis based on TQPs type

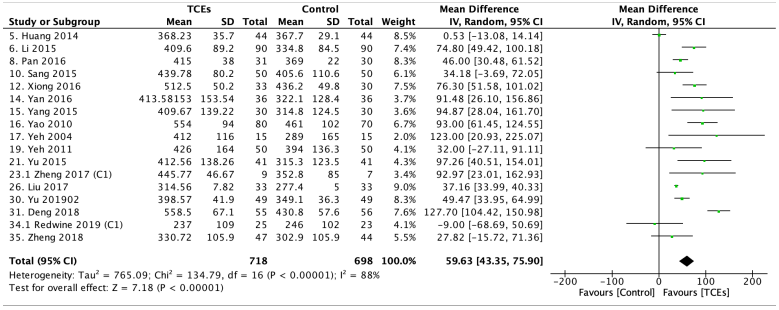



c. Subgroup analysis based on program durations

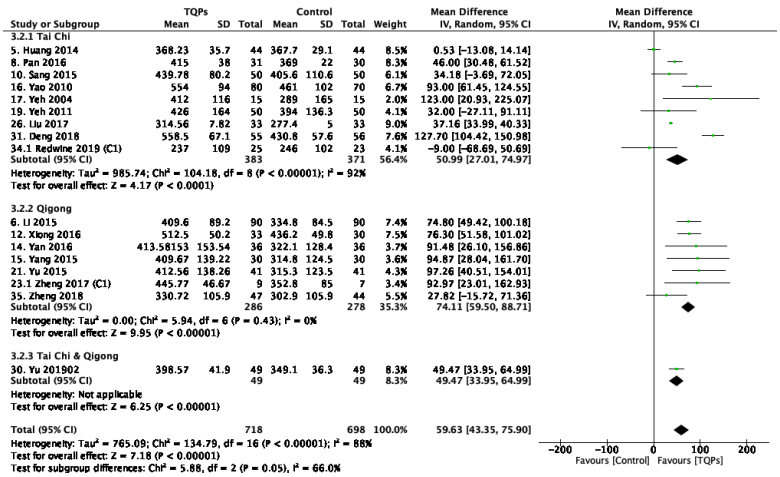


**eFig. 4** 6MWD (meters), TQPs plus RMs versus RMs (supplements to Fig. 3A)

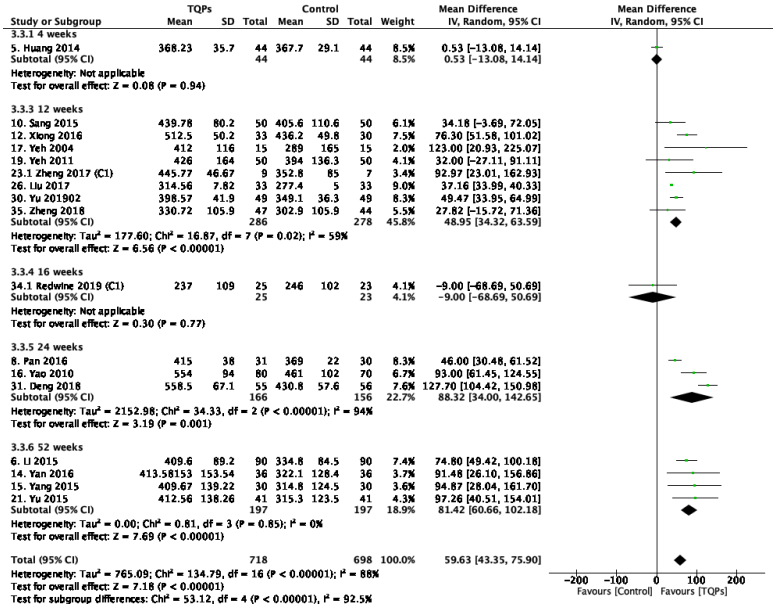
a. The overall pooled results




b. Subgroup analysis based on TQPs type

