Effect of Internet-based Cardiac Rehabilitation on Depression among Patients with Ischemic Heart Disease: A Systematic Review and Meta-analysis.

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Abstract

This study aimed to systematically review and meta-analyse the effect of internet-based Cardiac rehabilitation (CR) on Depression among patients with Ischemic heart disease (IHD). Embase, CINHAL, Medline, Cochrane, Web of Science databases, and additional sources were searched. The PROSPERO registration number is CRD42023387666.

Included 11 RCTs showed moderate(n=2) to high quality(n=9) and potential publication bias. The overall effect of Internet-based CR on depression was -0.09 (95% CI -0.33 to 0.16, p= 0.5, Z= 0.67) with high heterogeneity (I^2 = 84%, Tau^2 = 0.14, p = 0.00001). Internet-based CR may not significantly reduce depression among patients with IHD due to the diverse depression scales and other confounding.

Keywords: Internet, Depression, Ischemic heart disease, Cardiac rehabilitation

Introduction
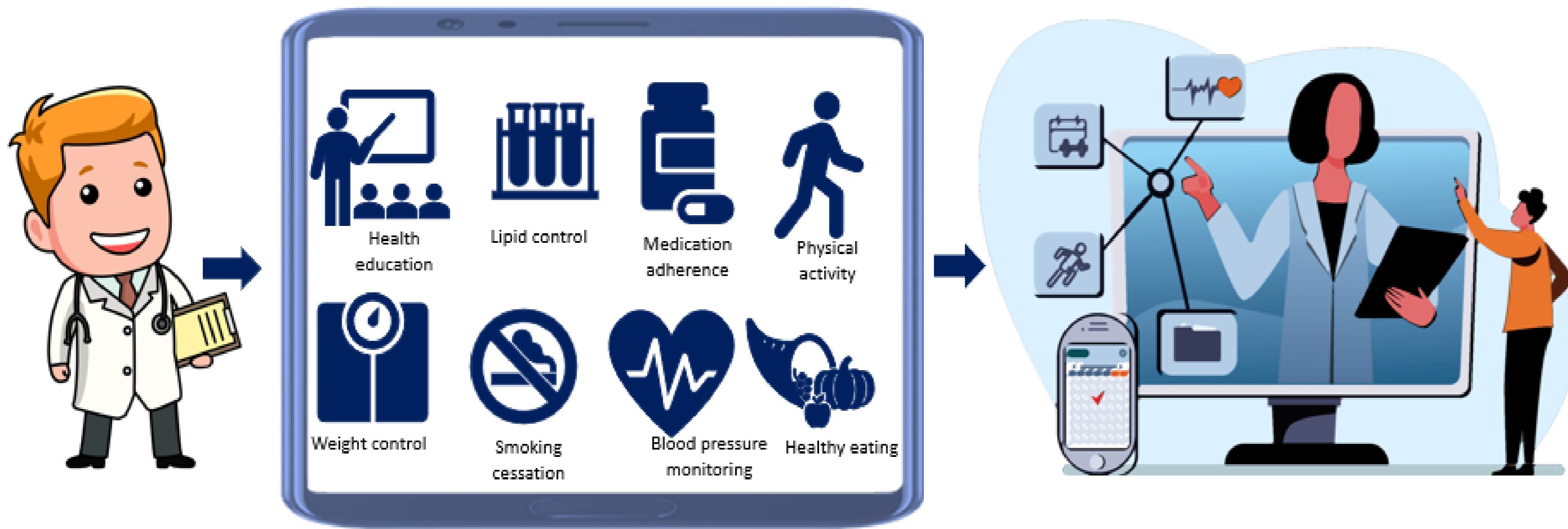
Internet-based Cardiac Rehabilitation (CR) is an innovative and convenient platform utilized in healthcare to prevent ischemic heart disease (IHD). The effectiveness of internet-based CR on depression remains inconclusive.

