



# Group versus one-to-one multi-component lifestyle interventions for weight management: a systematic review and meta-analysis of randomised controlled trials

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## Abstract

**Background:** Multi-component lifestyle interventions that incorporate diet, physical activity and behaviour change are effective for weight management. However, it is not clear whether delivery in a group or one-to-one format influences weight loss efficacy. The present study aimed to systematically review the evidence of the effectiveness of group compared to one-to-one multi-component lifestyle interventions for weight management.

**Methods:** MEDLINE, EMBASE, CINAHL, CENTRAL and ISRCTN databases were searched from inception up to February 2020 for randomised controlled trials comparing group versus one-to-one multi-component lifestyle interventions for weight loss in adults with a body mass index  $\geq 25 \text{ kg m}^{-2}$ . The primary outcome was weight loss (kg) at 12 months and the secondary outcome was attainment of  $\geq 5\%$  weight loss at 12 months. Risk of bias was assessed using the Cochrane Risk of Bias Tool. Meta-analysis used random effects and estimated risk ratios and continuous inverse variance methods. Heterogeneity was investigated using  $I^2$  statistics and sensitivity analyses.

**Results:** Seven randomised controlled trials with 2576 participants were included. Group interventions were favoured over one-to-one interventions for weight loss at 12 months ( $-1.9 \text{ kg}$ , 95% confidence interval =  $-1.3$  to  $-2.6$ ;  $I^2 = 99\%$ ). Participants of group interventions were more likely to attain  $\geq 5\%$  weight loss at 12 months relative to one-to-one interventions (relative risk = 1.58, 95% confidence interval = 1.25–2.00;  $I^2 = 60\%$ ).

**Conclusions:** Group multi-component lifestyle interventions are superior for weight loss compared to one-to-one interventions with respect to adult weight management. Further research is required to determine whether specific components of group interventions can explain the superiority of weight loss outcomes in group interventions.

## KEY WORDS

lifestyle intervention, obesity, systematic review, weight management

## INTRODUCTION

Obesity is strongly associated with co-morbidities of type 2 diabetes, cardiovascular disease and several cancers,<sup>1</sup> as well as a reduced life expectancy,<sup>2</sup> and has vast economic consequences for society.<sup>3,4</sup> Addressing overweight and obesity poses a significant challenge, as a result of the complexity and interdependency of the 'complex web' of societal and biological influencing factors, which results in excess adiposity.<sup>5</sup>

There is strong evidence that multi-component lifestyle interventions incorporating diet, physical activity and behaviour change are effective in inducing a clinically important weight loss of 5–10%, which is associated with health improvements.<sup>6–8</sup> As a result, obesity management guidelines both in the UK<sup>9–11</sup> and internationally<sup>12–14</sup> recommend multi-component lifestyle interventions as the first-line intervention for adult weight management.

In the treatment of overweight and obesity, group interventions that offer social support networks may be the foundation to behaviour change for weight management. Social support is positively correlated with weight maintenance after weight loss<sup>15</sup> and is an integral cognitive behavioural approach for weight management.<sup>16,17</sup> On the other hand, one-to-one interventions offer tailored advice that matches patient characteristics and treatment needs.<sup>10,18</sup> Current obesity guidelines do not specify whether multi-component weight management interventions are more efficacious for weight loss when delivered in a group or one-to-one format.

One previous systematic review published over a decade ago<sup>19</sup> has synthesised direct comparisons between group and one-to-one weight management interventions for adults. This previous meta-analysis of randomised controlled trials (RCTs) found that group interventions led to a greater mean weight loss at 1-year compared to one-to-one interventions [–1.4 kg, 95% confidence interval (CI) = –2.7 to –0.1 kg].

Hence, in the absence of any recent evidence synthesis in this area, we systematically reviewed the available evidence from RCTs aiming to determine the efficacy of group versus one-to-one multi-component lifestyle interventions with respect to adult weight management.