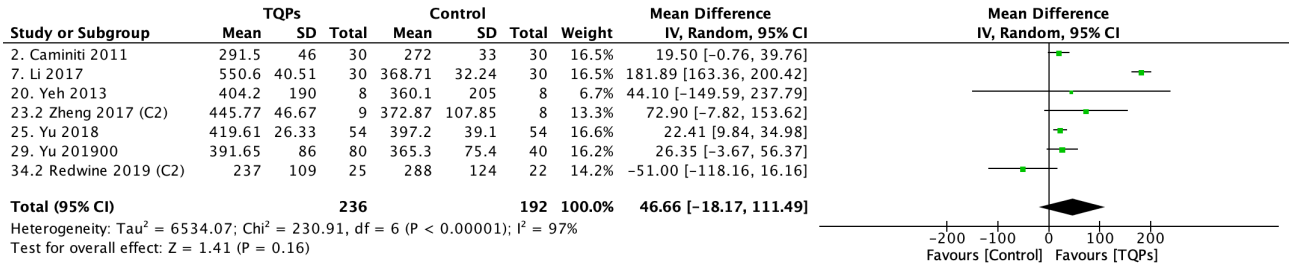



c. Subgroup analysis based on program durations

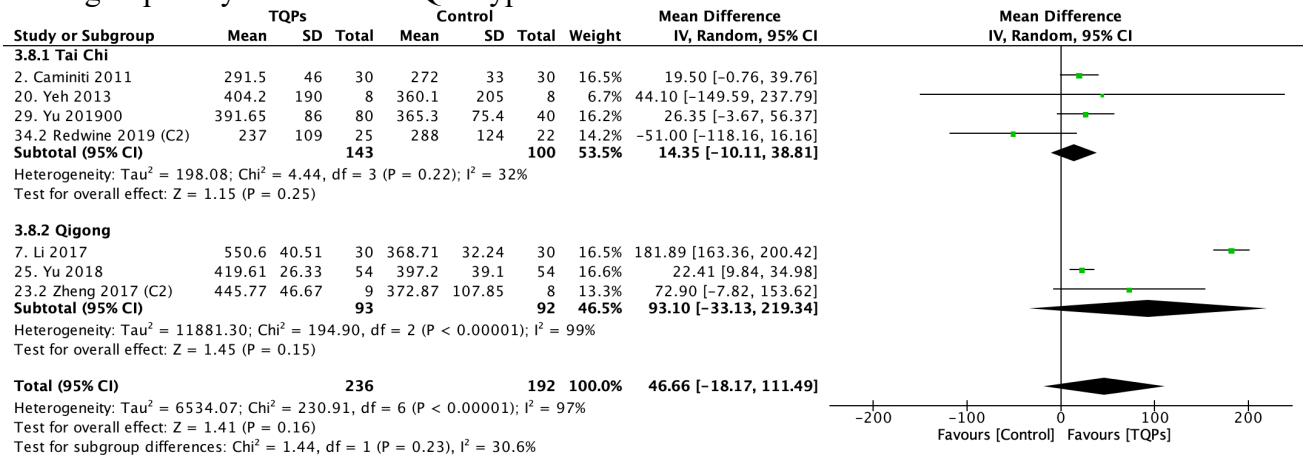


**eFig. 5** 6MWD (meters), TQPs plus RMs versus general exercises plus RMs (supplements to Fig. 3B)

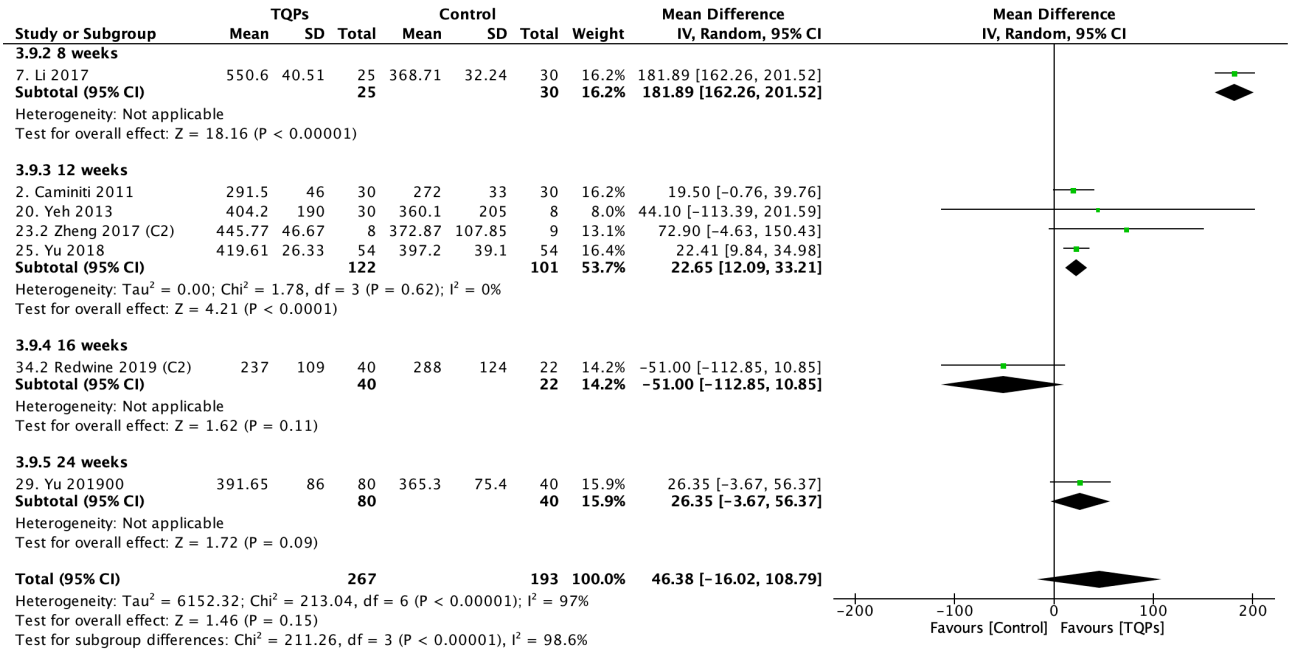
a. The overall pooled results




b. Subgroup analysis based on TQPs type

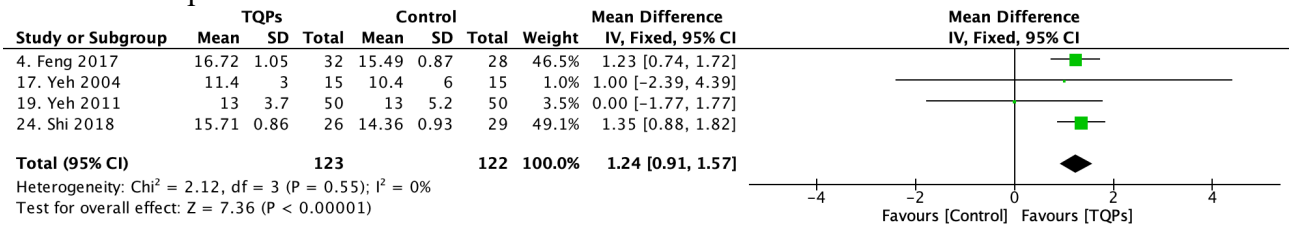



