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Dietary Interventions and Quality of Life: A Systematic Review of the Literature

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Abstract

Objective—To systematically review the literature to examine whether there has been adequate assessment of the effects of dietary intervention on quality of life (QOL) independent of weight loss, assess which instruments are being used to measure nutrition-related QOL, identify gaps in the literature, and suggest future directions.

Design—Systematic review guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement.

Results—A total of 24 studies were eligible for inclusion. The Short Form–36 Health Survey was the most widely used instrument to assess QOL. Other disease-specific instruments were used. Several different dietary approaches (eg, low carbohydrate, low calorie, low fat, combinations) were recommended. Across studies, QOL generally improved after participating in behavioral weight loss interventions, but findings revealed a lack of evidence to definitively determine whether reported changes in QOL were a result of weight loss or independent of it.

Conclusions and Implications—It is important to consider how making broad dietary recommendations for all individuals might affect overall QOL in both positive and negative directions when considering factors other than weight loss and health improvement. If dietary interventions are adversely affecting QOL in other domains (eg, social, economic) and this relationship is not being detected or reported by current research practices, barriers for successful and sustainable dietary changes may not be fully understood.

Keywords

quality of life; diet; weight loss; review

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INTRODUCTION

Behavioral lifestyle interventions that include recommendations for dietary changes are widely used to promote weight loss, which, for some individuals, results in decreased risk for several chronic diseases including type 2 diabetes,[1] hypertension,[2] and some cancers.[3] These interventions include a range of dietary approaches (eg, low fat/low calorie, low carbohydrate, low energy density) for creating the energy deficit needed for weight loss. Indeed, the implementation of a variety of dietary interventions has produced at least modest weight loss for many and substantial weight loss for some. However, despite the apparent benefits of dietary interventions on weight and weight-related health outcomes, the independent effect of these various dietary interventions on quality of life (QOL) remains unclear.

Broadly, QOL is a multidimensional concept that includes an individual's subjective evaluation of both positive and negative aspects of life.[4] Specific areas of study may explore QOL related to a particular discipline, such as a specific disease, overall health, or weight. Research examining the effect of weight loss on QOL is largely mixed depending on whether the QOL measure is obesity specific, and on the intervention modality.[5,6] In addition, much of these data are limited to examining only changes in QOL related to weight loss and improvement in health conditions. This approach fails to consider an independent effect that implementing behavior change, altering dietary consumption, or simply participating in an intervention program may have on an individual independent of weight loss. Figure 1 proposes a conceptual model for the relationship between dietary intake and QOL. It illustrates the relationship between dietary intake and several life domains that may ultimately influence QOL. This figure highlights important areas to consider when examining how dietary changes may affect QOL in both positive and negative ways and regardless of whether weight loss occurs. For example, whereas weight loss that results from dietary change may improve some domains of QOL for some individuals, dietary change may also have negative effects on QOL by affecting that individual's economic situation or social interactions, which are often food centered. Thus, if an individual's QOL is diminished in some way as a result of dietary change, that individual may be less likely to continue to implement the change, which will ultimately limit successful weight loss and/or weight loss maintenance.

To date, the majority of nutrition-or weight-related QOL research has focused on the relationship between dietary intake and QOL by way of physical measures such as weight loss or risk factor reduction. However, it is plausible that making dietary changes can have a meaningful effect—positive or negative—on QOL through other avenues that are less well understood. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement,[7] the purpose of this report was to systematically review the literature to examine whether there has been adequate assessment of the effects of dietary intervention on QOL independent of weight loss, to assess which instruments are currently being used to measure nutrition-related QOL, to identify gaps in the current literature, and to suggest future research directions.

METHODS

Published results of nutrition/dietary interventions intended to promote weight loss were reviewed. The primary outcome of interest was change in QOL. Secondary outcomes of interest were changes in weight and attrition.

With the assistance of a reference librarian, articles were retrieved using searches performed in PubMed, CINAHL, Psychinfo, Scopus, and the Cochrane Library. Searches for MeSH headings and key words were conducted to identify publications for inclusion, using the following limits: date, human studies, age and language. Searches were performed using combinations of the following terms: “quality of life,” “nutrition,” “diet,” “food,” “weight,” “weight loss,” and “intervention.”