## MATERIALS AND METHODS

The present study was registered prospectively on PROSPERO (identifier CRD42017056396) and is reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standard.<sup>20</sup>

### Inclusion criteria

We included RCTs that investigated the effect of multi-component lifestyle interventions for weight loss delivered exclusively in groups compared to exclusively one-to-one.

The PICOS criteria for inclusion and exclusion of studies are provided in the Supporting information (Appendix S1). Studies were included if they reported the primary outcome of weight change (kg). Studies that presented untransformed non-parametric data for the primary outcome were excluded because it is not possible to include such studies in a meta-analysis.<sup>21</sup> Trials were excluded if follow-up data were limited to <12 months post-randomisation, used non-lifestyle interventional methods (i.e. pharmacotherapy, bariatric surgery), used meal replacements, included participants <18 years old or with a body mass index (BMI) <25 kg m<sup>-2</sup>. Studies focusing on participants with only one type of morbidity were excluded to reflect generalisable weight management interventions for a range of obesity-related co-morbidities, rather than condition-specific interventions.

### Literature search

The search strategy (see Supporting information, Appendix S2) was tested and refined to achieve the maximum sensitivity for obtaining relevant studies<sup>21</sup>. Searches were performed on 28 February 2020 and performed via EBSCO from database inception (MEDLINE (1946 to present), EMBASE (1974 to present) and CINAHL (1981 to present)). The CENTRAL database was searched from inception via The Cochrane Library. The ISRCTN database was also searched from inception to identify unpublished trials. The reference lists of the included studies and the previous systematic review<sup>19</sup> were searched for additional trials. Language of publication was unrestricted.

References were imported into EPPI-REVIEWER 4<sup>22</sup> for de-duplication and screening. Two reviewers (SA and ES), independently and in duplicate, screened titles and abstracts and full-text reports of all identified studies. Additional information was requested from trial authors as required. Reviewers were blinded to each other's responses until each screening stage was complete. Disagreement was resolved by consensus between reviewers.

### Data extraction

Data were extracted in duplicate by three of the reviewers (SA, BT and DL) using an electronic data extraction form. Information on study characteristics and data for the primary outcome of weight loss (kg) at 12 months post-randomisation and secondary outcome of attainment of ≥5% weight loss post-randomisation was extracted. Methods were used to mitigate attrition bias, including non-responder imputations for dichotomous attainment of ≥5% weight loss, on the assumption that non-attendance meant non-achievement, and preference to baseline-observation-carried-forward (BOCF) for continuous weight loss (kg), assuming that participants who dropped out of the study returned to their baseline weight.<sup>23</sup> Completers-only data were extracted where BOCF data were not available.