c. Subgroup analysis based on program durations

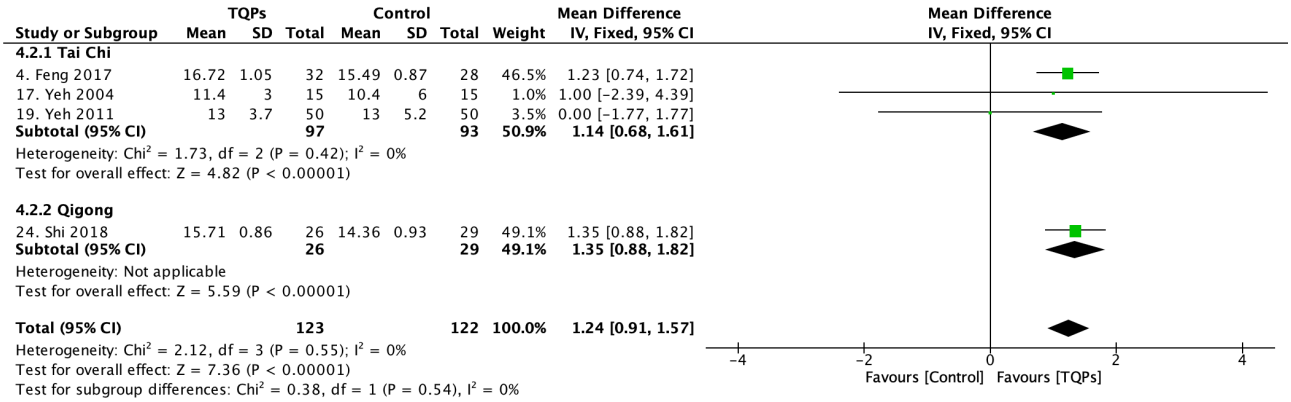


**eFig. 6** Peak VO2 (mL/kg/min), TQPs plus RMs versus RMs (supplements to Fig. 4A)

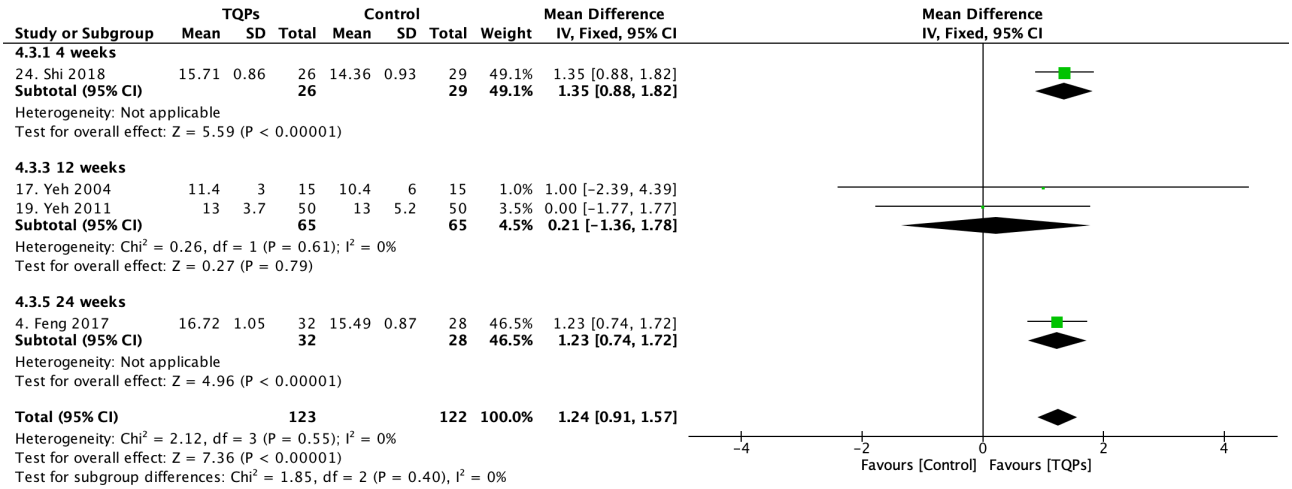
a. The overall pooled results




b. Subgroup analysis based on TQPs type

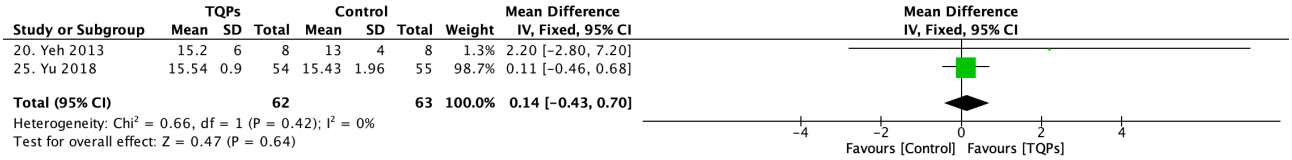



c. Subgroup analysis based on program durations