Methods

| Inclusion criteria	Exclusion
• Stable IHD patients, age ≥18 years, capable of using smartphone/ computer and have access to the internet • Internet-based interventions that deliver CR • Outcome reported in mean and SD • Original RCTs published and grey literature • Full texts in English between 2015 and 2022	Patients with Unstable IHD condition (cardiac arrhythmia, untreated ventricular tachycardia, severe heart failure)
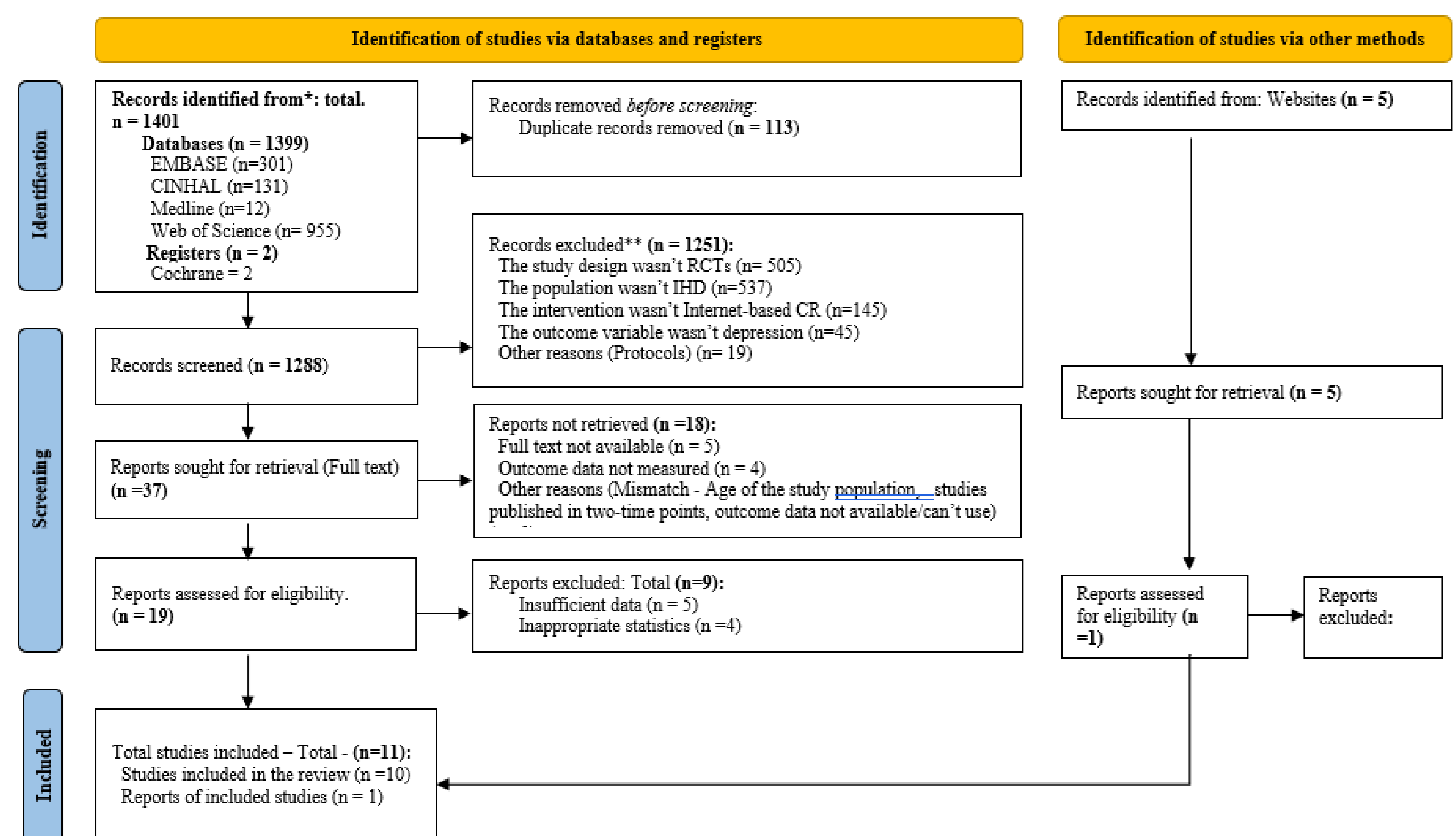
Figure 1: PRISMA Flow Chart for Study Section

➢ PRISMS guidelines
➢ CASP RCT appraisal checklist
➢ RevMan 5.4
➢ Random effect model
➢ Two reviewers independently screened extracted data and assessed quality. The third resolved any disagreements.