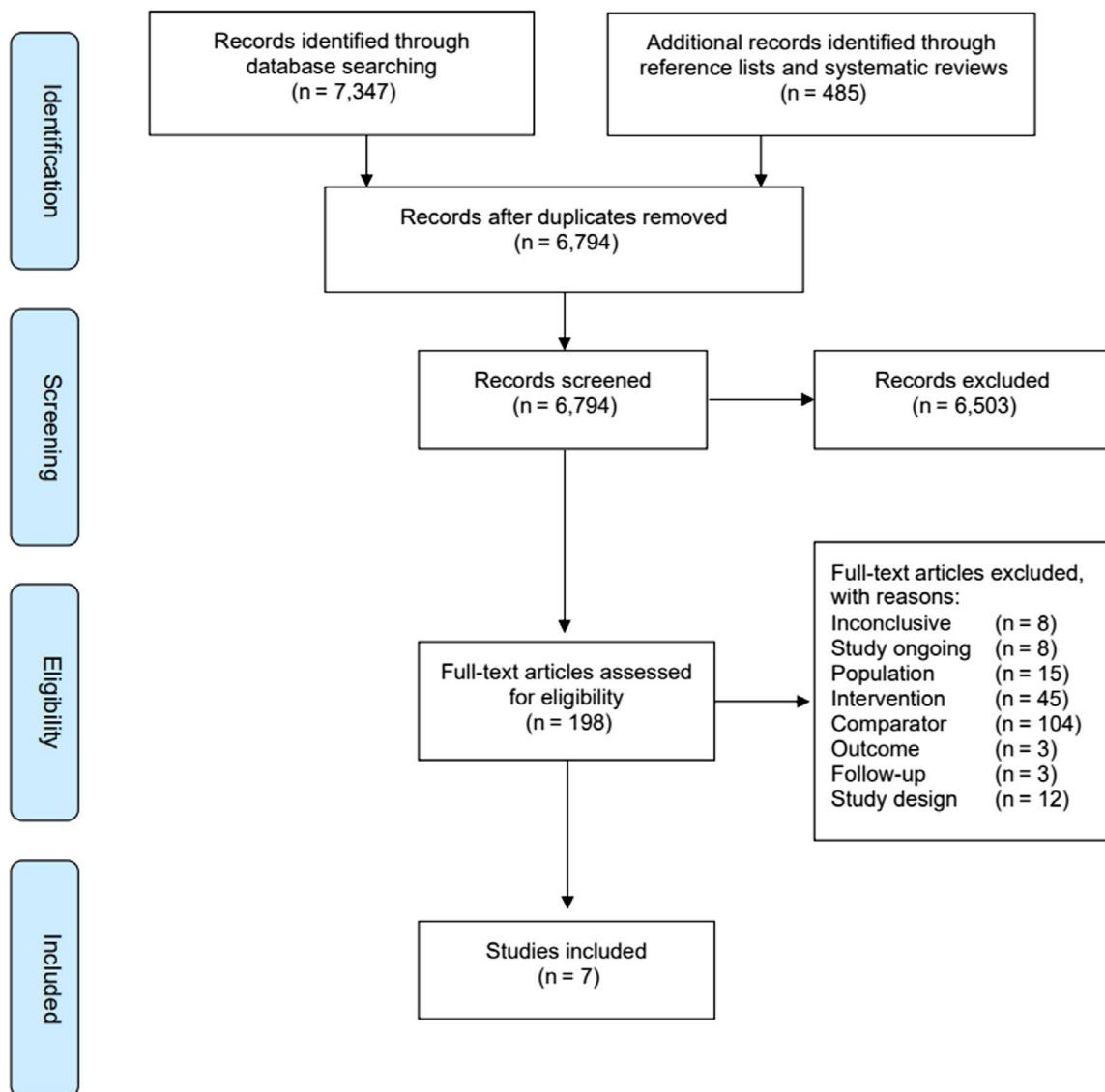


FIGURE 1 PRISMA flowchart.

## Quality assessment

The Cochrane risk of bias tool<sup>24</sup> was used to assess quality of included studies. The Cochrane risk of bias tool<sup>24</sup> was adapted by removing the 'blinding of participants and personnel' item to recognise the impossibility of blinding participants and interventionists to the allocation of lifestyle interventions. Two reviewers (SA and ES) conducted a double-blinded quality assessment of the included studies. The domains 'incomplete outcome data', 'random sequence generation' and 'allocation concealment' must all have been judged as 'low' risk of bias for the study to be assigned overall as a 'low' risk of bias study.

## Statistical analysis

Meta-analysis was undertaken using REVMAN 5<sup>25</sup> to summarise the effectiveness of group interventions compared

with one-to-one interventions. A chi-squared based test of homogeneity was performed using Cochran's Q statistic and  $I^2$ . This describes the percentage of the variability in effect estimates that is a result of heterogeneity rather than sampling error.<sup>26</sup> Substantial heterogeneity was defined by  $I^2 > 50\%$  and  $P < 0.10$ .<sup>26</sup> The random effects model using DerSimonian and Laird methods was used because of substantial heterogeneity. Meta-analysis used estimated risk ratios for attainment of  $\geq 5\%$  weight loss and continuous inverse variance methods for weight loss (kg).  $P < 0.05$  was considered statistically significant. Sensitivity analyses were performed to explore heterogeneity by (i) including only 'low' risk of bias studies and (ii) excluding 'outlier' studies.<sup>26,27</sup> It was not possible to perform meta-regression to explore between study clinical variation as a result of an insufficient number of included studies.<sup>26</sup> Likewise, statistical testing for publication bias using asymmetry of funnel plots was not possible as a result of an insufficient number of included studies.<sup>28</sup>

TABLE 1 Study characteristics.