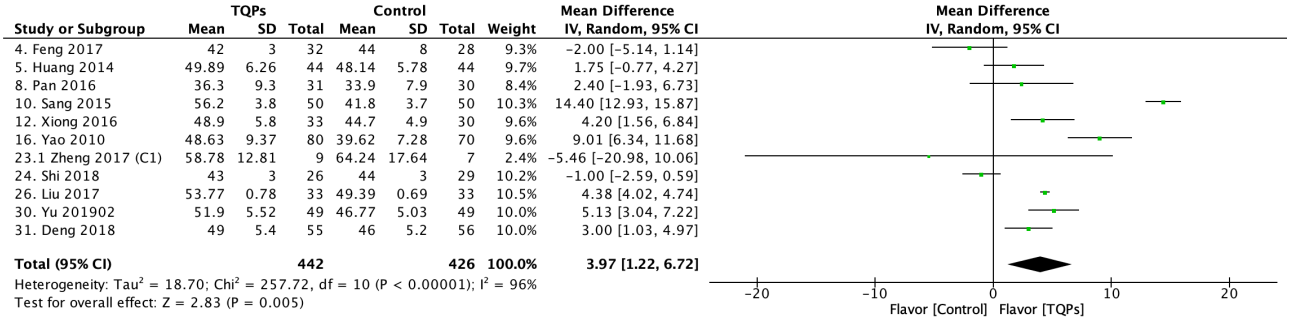

**eFig. 7** Peak VO2 (mL/kg/min), TQPs plus RMs versus general exercises plus RMs (supplements to Fig. 4B)

a. The overall pooled results

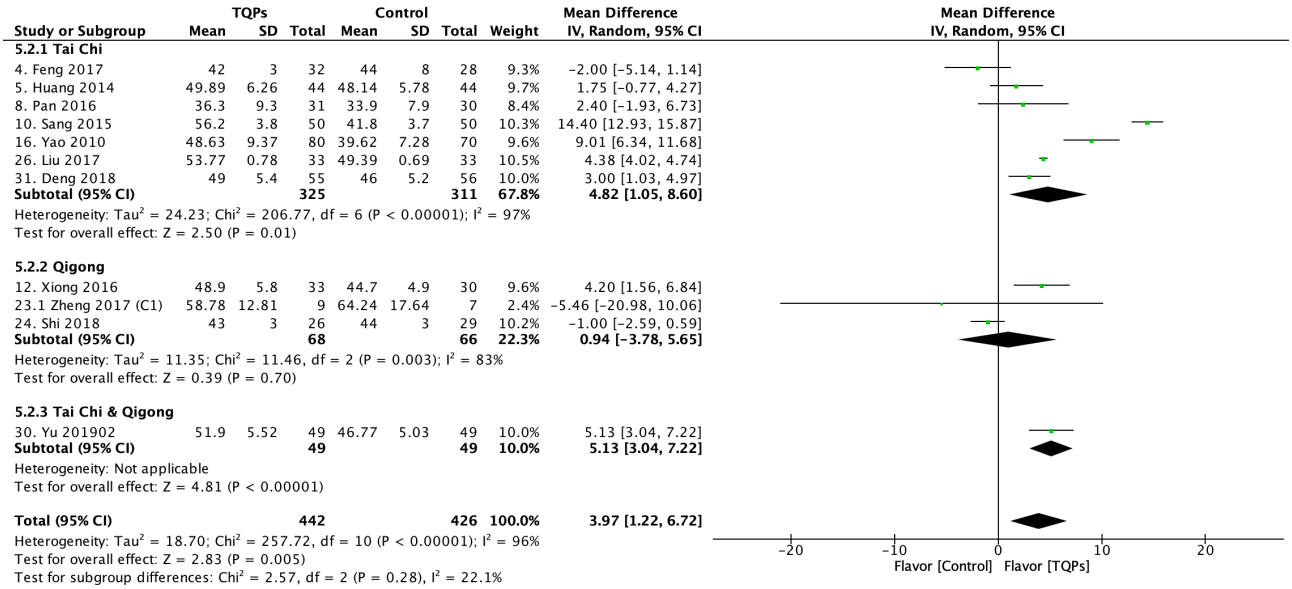


**eFig. 8** LVEF (%), TQPs plus RMs versus RMs (supplements to Fig. 5A)

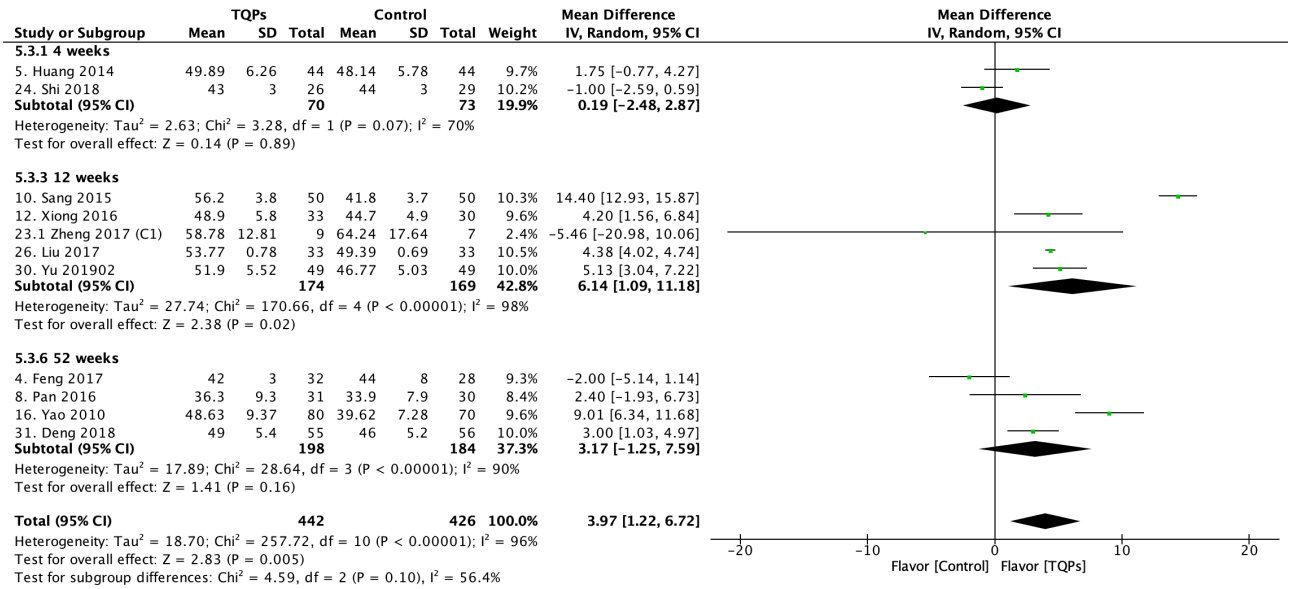