Inclusion and Exclusion Criteria

All studies were evaluated according to the following inclusion criteria: (1) The study reported QOL as an outcome; (2) the study was a dietary intervention; (3) the study was intended to promote weight loss; (4) the intervention was at least 12 weeks in duration; (5) the study was a human study; (6) study participants were adults (age ≥ 19 years); (7) the publication was available in the English language; (8) the study was conducted in the United States; and (9) the publication date was between January 1, 1990 and August 31, 2012. Studies were excluded if the intervention provided food, surgery, or pharmaceutical means for weight loss, unless a dietary intervention arm that met the inclusion criteria was included in the trial as a comparison group. Studies were also excluded if they met none of the stated inclusion criteria (ie, studies were required to meet all inclusion criteria to be evaluated for this report).

Filtering Steps

All search results were first combined into a master reference database and duplicate references were deleted. Studies that clearly did not meet inclusion criteria based on reading the titles and abstracts were excluded. For all remaining papers, the full text of the paper was read to determine whether the study met inclusion criteria.

Methodological Quality Assessment

Each study was assessed for bias using the Methodological Index for Non-Randomized Studies, a tool for assessing risk of bias in both non-comparative and comparative studies.[8] Two co-authors (B.H. and O.A.) independently rated each study (not reported = 0, reported but inadequate = 1, or reported and adequate = 2) for the following items: clearly stated aim, inclusion of consecutive patients, prospective data collection, appropriate end points, unbiased assessment of study end point, appropriate follow-up period, < 5% loss to follow-up, prospective calculation of the sample size. For comparative studies, items also included an adequate control group, contemporary groups, baseline equivalence of groups, and adequate statistical analyses. These ratings were used as the basis for the overall score of quality for each study, with the possibility of 24 points for comparative studies and 16 points for non-comparative studies. The 2 reviewers discussed the ratings and arrived at an agreement on the quality score in each study. When consensus could not be reached, a third co-author (T.L.C.) reviewed the study to adjudicate the quality score.

Data Extraction

Data were extracted by the co-authors individually using data extraction tables. Data extracted included study name and dates of study, intervention setting and duration, sample size, gender and race composition of sample, anthropometrics, QOL instrument used, and changes in QOL.

RESULTS

The initial search yielded 302 articles (Figure 2). After removal of 3 duplicates, title and abstract review of the remaining results led to exclusion of 219 articles. The primary reasons

for exclusion at this point in the review were studies not meant to promote weight loss, studies conducted outside the United States, surgical interventions, or pediatric populations. Thus, 80 articles were deemed potentially eligible. Of the 80 potentially eligible articles, 56 were excluded because they did not meet all eligibility criteria. Descriptive characteristics of the 24 included studies are shown in Table 1. All but 3[9–11] of the included studies were randomized trials ranging in duration from 12 to 104 weeks in treatment and duration. Study samples included mostly women (50% to 100% of participants) for all included studies except Evangelista et al[12] and Pope et al.[13]

Methodological Quality Assessments

The mean quality score was 19.6 ± 2.6 (81.8%) for comparative studies and 8.7 ± 0.9 (54.2%) for non-comparative studies, respectively. Unbiased end point assessment (ie, blinding), sample size calculation, and loss to follow-up received the 3 lowest ratings (range, 0.71–1.29 out of 2) across all items irrespective of study design. These findings suggest that attention is needed to improve the methods and reporting of studies in the nutrition literature assessing QOL.