Results

Table 1 - Characteristics of included studies (11 Studies)

Author Year Country	Total participant (n) (Intervention Group = I, Control Group = C) Mean age. Male (%)	Intervention (I) and Control (c) Group, Devise used, Intervention characteristics	Measurement tool	Findings Mean and SD of depression, anxiety, and QoL	Quality
1. Snoek et al., 2021 Netherlands	n = 118: (I = 58, C =60) Mean age: (I = 60, C = 59) Male - 82%	I- telemonitoring and tele coaching (TELE); C- traditional follow-up program; Smartphones; Physical activity (PA): walking, cycling, etc	Hospital Anxiety and Depression Scale (HADS)	No significant difference between the I = (2.4[2.7]) and the C = (3.0[3.2]) for emotional/depression scores. No significant differences in QoL scores. The telerehabilitation program was non-superior to regular care.	High
2. Yudi et al., 2021 Australia	n= 168: (I = 83, C= 85) Mean age: (I = 56.8, C = 56.2) Male - 85%	I - The SMARTphone-based, early cardiac REHABilitation in patients with Acute coronary syndrome (SMART-REHAB); C - Usual care; Smartphones; PA, tracking of cardiovascular risk factors, assessment of dietary habits, heart health education.	HADS	No significant differences were observed in depression scores in the I = (8.4 [7.2]) and C = (8.2[6.8]) and no significant difference in QoL; I = (77.0 [14.8]), C= (79.8 [16.1]). No significant improvements in depression and QoL measures compared to usual care.	High
3. Lunde et al., 2020 Norway	n = 102: (I = 48, C =54) Mean age:(n = 59) Male - 78%	I - Mobile health interventions using smartphone applications (apps); C- Usual care; Mobile app; Individualized technology-based follow-up for CR	HeartQoL- emotional - (4- item)	No significant differences between the two groups for emotional/ depression; the I = (2.61 [0.51]), and the C= (2.49 [0.49]). Change - 0.18(0.43)*	High
4. Fang et al., 2019 China	n= 67: (I =33, C =34) Mean age:(I = 60.24, C = 61.41) Male – 63%	I – home-based cardiac telerehabilitation (HBCTR); C - Usual care; Smartphone application; PA with real-time monitoring and counseling for risk factor management	The Cardiac Depression Scale (CDS)	There is no significant difference between the C and I groups for improving depression scores at the endpoint; I group (57.88 [17.40]); C group (50.62 [26.72]) (p = 0.001*). QoL improved significantly in the I = (72.07[6.15] compared to the C = (65.82[9.07]). The HBCTR program is an equally effective intervention in reducing depression.	Moderate
5. Islam et al., 2019 Australia.	n= 683: (I = 333, C = 350) Mean age:(I = 57.9, CI = 57.3 Male - 82%	I - Tobacco, Exercise, and dieT MEssages (TEXT ME); C - Usual care; Text messages; Improve general heart health, PA and advise for risk factor modification.	Patient health questionnaire (PHQ-9)	TEXT ME cardiac rehabilitation intervention shows a significant effect in reducing depression among participants. The mean difference (95% CI) in depression scores between the two groups was 1.90 (1.50 to 2.40), with the IG showing significantly lower (better) scores compared to the CG (p<0.0001).	Moderate