a. The overall pooled results




b. Subgroup analysis based on TQPs type

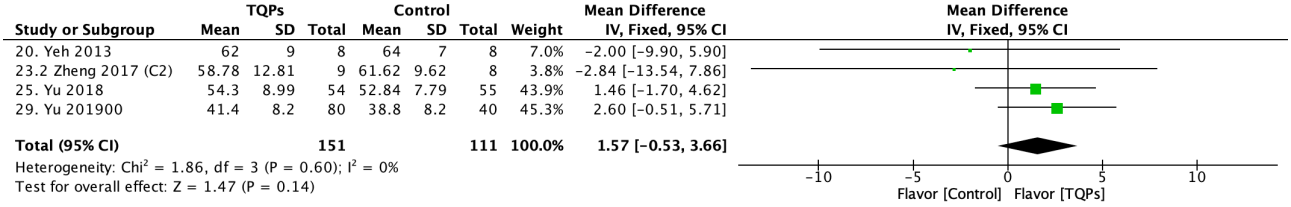



c. Subgroup analysis based on program durations

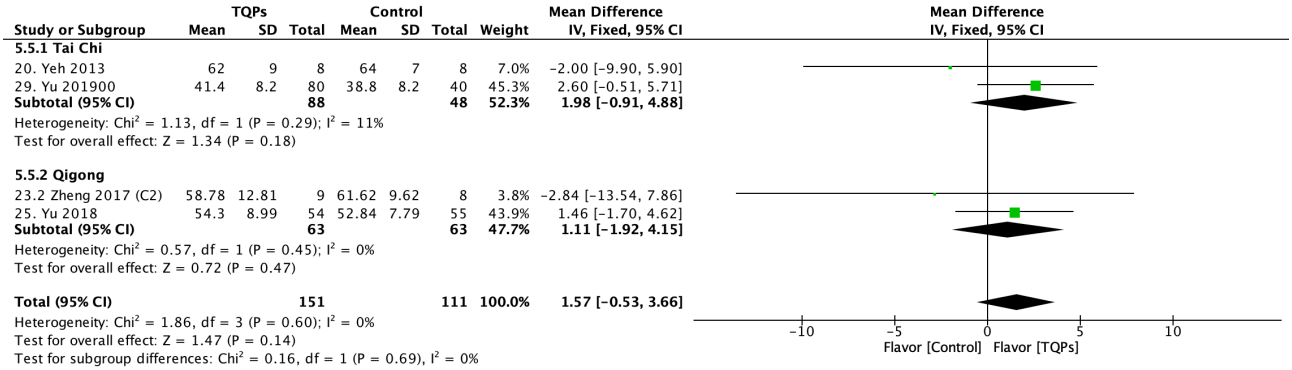


**eFig. 9** LVEF (%), TQPs plus RMs versus general exercises plus RMs (supplements to Fig. 5B)

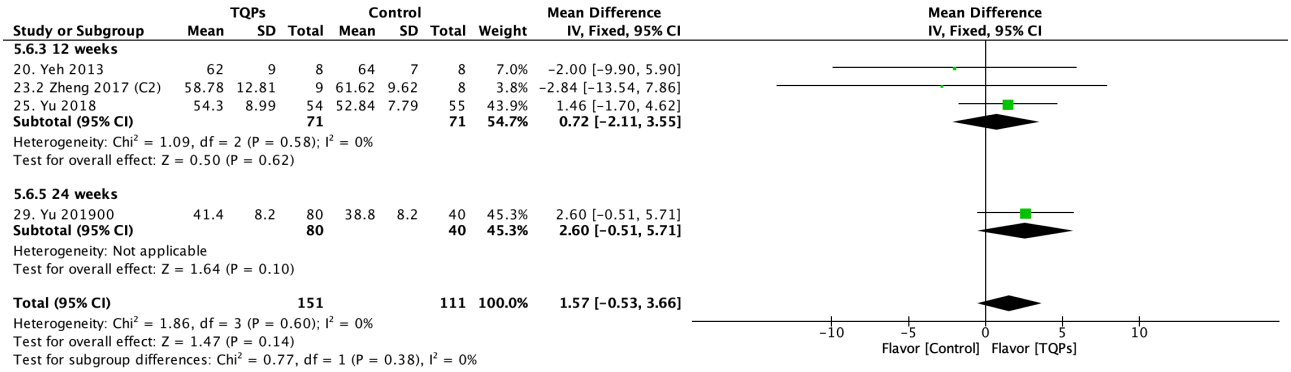
a. The overall pooled results