Study	Year	Country	n	Inclusion BMI	Mean BMI (kg m <sup>-2</sup> )	Mean Age (years)	Male (%)	Group Intervention		One-to-One Comparator			
								Interventionist	Contact (hours)	Setting	Interventionist	Setting	Contact (hours)
Appel <i>et al.</i> <sup>29</sup>	2011	USA	277	30-50	36.4	55	36	Weight Loss Coach	55.3	Primary care	Weight Loss Coach	11	Remote
Ash <i>et al.</i> <sup>30</sup>	2006	Australia	128	>27	34.0	49	29	Dietitian	14	Outpatients	Dietitian	NA	Outpatients
Heshka <i>et al.</i> <sup>31</sup>	2003	USA	423	27-40	33.7	45	16	Group Leader (Weight Watchers)	NA	Community	Dietitian	2.5	-
Jebb <i>et al.</i> <sup>32</sup>	2011	UK Australia Germany	772	30-35	31.4	48	13	Group Leader (Weight Watchers)	NA	Community	Nurse or GP	NA	Primary care
Jolly <i>et al.</i> <sup>33</sup>	2011	UK	540	>25	33.6	50	32	Group Leader (Weight Watchers)	12	Community	Pharmacist	3.75	Pharmacy
								Group Leader (Slimming World)	18	Community	Primary Care Nurse	3.75	Primary care
								Group Leader (Rosemary Conley)	18	Community			
McRobbie <i>et al.</i> <sup>34</sup>	2016	UK	330	28-45	35.4	46	29	Food Advisor	12	Community	Nurse	3	Primary care
Tur <i>et al.</i> <sup>35</sup>	2013	Spain	106	>40	46.2	48	33	Nurse	46.5	Outpatients	Dietitian & Endocrinologist	NA	Outpatients

Abbreviations: BMI, body mass index; NA, not available.

## RESULTS

### Study selection

The study selection process is shown in Figure 1. Our search yielded 6794 records, of which 198 were potentially eligible for inclusion after title and abstract screening. The exclusion of studies at full-text review was mostly a result of inappropriate comparators (minimal intervention control or including group-delivery) ( $n = 104$ ). Other reasons for exclusion were study design, population (entry BMI unspecified or including participants with a BMI  $<25 \text{ kg m}^{-2}$ ) and the intervention group (involving meal replacement, pharmacological or surgical interventions; or were not multi-component). After full-text review, we included seven studies<sup>29–35</sup> which enrolled 2576 participants in total.

### Study characteristics

The findings of this review are based upon 10 group interventions and eight one-to-one interventions across seven RCTs (Table 1). Participant numbers in each study ranged from 106 to 779. All included studies were conducted in developed countries, of which half of the studies were conducted within UK populations. Representation of men ranged between 13% and 36%. The mean BMI of participants in the included studies ranged from  $31.4 \text{ kg m}^{-2}$  to  $46.2 \text{ kg m}^{-2}$ , with one study<sup>35</sup> specifying a higher inclusion BMI ( $>40 \text{ kg m}^{-2}$ ). Where total contact time was reported, participants of group interventions received a greater amount of contact time (range 12–55 hours) than participants in the one-to-one intervention (range 2.5–11 hours). Out of the 10 group interventions, five were commercial slimming clubs; however, these were provided free of charge to all study participants. All group interventions were delivered in-person, whereas one<sup>29</sup> of the one-to-one interventions was provided remotely via telephone.