Quality of Life Measures

Eight different surveys were used to measure QOL in the included studies. The majority (71%) of the studies[9–11,13–27] used the Short Form–36, a generic tool for assessing QOL using 36 items and including both a physical and mental component summary.[28] Four studies[15,16,29,30] used the Impact of Weight on Quality of Life–Lite, which was designed to specifically assess QOL related to weight.[31] Other disease-specific instruments (eg, Minnesota Living With Heart Failure Questionnaire, Functional Assessment of Cancer Therapy–General, and Polycystic Ovarian Syndrome Health–Related Quality of Life) were employed in 4 of the included studies.[12,32–34]

Recommended dietary interventions included calorie restriction alone; fat restriction alone; calorie and fat restriction combined; low-carbohydrate, high-protein, low-sodium/high-potassium, commercial programs such as Weight Watchers; or a general “healthy diet” recommendation. Calorie restriction was the most frequently endorsed approach. With the exception of 3 studies,[13,33,34] all treatment arms with any type of dietary intervention component reported a within-group improvement in QOL (Table 2). Similarly, all active treatment arms reported some weight loss, although the amount ranged from 0.8 to 10.0 kg (Table 2). Based on reported analyses, 4 studies clearly demonstrated that changes in QOL were independent of weight loss,[9,15,18,24] whereas 11 studies indicated that changes were likely a result of weight loss (Table 2).[11–14,16,19,25–27,32,34] Based on information provided, the role of weight loss in QOL change was unclear for the remaining 9 studies.[10,17,20–23,29,30,33] Independent changes in QOL were noted, although not consistently observed, in studies of several different strategies for weight loss, including fat restriction,[9] calorie restriction,[18] and studies including low-carbohydrate recommendations (Table 3).[15,24]

DISCUSSION

A total of 24 studies were included in this systematic review, designed to assess whether dietary intervention alone affects QOL for individuals attempting weight loss. Across these studies, the Short Form–36, a general health QOL instrument, was the most widely used. Several studies also used a disease-specific survey (eg, Impact of Weight on Quality of Life–Lite, Functional Assessment of Cancer Therapy–General, Polycystic Ovarian Syndrome Health–Related Quality of Life, and Minnesota Living with Heart Failure) to measure QOL in various populations. This review revealed that the large majority (21 of 24;

88%) of studies reported improvement in QOL over time; however, for nearly half of the studies, it was unclear whether improvement in QOL was as a result of weight loss and/or risk factor reduction rather than actual implementation of dietary changes.

Based on the findings of this review, there is a lack of data to support whether implementing dietary change positively or negatively affects QOL independent of weight loss. Although it is widely accepted that there is no downside to encouraging generally healthy, overweight, and obese persons to eat more fruits and vegetables or eat less calories, the results of this review suggest that it remains unclear whether making dietary changes translates into improved QOL regardless of whether the individual actually loses weight. The only dietary recommendation consistently associated with improved QOL was the low-carbohydrate diet, but this was limited to only 2 studies[15,24] Yancy et al[24] suggested that the allowance of unlimited consumption of certain food groups while on a low-carbohydrate diet may improve QOL in contrast to diets focused solely on calorie restriction. Because diet is linked to a range of factors, as illustrated in Figure 1, it is important to consider how making broad dietary recommendations for all individuals might affect overall QOL in both positive and negative directions. For example, attempting to adopt standard dietary recommendations such as eating more fruits and vegetables or fewer calories may have social implications by making an individual feel isolated or disconnected from his or her social circles, which may not be attempting to adopt the same recommended eating patterns. These recommendations may also have economic implications that negatively affect the QOL for those with a limited income. In contrast, adoption of a healthier dietary pattern may lead to increased personal satisfaction associated with successful implementation of a behavior change, and thus improved QOL, regardless of whether weight loss occurs. Further exploration of mechanisms influencing QOL is warranted.

One apparent limitation for advancing research to examine the effect of diet on QOL is the lack of nutrition-specific tools for assessment. Initial work from Barr and Schumacher[35,36] yielded the Nutrition Quality of Life questionnaire. However, reported use in the literature has been infrequent.[37] Recently, another nutrition-specific QOL tool was developed by Schunemann and colleagues[38] for Italian populations, but it has not been adapted or tested in other populations such as the United States. Nevertheless, statistical approaches can be employed to begin to disentangle the possible relationships between treatment effect, weight loss, and QOL in behavioral weight loss interventions, even in the absence of specific tools for measuring nutrition-related QOL.