b. Subgroup analysis based on TQPs type

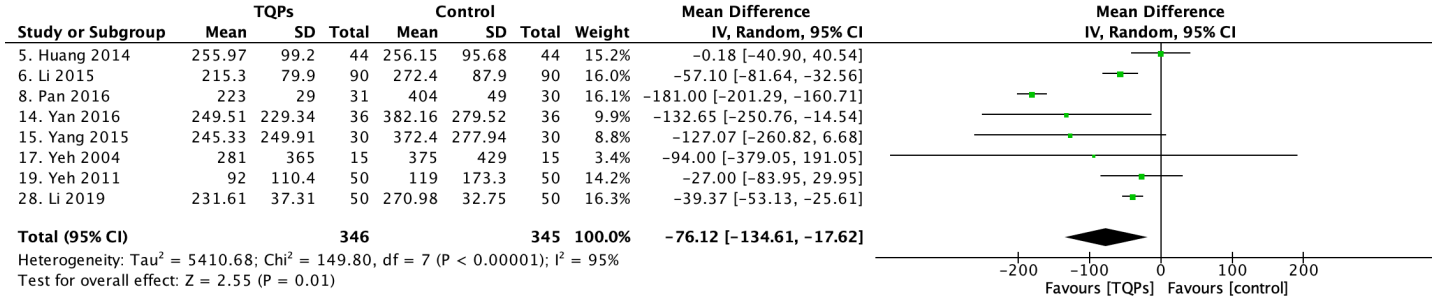



c. Subgroup analysis based on program durations

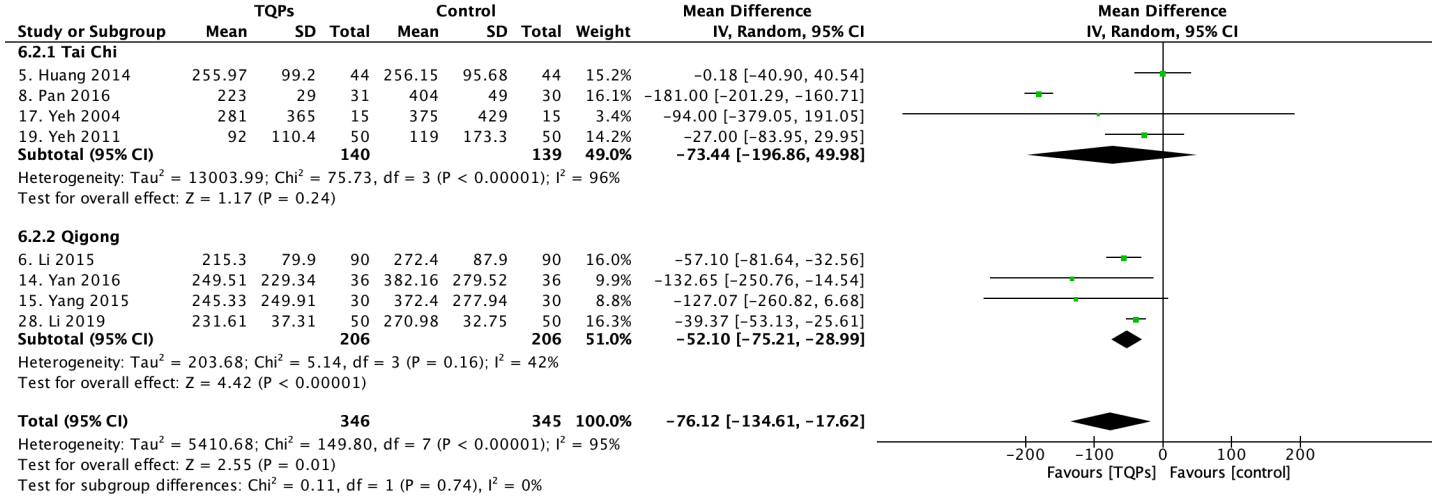


**eFig. 10** BNP (pg/mL), TQPs plus RMs versus RMs (supplements to Fig. 6A)

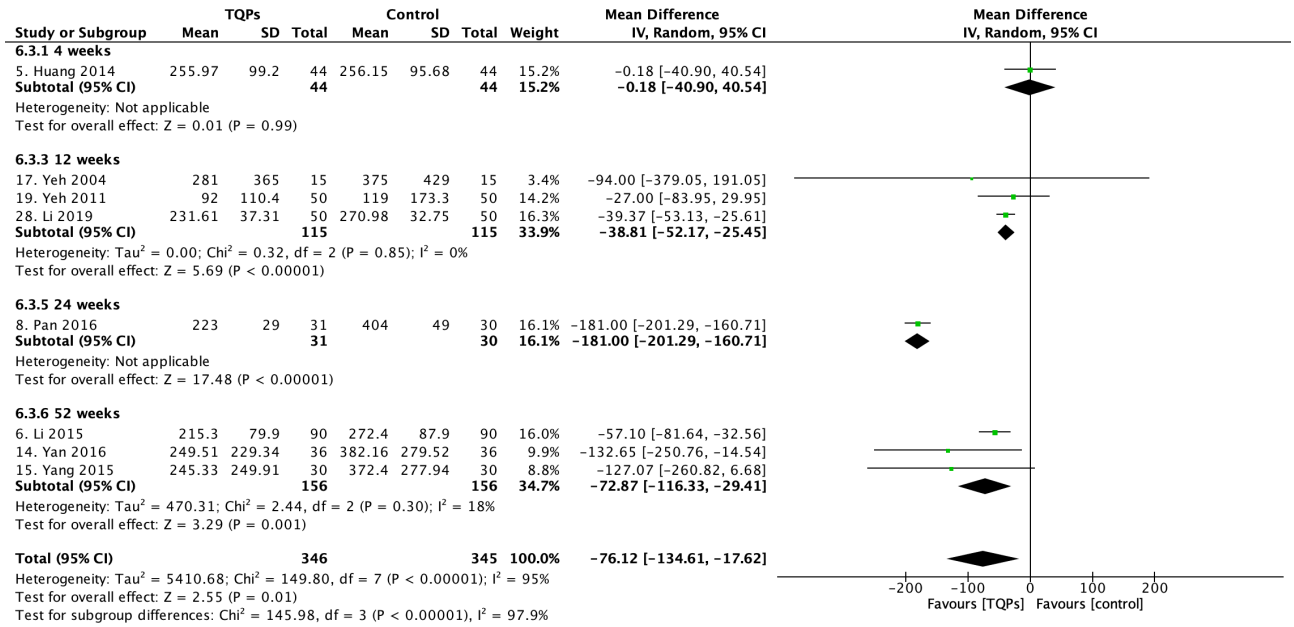
a. The overall pooled results




b. Subgroup analysis based on TQPs type