### Risk of bias

The quality of the included studies is shown in Figure 2. An assessment of the overall risk of bias of each study classified four studies<sup>29,32–34</sup> with a 'low' risk of bias, one study with an 'unclear' risk of bias<sup>31</sup> and two studies with a 'high' risk of bias.<sup>30,35</sup>

### Weight loss outcomes

Group interventions were favoured over one-to-one interventions for weight loss ( $-1.9 \text{ kg}$ , 95% CI =  $-1.3$  to  $-2.6$ ,  $P \leq 0.00001$ ;  $I^2 = 99\%$ ) based upon data from seven studies (Figure 3). Sensitivity analysis including only 'low' risk of bias studies ( $-1.6 \text{ kg}$ , 95% CI =  $-0.3$  to  $-2.8$ ,  $P = 0.01$ ;  $I^2 = 99\%$ ) and sensitivity analysis removing the 'outlier' study<sup>35</sup> (which included patients with BMI  $>40 \text{ kg m}^{-2}$ )

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)
Appel 2011	+	+	+	+	-
Ash 2006	+	?	-	-	-
Heshka 2003	+	?	?	+	?
Jebb 2011	+	+	-	+	?
Jolly 2011	+	+	-	+	+
McRobbie 2016	+	+	+	+	+
Tur 2013	?	?	-	-	-

FIGURE 2 Risk of bias of included studies.

( $-1.8 \text{ kg}$ , 95% CI =  $-1.1$  to  $-2.4$ ,  $P \leq 0.00001$ ;  $I^2 = 99\%$ ) did not alter the findings.

Five studies<sup>29,31–34</sup> also reported data on attainment of a 5% weight loss. Group interventions were also favoured over one-to-one interventions for the attainment of a 5% weight loss. Individuals attending a group intervention were 58% more likely to attain a 5% weight loss at 12 months relative to attending one-to-one interventions (relative risk = 1.58, 95% CI = 1.25–2.00,  $P = 0.04$ ;  $I^2 = 60\%$ ) (see Supporting information, Appendix S3). Sensitivity analysis including only 'low' risk of bias studies did not alter the findings (relative risk = 1.51, 95% CI = 1.14–2.00,  $P = 0.03$ ;  $I^2 = 66\%$ ).

## DISCUSSION

This systematic review provides the first updated evidence for over a decade on the comparative effectiveness of group versus one-to-one lifestyle interventions. We found that participants attending group multi-component lifestyle interventions lose on average 1.9 kg more (95% CI = 1.3–2.6 kg) weight than in one-to-one interventions, at 12 months. This is also the first time weight loss efficacy of group versus one-to-one multi-component lifestyle interventions has been assessed by the attainment of a 5% weight loss in a systematic



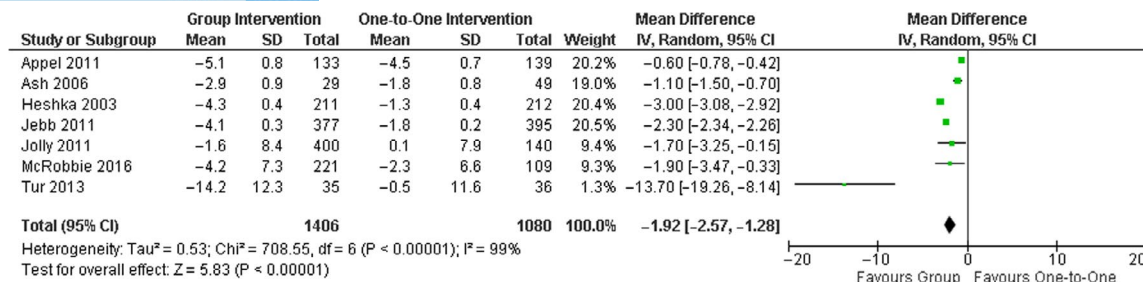


FIGURE 3 Forest plot of weight loss (kg).

review. We found that participants attending groups had a 58% greater (95% CI = 25–100%) likelihood of attaining a 5% weight loss at 12 months. However, not all included studies reported on 5% weight loss and therefore these findings are based upon data from five out of the seven included studies.