This study was also limited. The range of dates for included studies may have affected the QOL surveys included. A start year of 1990 was selected to coincide with the onset of the obesity epidemic and the era in which there was a marked increase in the number of behavioral weight control studies. However, new QOL instruments have been developed over the past 20 years that were not available to be used in earlier studies.

Most studies indicated that participants in behavioral weight control studies report improved QOL after the intervention; however, there are limited published data to determine whether an independent effect of implementing dietary change on QOL exists. Evidence for the impact of diet on QOL would be strengthened by a nutrition-specific QOL tool. The effect of implementing recommended dietary changes for weight loss–seeking individuals may affect QOL through a range of domains other than weight loss or health improvement.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The lack of evidence needed to fully understand the impact of dietary interventions on QOL has research and clinical implications that must be considered and addressed. If dietary interventions are adversely affecting QOL and this potential relationship is not being

detected or reported by current research practices, barriers for successful dietary changes and maintenance of changes may not be fully understood. Statistical methodology (eg, modeling, mediation tests) can be used with current tools to begin to explore the effect of dietary changes alone on QOL. In addition, the optimal approach is to develop specific tools to accurately assess the effect of implementing dietary changes on the full spectrum of factors that influence QOL.

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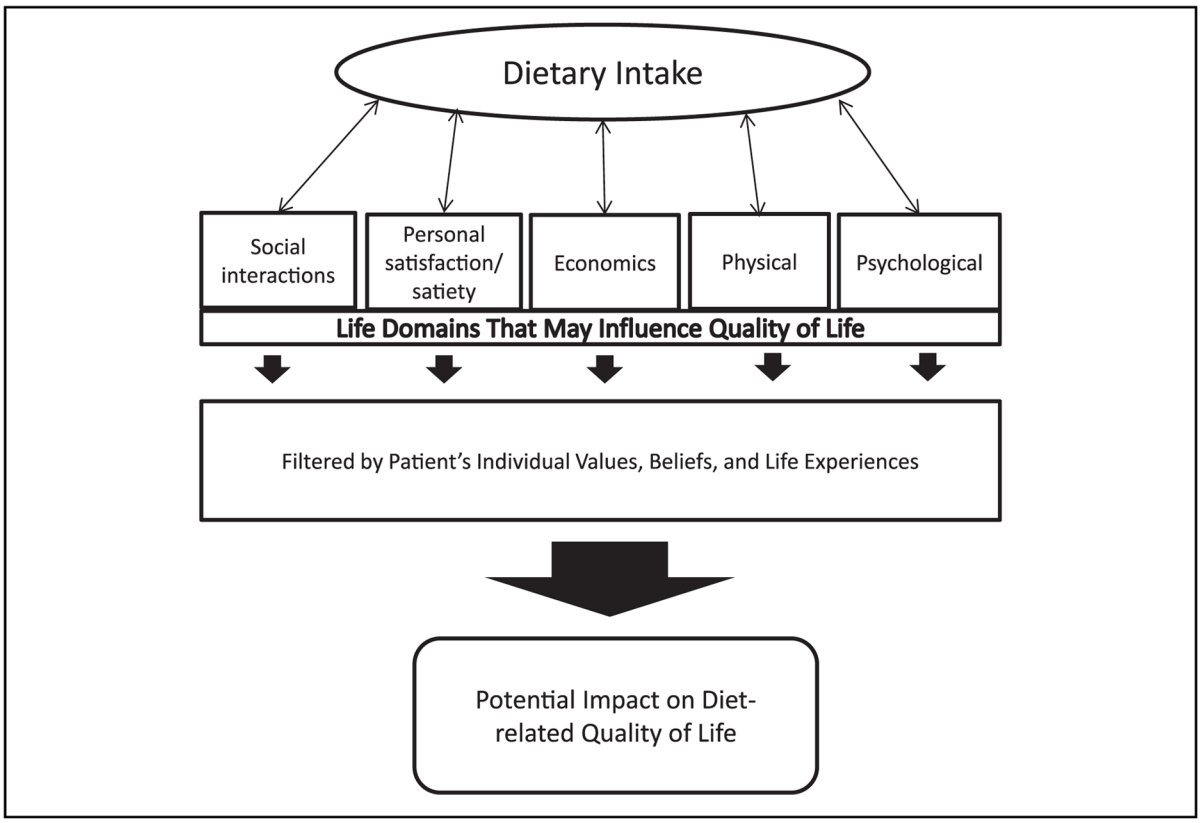

Figure 1.
Conceptual model of the potential impact of dietary intake on quality of life.