6. Spindler et al., 2019 Denmark	n = 119:(I = 64, C= 55) Mean age: (I = 61.86, C = 62.68) Male - 80%	I - Telerehabilitation (TR); C - Usual care; interactive web portal; PA, lifestyle, and risk factor modification.	HADS	No significant differences between the two groups regarding anxiety, depression, and QoL; Depression in the IG (4.47 [4.78]) and the in C = (3.64 [3.25]); (P=0.03); QoL in I = (62.02 [25.24]) and in C= (64.98 [22.56]); (P=0.46). TR is as effective as traditional methods in improving depression and QoL.	High
7. Dorje et al., 2019 China	n= 312 :(I = 156, C = 156) Mean age: (I = 59-10, C = 61-90) Male – 81%	I – smartphone-based and WeChat-based cardiac rehabilitation and secondary prevention (SMART-CR/SP); C - Usual care; Online education, and monitoring PA and risk factors	PHQ-9	No significant differences between the I and C on anxiety and depression scores. Depression in the I = (2.90 [3.00]) and in the C = (3.60 [3.80]); p : 0.51; For Anxiety, p: 0.17 – NS). SMART-CR/SP intervention had no significant impact on anxiety, depression, and QoL.	High
8. Houchen-Wolloff et al., 2018 United Kingdo	n= 60: (I = 37, CI = 23) Mean age (I = 62.00, C = 61.00) Male – 90%	I – web-based CR ('ACTIVATE YOUR HEART'); C - Usual care; website - through a smart device; Interventions to enhance overall cardiac risk factors.	HADS	No significant improvements in mood (anxiety and depression) in both I and C. Mean, SD of depression score in the I = (1.50 [1.40]), and in the C = (2.40 [2.50]), with the mean difference of 1.90 (95% CI: 1.50 to 2.40) between the two groups.	High
9. Vieira et al., 2018 Portugal	n= 22 :(I =11, CI = 11) Mean age:(I = 55.00, C = 59.00) Male – 100%	I - CR based on the use of Virtual Reality (VR) exercise with the Kinect tracking sensor; C– Usual care; Exercise program facilitated by VR and education on risk factors monitoring; Computer/Smart devise	Depression Anxiety Stress Scale 21 - (DASS 21)	No significant differences in any dimension or total score for depression and anxiety or QoL. The mean (SD) of depression at the endpoint was 2.40 (3.60) for the I and 5.50 (5.40) for the C (F= 5.133, p-0.013, p- 0.012: p-value - Tukey's post hoc test).	High
10. Pfaeffli Dale et al., 2015 New Zealand	n=123 patients: (I = 61, C=62): Mean age (I = 59.00, C = 59.90) Male - (81%)	I- mHealth-delivered comprehensive CR program (Text4Heart); C - Usual care; mHealth with text message and Web guidelines to risk factor modification	HADS	No significant differences in psychological outcomes; with mean and SD of depression in the I = (2.8[2.8]) and in the C = (2.5 [2.2]), with adjusted mean difference 0.08 (- 0.71 to 0.87), p = 0.84 (95% CI); anxiety 1.18 (0.28 to 2.08), p = 0.01(95% CI).	High
11. Frederix et al., 2015 Belgium	n =139: (I = 69, C = 70) Mean age: (I = 61.00, C = 61.00) Male- (82%)	I – Internet-based, comprehensive telerehabilitation program (with SMS texting support); C - Usual care; Computer/ smartphone; PA and other risk factor monitoring and tele coaching.	HeartQoL- emotional - (4- item)	The emotional subscale based on Friedman's test shows χ² =0.5, P=0.80. Positive improvement in emotional well-being was reported but not significant Overall; p - 0.80). The Mean (SD) of the emotional (depression) scores at the endpoint were 2.53 (0.54) and 2.41 (0.69) for the I and the C respectively.	High