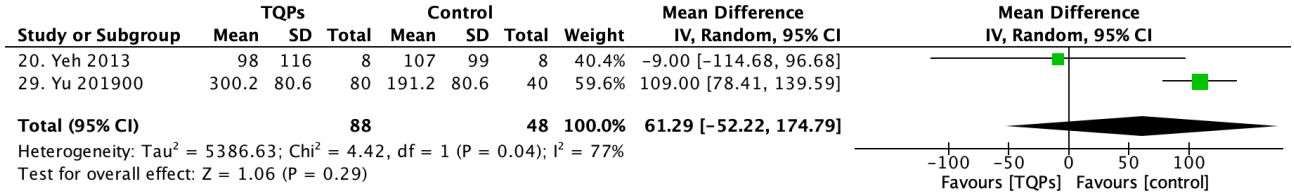



c. Subgroup analysis based on program durations



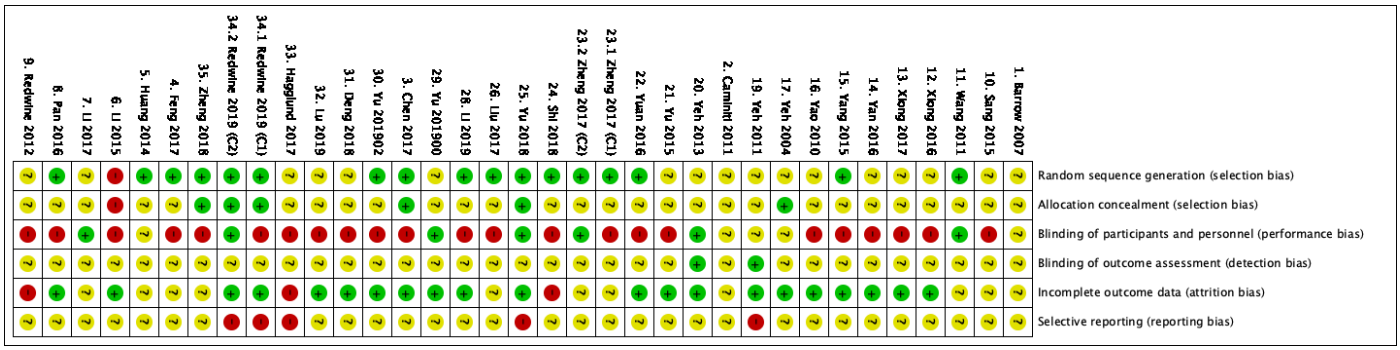
**eFig. 11** BNP (pg/mL), TQPs plus RMs versus general exercises plus RMs (supplements to Fig. 6B)

a. The overall pooled results



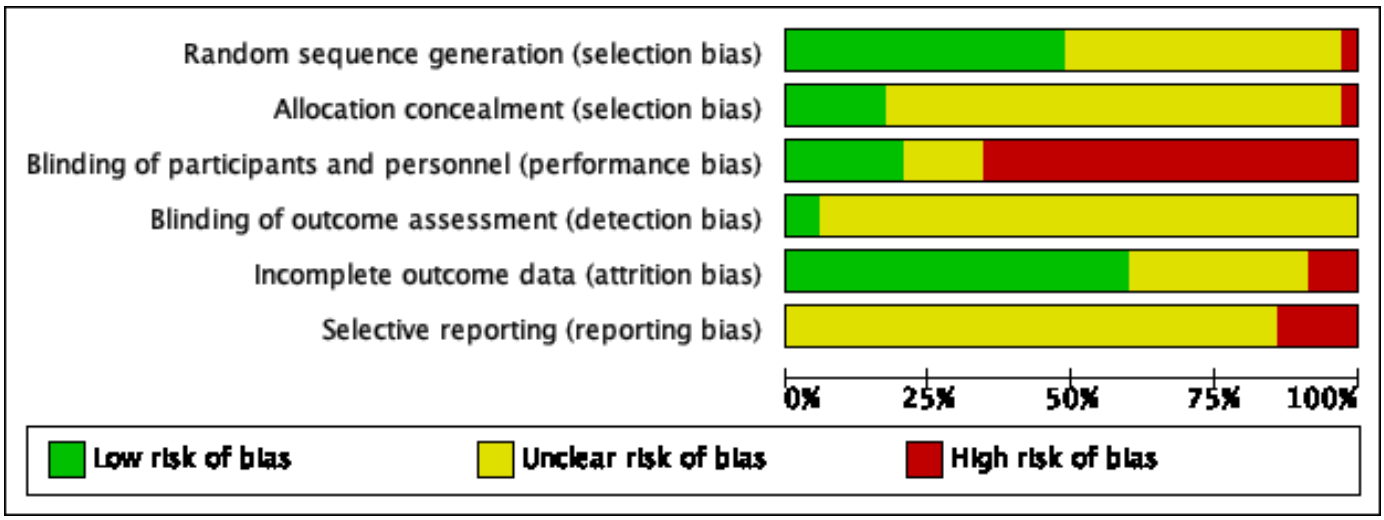
## Supplementary Figures: Risk of bias and publication bias