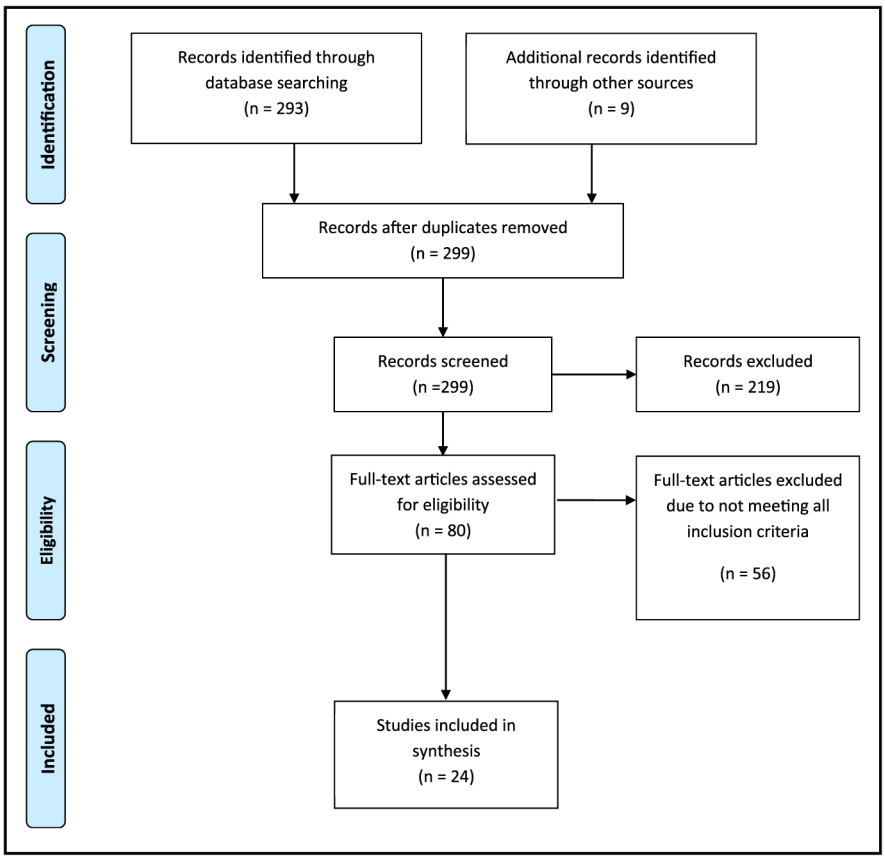

Figure 2.
Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram detailing the review filtering process.

Table 1

Characteristics of Included Studies (n = 24)