Although, interventions were superior for weight loss in our study group, compared to one-to-one interventions, substantial statistical heterogeneity ( $P \leq 0.10$ ;  $I^2 > 50\%$ ) was present when measuring weight loss continuously ( $I^2 = 99\%$ ,  $P \leq 0.00001$ ) and dichotomously as attainment of a 5% weight loss ( $I^2 = 60\%$ ,  $P = 0.04$ ). The populations across the included studies were broadly clinically homogenous. One study,<sup>35</sup> however, included patients with a higher mean BMI ( $46.2 \text{ kg m}^{-2}$ ) compared to the other included studies (range  $31.4$ – $36.4 \text{ kg m}^{-2}$ ); however, our sensitivity analysis showed that removing this study did not influence the findings.

Although our study has established that group interventions are more effective than one-to-one interventions, it was beyond the scope of this systematic review to explore why. It could be hypothesised that the greater weight loss attained in group compared to one-to-one interventions is a result of enhanced peer support, or it could be a result of the time efficiency of group interventions, which allows for greater contact time per participant and therefore a greater intervention intensity.

Social support, especially from peers, contributes to successful weight loss and long-term weight loss maintenance.<sup>36</sup> Empathy, role modelling, accountability and problem solving accompany the social support offered in group settings by peers and are important factors for lifestyle change and weight loss.<sup>37,38</sup>

On the other hand, the group interventions included in the present study provided more hours of contact per participant (range of 12–55 h) compared to one-to-one interventions (range of 2.5–11 hours). A systematic review of reviews<sup>39</sup> found that greater weight loss during lifestyle interventions was associated with a greater contact time and greater frequency of contact per participant. It would therefore be plausible to hypothesise that group interventions could be more effective because of a greater intervention intensity.

Our findings are similar to those of the previous systematic review,<sup>19</sup> which also found that groups attained a significantly greater weight loss compared to one-to-one, although

the previous study reported a lesser mean difference in weight loss as well as less precision ( $-1.4 \text{ kg}$ , 95% CI =  $-2.7$  to  $-0.1$ ,  $P = 0.03$ ) than our present study. The greater mean weight loss (kg) reported in the present study may be explained by our inclusion of only multi-component lifestyle interventions, which are known to be more effective for weight management.<sup>10</sup> In the previous systematic review,<sup>19</sup> four out of the five studies included were published in either the 1970s or 1980s, when the clinical management of obesity was not multi-component. Considering it is known that the results of smaller studies are subject to greater sampling variation and hence are less precise,<sup>40</sup> the greater precision of effect in our study may be accounted for by our inclusion of larger studies (range 106–772 participants) compared to the smaller studies included in the previous systematic review<sup>19</sup> (range 12–132 participants).

A more recent systematic review<sup>41</sup> examined the efficacy of long-term ( $\geq 12$  months) non-surgical interventions for weight loss and weight maintenance for adults with obesity ( $\text{BMI} \geq 35 \text{ kg m}^{-2}$ ), exclusively within the UK context. In total, 20 studies (8982 participants) were included, which were mostly non-comparative. The findings were presented narratively because meta-synthesis was precluded as a result of the heterogeneity among intervention designs. Mean weight loss reported across studies ranged from  $-1.6 \text{ kg}$  to  $-18.0 \text{ kg}$  at 12 months, with higher mean weight losses reported for programmes including a low energy diet meal replacement formula intervention. However, these findings represent all non-surgical interventions, including pharmacotherapy, and interventions that were single component. Studies delivered outside the UK setting were also excluded, and therefore their findings can only be generalised to the UK setting. For these reasons, these findings are not directly comparable with the findings from our study which examined international multi-component lifestyle interventions (excluding meal replacement diets).