**eFig. 12** Risk of bias summary:




**Legend:** The authors' judgments about each risk of bias item for each included study

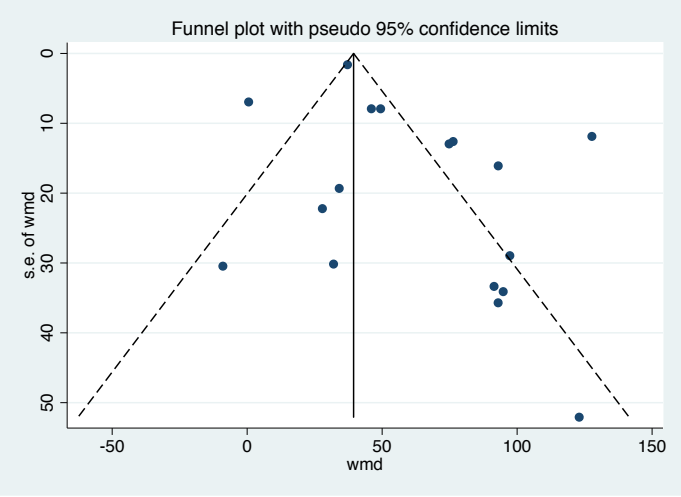
**eFig. 13** Risk-of-bias graph




**Legend:** The authors' judgments regarding each risk-of-bias item presented as percentages across all included studies.

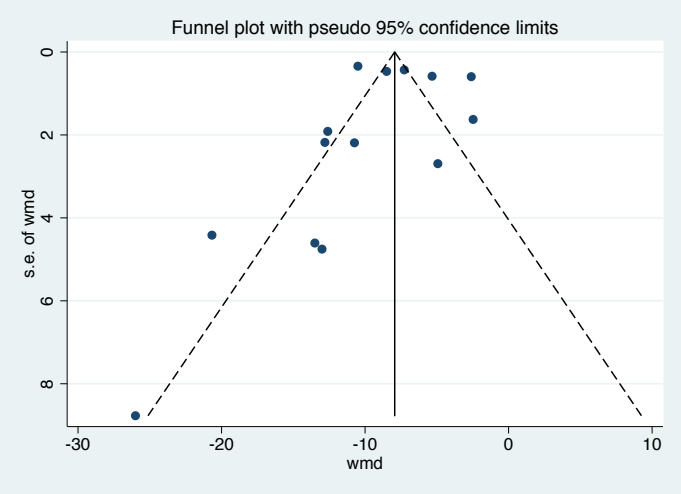
**eFig. 14** Publication bias

a. 6MWD



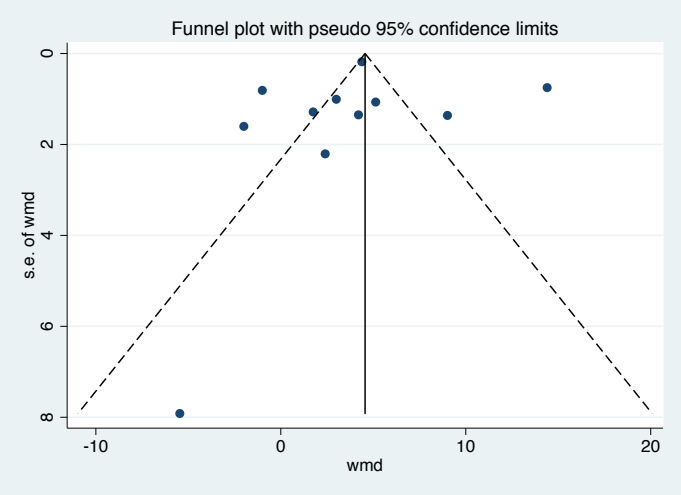

**Legend:** Egger's test: *P* = 0.079

b. MLHFQ




**Legend:** Egger's test: *P* = 0.817

c. LVEF (Egger's test: P = 0.929)




**Legend:** Egger's test: *P* = 0.929

# PRISMA 2009 Checklist

| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | 1 |
| **ABSTRACT** | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of what is already known. | 4-5 |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS). | 5 |
| **METHODS** | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | 5 |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | 5-6 |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | 5 |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated. | Supl |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | 5-6 |
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | 6-7 |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | 6-7 |

| | | | |
|---|---|---|---|
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis. | 7 |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | 7-8 |
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$) for each meta-analysis. | 7-8 |



| Section/topic | # | Checklist item | Reported on page # |
|---|---|---|---|
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies). | 8 |
| Additional analyses | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified. | 8 |
| **RESULTS** | | | |
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram. | 9 |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations. | 9-10 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12). | 12 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot. | 10-12 |
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency. | Figure 1 |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies (see Item 15). | 12 |
| Additional analysis | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]). | 12 |
| **DISCUSSION** | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers). | 13 |
| Limitations | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias). | 15 |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | 16 |
| **FUNDING** | | | |

| | | | |
|---|---|---|---|
| Funding | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | 17 |

*From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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