Study	Design, Setting	Intervention Groups, Component Details	Treatment Duration, Follow-up Duration	Sample Characteristics (Group Size, n; Age, y [% Female Gender])	Quality of Life Instrument Used
Ackerman et al[14]	RCT, clinical	G1: placebo G2: metformin (increased to 1,700 mg/d) G3: lifestyle: goal-based diet and PA intervention; 150 min/wk moderate PA; 1,200–2,000 kcal/d based on baseline weight and dietary fat to < 25% of total calories	104 wk, 104 wk	G1: n = 1,082; 50.6 (68%) G2: n = 1,073; 50.6 (68%) G3: n = 1,079; 50.6 (68%)	SF-36 and QWB-SA
Barham et al[29]	RCT, worksite	G1: wait-list control G2: lifestyle: goal-based diet and PA intervention; 150 min/wk moderate PA; 1,200–2,000 kcal/d based on baseline weight and dietary fat to < 25% of total calories	52 wk, 52 wk	G1: n = 24; 51.2 (81%) G2: n = 21; 51.1 (81%)	HRQOL SF-12, IWQOL, 3-Factor Eating Questionnaire
Blissmer et al[9]	Cohort, clinical	G1: increased F/V and whole grains, set fat goals of 20%/25%/30% of total calories	24 wk, 24 wk	G1: n = 144; 50.2 (78%)	SF-36
Darga et al[32]	RCT, community	G1: control: received National Cancer Institute's *Action Guide to Healthy Eating and Food Guide Pyramid* pamphlets with no other instruction G2: Weight Watchers G3: One-on-one dietary counseling of calorie/fat restriction G4: combined Weight Watchers and individualized counseling group	24 wk, 24 wk	Overall (not group specific): n = 39; 52.1 (100%)	FACT-An and FACT-G
Davis et al[15]	RCT, clinic/university	G1: low-CHO diet; 2-wk phase of CHO restriction of 20–25 g daily with gradual 5-g increase G2: low-fat diet; 25% of energy needs based on baseline weight	52 wk, 52 wk	G1: n = 55; 54 (81%) G2: n = 50; 53 (74%)	SF-36 and IWQOL-Lite
Evangelista et al[12]	RCT, clinical	G1: AHA recommended conventional diet G2: high protein; 40% CHO, 30% protein, 30% fat G3: standard protein, hypocaloric; 55% CHO, 15% protein, 30% fat	12 wk, 12 wk	G1: n = 4; 62.2 (25%) G2: n = 5; 56.4 (20%) G3: n = 5; 58.6 (20%)	Minnesota Living With Heart Failure questionnaire
Fontaine et al[26]	RCT, community	G1: control: lifestyle PA to increase PA throughout day G2: diet + PA; traditional aerobics and reduced-calorie, reduced-fat diet; 1,000 kcal less than maintenance	13 wk, 13 wk	G1: n = not stated; 37.3 (53.3%) G2: n = not stated; 36.4 (46.7%)	SF-36, BDI
Heshka et al[16]	RCT, clinic	G1: self-help program; 20-min counseling sessions with nutritionist and provision of self-help resources G2: commercial Weight Watchers weight loss program: food plan, activity plan, and cognitive restructuring behavior modification plan	104 wk, 104 wk	G1: n = 211; 45 (82%) G2: n = 212; 44 (87%)	SF-36 and IWQOL-Lite