Forest Plot 1 - Effect of Internet-based cardiac rehabilitation vs usual care on Depression in patients with IHD (11 studies)
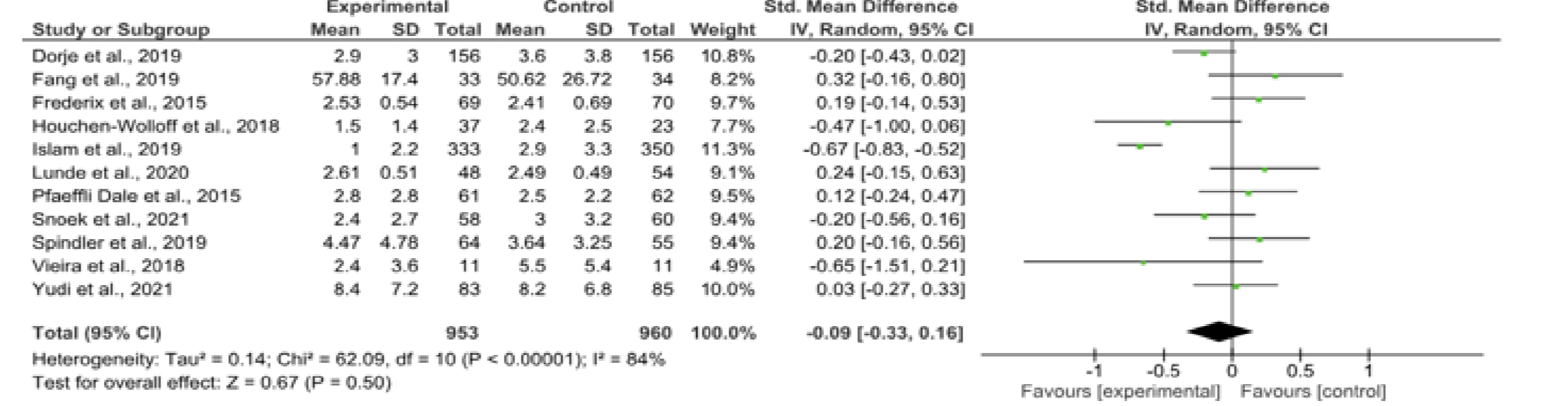
Forest Plot 2 - Effect of Internet-based cardiac rehabilitation vs usual care on Anxiety in patients with IHD (Six studies)
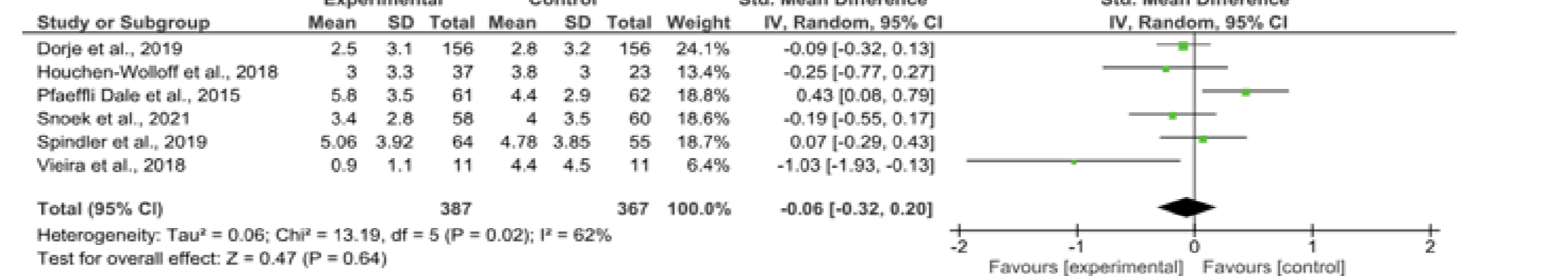