## Strengths and limitations

This review has several methodological strengths, including being prospectively registered on PROSPERO, ensuring protocol fidelity and employing a search strategy that was designed to have maximum sensitivity.<sup>21</sup> Screening was conducted by two blinded reviewers and data extraction was

peer reviewed, reducing the risk of selection bias and minimising data errors.<sup>42</sup> The inclusion criteria ensured generalisability to adults who are overweight or have obesity across populations, and the dominance of large studies included in our review minimises small study effects and overestimation of effect sizes.<sup>26</sup>

The study was limited by reliance on database searches, without handsearching relevant journals, and therefore source selection bias cannot be ruled out. However, several databases were searched, including ISRCTN, to identify unpublished research. We were unable to assess publication bias through funnel plot asymmetry as a result of an insufficient number of studies.<sup>43</sup> The results may also have been influenced by missing data assumptions;<sup>23</sup> however, this was mitigated by preference to extracting BOCF data. Lastly, as a result of an insufficient number of included studies, it was not possible to conduct meta-regression to explore heterogeneity in more detail.

### Implications for practice

The population sample within this review included 2576 participants exclusively from westernised populations. Therefore, these findings are widely generalisable to westernised countries. Clinicians who provide support to patients who are overweight or have obesity should establish which multi-component lifestyle interventions are available in their locality because there may be a substantial geographical variation in access. If there is the option for an individual seeking weight management to attend either a group or a one-to-one intervention, the findings of this review suggest that attending a group over a one-to-one intervention will lead to greater weight loss at 12 months. However, patients' choices should be exercised to promote treatment fidelity. Group interventions may not be suited to all people seeking weight management intervention, including those suffering from agoraphobia or social anxiety, or those requiring translator services. The evidence presented in our study should be considered by clinicians and service users in light of the wider evidence base, which shows that greater social support and greater intervention intensity may lead to greater weight loss outcomes.

### Implications for future research

Although this study has established that group multi-component lifestyle interventions are more effective than one-to-one interventions for weight loss, we were not able to explain why. It is arguable that the treatment effect may be enhanced peer support<sup>37,44</sup> or rather it may be a result of intervention intensity.<sup>39,45</sup> Therefore, further research is warranted to examine specific components of group interventions that may explain efficacy, including an RCT that compares a multi-component group versus a one-to-one intervention, with equitable contact time and contact

frequency. Future empirical studies should consider more complete reporting on intervention characteristics and report on the attainment of a 5% weight loss, rather than only continuous weight loss in kilograms, to provide additional clinically relevant outcome data.

## CONCLUSIONS

The findings of this meta-analysis of seven studies conducted across westernised populations suggest that multi-component lifestyle interventions delivered in groups are more effective for weight loss compared to one-to-one interventions among adults. Where both one-to-one and group multi-component lifestyle programmes are available to adults with a BMI  $\geq 25$  kg m<sup>-2</sup>, group interventions should be the preferred first-line treatment option for weight management. Future research should explore whether specific components of group interventions, such as intervention intensity, peer support or other behavioural taxonomies, may explain why participants lose more weight in group compared to one-to-one multi-component lifestyle interventions.

### CONFLICT OF INTERESTS, SOURCE OF FUNDING AND AUTHORSHIP

All authors declare that there are no financial relationships with any organisations that could appear to have influenced the submitted work. DL has been involved in clinical trials where the treatment in the intervention arms have been provided by Slimming World and Rosemary Conley Health and Fitness Clubs, although this treatment provision was (and remains) of no financial benefit to her or her employer.

This research was conducted by the lead author (SA) as part of a Masters in Clinical Research Studentship funded by National Institute of Health Research (NIHR).

SA, BT and DL designed the study. SA conducted the literature searches. SA and ES screened studies for inclusion and carried out quality assessments. SA, BT and DL extracted the data. SA analysed the data. SA, ES, BT and DL contributed to the interpretation of findings and the writing of the manuscript work.

### ETHICS STATEMENT

This research was conducted as part of a MRes in Clinical Research at Coventry University, therefore ethical approval was sought. Ethical approval was granted by the Ethics Committee at Coventry University (P51006).

### TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with PRISMA guidelines. The lead author affirms that no important aspects of the study have been omitted and that there were no discrepancies from the study as planned.

## PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/jhn.12853>.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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