Study	Design, Setting	Intervention Groups, Component Details	Treatment Duration, Follow-up Duration	Sample Characteristics (Group Size, n; Age, y [% Female Gender])	Quality of Life Instrument Used
Imayama et al[27]	RCT, community and cancer research center	G1: wait-list control G2: lifestyle; goal-based diet and PA intervention; 150 min/wk moderate PA; 1,200–2,000 kcal/d based on baseline weight and dietary fat < 30% of total calories G3: exercise; 45 min/d MVPA, 5 d/wk G4: diet and exercise combined	52 wk, 52 wk	G1: n = 118; 54.7 (100%) G2: n = 87; 57.4 (100%) G3: n = 117; 58.1 (100%) G4: n = 117; 58 (100%)	SF-36
Kennedy et al[30]	RCT, community	G1: general nutrition education, group G2: general nutrition education, individual	24 wk, 24 wk	G1: n = 20; 44 (NP) G2: n = 20; 44 (NP)	IWQOL
Ladson et al[33]	RCT, clinical	G1: metformin (increased to 2,000 mg/d) + caloric restriction; 500 kcal less than maintenance G2: lifestyle-alone caloric restriction; 500 kcal less than maintenance	24 wk, 24 wk	G1: n = 55; 29 (100%) G2: n = 59; 28.8 (100%)	PCOS HRQOL
Malone et al[10]	Cohort, university	G1: general nutrition education, group	20 wk, 20 wk	G1: n = 90; 48 (82%)	SF-36
Melanson et al[17]	RCT, community	G1: exercise only G2: lifestyle; 25% to 40% calories from meal replacements with F/V, whole grains, if dairy; 50% CHO, 25% protein, 25% fat	12 wk, 24 wk	G1: n = 47; 42.3 (85.1%) G2: n = 43; 43.0 (86.0%)	SF-36
Pope et al[13]	RCT, community	G1: standard cardiac rehabilitation + caloric restriction; 500 kcal less than maintenance G2: high-calorie expenditure + caloric restriction; 500 kcal less than maintenance	20 wk, 20 wk	G1: n = 36; 63 (16.7%) G2: n = 38; 64 (21%)	SF-36
Rejeski et al[18]	RCT, university	G1: control; group sessions of usual care G2: diet; emphasis on changing eating habits to lower caloric intake G3: exercise; 60 min, 3 d/wk G4: combined diet and exercise	72 wk, 72 wk	G1: n = 68; 68.6 (66.7%) G2: n = 73; 68.1 (74.1%) G3: n = 69; 68.96 (73.8%) G4: n = 68; 68.5 (73.3%)	SF-36
Rippe et al[19]	Randomized prospective trial, Weight Watchers International	G1: control; maintain regular lifestyle G2: diet and exercise; commercial Weight Watchers program G3: exercise; expenditure of 3,139.5 kJ in self-selected PA; gradual increase to maximum of 6,379 kJ	12 wk, 12 wk	G1: n = 40; 35.6 (100%) G2: n = 30; 37.4 (100%)	SF-36
Ross et al[11]	Cohort, community	G1: lifestyle; goal-based diet and PA intervention; 150 min/wk moderate PA; 1,200–2,000 kcal/d based on baseline weight and dietary fat to < 25% of total calories	24 wk, 24 wk	G1: n = 274; 59.0 (100%)	SF-36
Villareal et al[20]	RCT, university	G1: control; maintain regular lifestyle G2: diet and exercise; caloric restriction of 750 kcal less than maintenance	26 wk, 26 wk	G1: n = 10; 71.1 (60%) G2: n = 17; 69.4 (71%)	SF-36
Villareal et al[21]	RCT, university	G1: control G2: diet; 500–750 kcal less than daily energy requirement G3: exercise; 90-min aerobic, strength, and flexibility exercises	52 wk, 52 wk	G1: n = 27; 69.0 (67%) G2: n = 26; 70.0 (65%) G3: n = 26; 70.0 (62%) G4: n = 28; 70.0 (57%)	SF-36

Study	Design, Setting	Intervention Groups, Component Details	Treatment Duration, Follow-up Duration	Sample Characteristics (Group Size, n; Age, y [% Female Gender])	Quality of Life Instrument Used
		G4: diet and exercise combined			
von Gruenighen et al[34]	RCT, clinical/community	G1: control; usual care brochure G2: general nutrition/PA education	24 wk, 52 wk	G1: n = 23; 55.5 (100%) G2: n = 22; 54.0 (100%)	FACT-G
Williamson et al[25]	RCT, multi-site clinical	G1: control; diabetes support and education G2: lifestyle; goal-based diet and PA intervention; 175 min/wk moderate PA; 1,200–2,000 kcal/d based on baseline weight and dietary fat to < 25% of total calories	52 wk, up to 11.5 y	G1: n = 2,575; 58.8 (59.7%) G2: n = 2,570; 58.6 (59.4%)	SF-36, BDI-II
Wolf et al[22]	RCT, university	G1: control; usual care brochure G2: general nutrition/PA education	52 wk, 52 wk	G1: n = 71; 53.4 (58%) G2: n = 73; 53.3 (62%)	SF-36
Womble et al[23]	RCT, community	G1: weight loss manual; 1,200–1,500 kcal/d self-selected diet of conventional foods based on Food Guide Pyramid G2: commercial program; e-diets; conventional foods with caloric restriction based on body mass index	52 wk, 52 wk	G1: n = 24; 43.3 (100%) G2: n = 23; 44.2 (100%)	SF-36
Yancy et al[24]	RCT, Veterans Administration	G1: low-CHO/low-ketogenic diet; < 20 g/d G2: low-fat diet; < 30% of daily energy	24 wk, 24 wk	G1: n = 59; 44.2 (75%) G2: n = 60; 45.6 (78%)	SF-36

AHA indicates the American Heart Association; BDI, Beck Depression Inventory; CHO, carbohydrates; F/V, fruits and vegetables; FACT-G/An, Functional Assessment of Cancer Therapy–General/Anemia; G1, G2, G3, Group 1, 2, or 3; HRQOL, Health-Related Quality of Life; IWQOL, Impact of Weight on Quality of Life; MVPA, moderate and vigorous physical activity; NP, not provided; PA, physical activity; PCOS, polycystic ovarian syndrome; QWB-SA, Quality of Well-Being Scale–Self-administered; RCT, randomized controlled trial; SF-36, Short Form–36 Health Survey.