Forest Plot 3 - Effect of Internet-based cardiac rehabilitation vs usual care on QoL in patients with IHD (Seven studies)
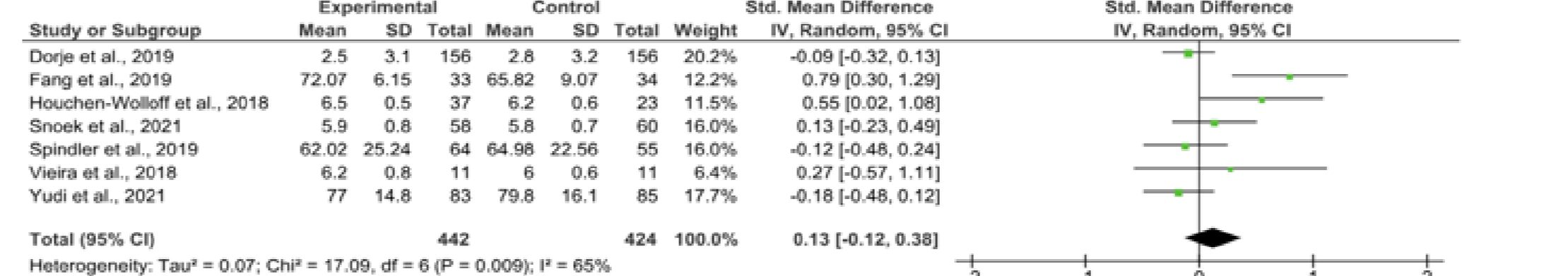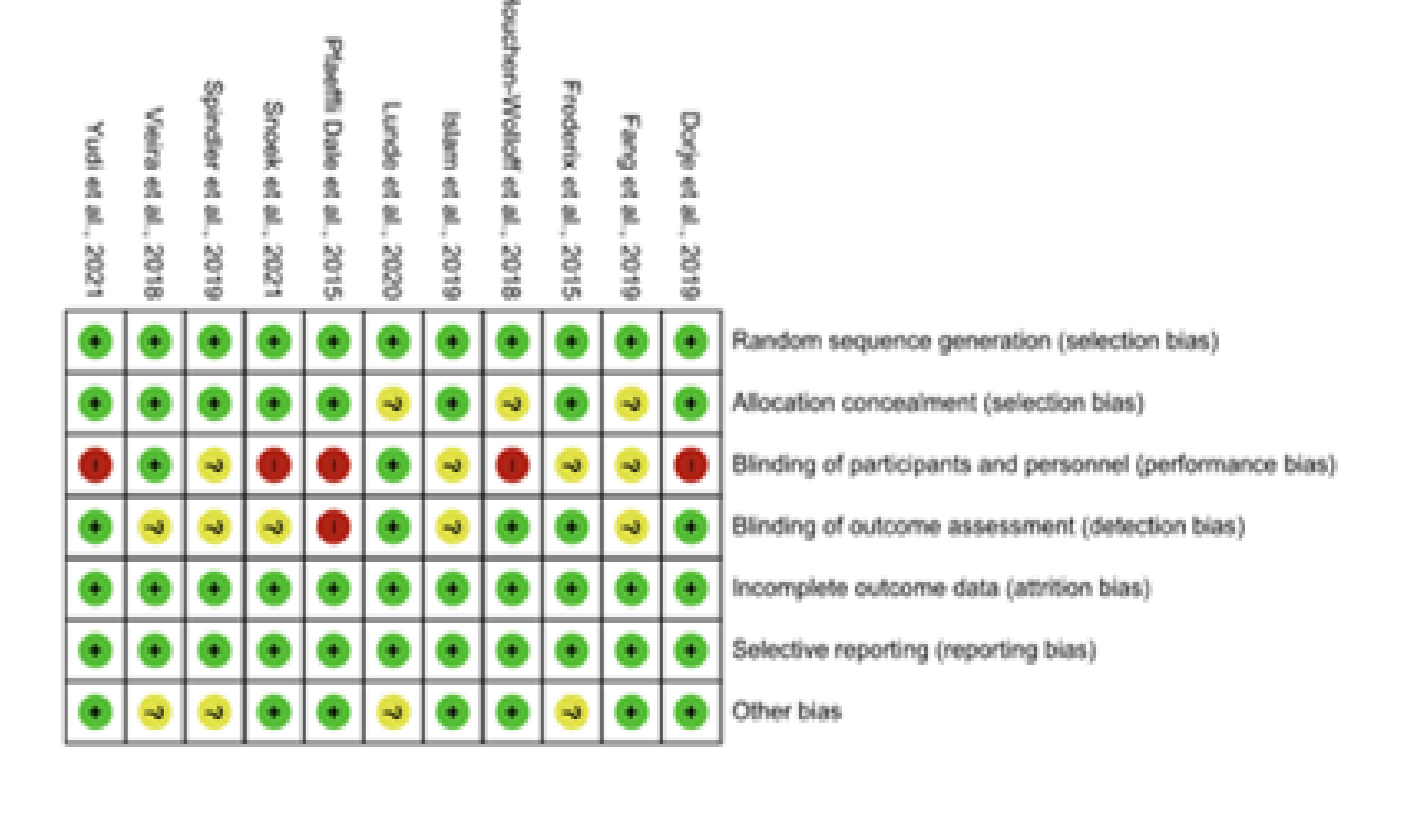
Figure 2: Outcome of Internet-based cardiac rehabilitation vs usual care on depression, anxiety, and QoL in patients with IHD

Review authors' judgments about each risk of bias item for each included study

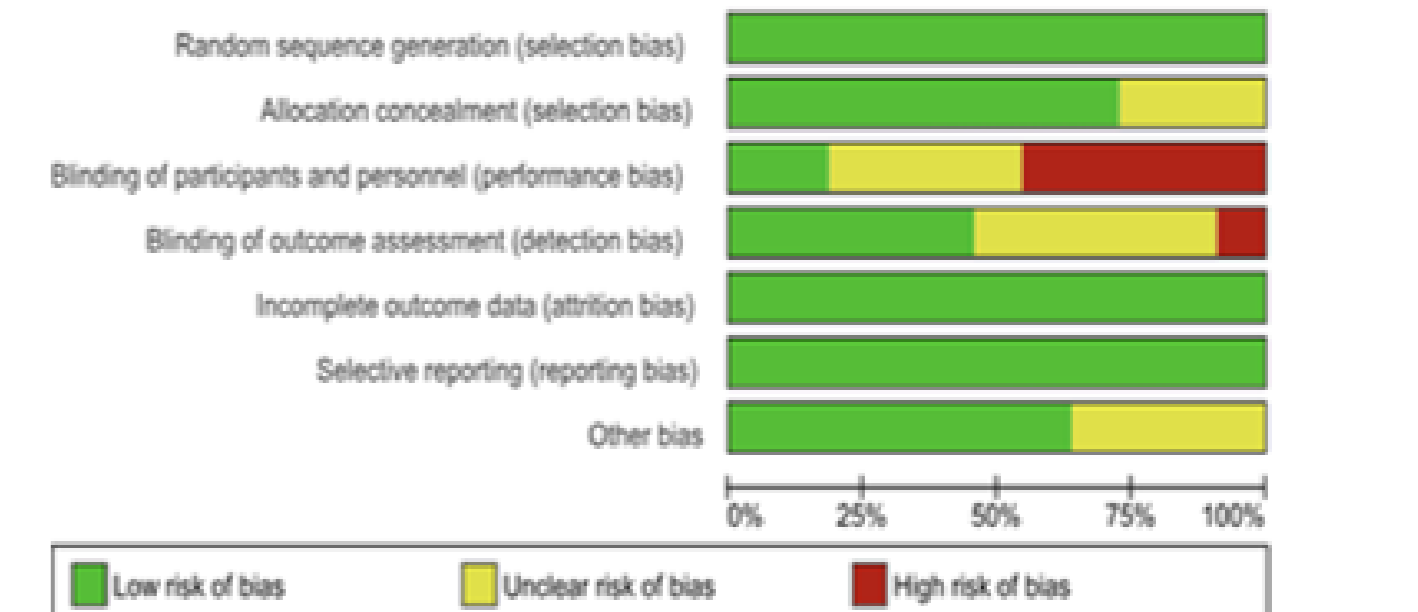Risk of bias item presented as percentages across all included studies

Figure 3: Risk of Bias of Included Studies (11 Studies)

Conclusion

Internet-based cardiac rehabilitation does not significantly reduce depression among patients with ischemic heart disease. Advanced internet platforms need personalized interventions for enhanced psychological care; future research should employ advanced platforms, lengthier follow-ups, and larger samples for robust conclusions.

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