Table 2

Quality of Life and Weight Change Outcomes, by Study Group

Study Authors	Attrition by Study Group (%)	Baseline Weight, kg	Weight Change by Study Group, kg	Within-Group QOL Improvement	Between-Group Differences in QOL Change	QOL Independent of Weight Change? (Yes/No/Cannot Determine)
Ackerman et al[14]	Placebo: 0.0 Metformin: 0.0 kcal/fat restriction: 0.0	Placebo: 93.89 Metformin: 91.5 kcal/fat restriction: 87.2	Placebo: −0.4 Metformin: −2.7 kcal/fat restriction: −6.8	Placebo: no Metformin: no kcal/fat restriction: yes	Yes	No
Barham et al[29]	Control: NP kcal/fat restriction: NP	Control: 96.5 kcal/fat restriction: 107.3	Control: +0.7 kcal/fat restriction: −2.3	Control: yes kcal/fat restriction: yes	Yes	Cannot determine
Blissmer et al[9]	Fat restriction: 24.0	Fat restriction: 89.7	Fat restriction: −5.6	Fat restriction: yes	NA	Yes
Darga et al[32,a]	Control: 23.0 Commercial diet: 23.0 kcal/fat restriction: 23.0 Combination: 23.0	Control: 94.5 Commercial diet: 94.5 kcal/fat restriction: 94.5 Combination: 94.5	Control and commercial diet: −0.5 kcal/fat restriction and combination: −8.7	Control: yes Commercial diet: yes kcal/fat restriction: yes Combination: yes	Unclear	No
Davis et al[15]	Low-CHO: 19.0 Fat restriction: 19.0	Low-CHO: 93.6 Fat restriction: 101.0	Low-CHO: −3.1 Fat restriction: −3.1	Low-CHO: yes Fat restriction: yes	No	Yes
Evangelista et al[12]	Control: 0.0 High protein: 0.0 kcal restriction: 0.0	Control: 109.6 High protein: 110.8 kcal restriction: 99.5	Control: −1.5 High protein: −9.9 kcal restriction: −5.6	Control: yes High protein: yes kcal restriction: yes	Yes	No
Fontaine et al[26]	Control: NP kcal/fat restriction: NP	Control: 85.2 kcal/fat restriction: 87.2	Control: −7.0 kcal/fat restriction: −8.7	Control: yes kcal/fat restriction: yes	No	No
Heshka et al[16]	Control: 25.0 Commercial: 28.0	Control: 93.1 Commercial: 94.2	Control: −0.1 Commercial: −3.0	Control: yes Commercial: yes	No	No
Imayama et al[27]	Control: 0.0 kcal/fat restriction: 0.0 Exercise: 1.0 Combination: 0.0	Control: 30.7 (BMI) kcal/fat restriction: 31.0 (BMI) Exercise: 30.7 (BMI) Combination: 31.0 (BMI)	Control: not stated kcal/fat restriction: −7.2 Exercise: −2.0 kg Combination: −8.9	Control: yes kcal/fat restriction: yes Exercise: yes Combination: yes	Yes	No
Kennedy et al[30]	Healthy diet, group: 20.0 Healthy diet, individual: 0.0	Healthy diet, group: 103.7 Healthy diet, individual: 103.4	Healthy diet, group: −3.1 Healthy diet, individual: −3.4	Healthy diet, group: no Healthy diet, individual: no	No	NA
Ladson et al[33]	Drug + kcal restriction: 72.0 kcal restriction: 60.0	Drug + kcal restriction: 102.7 kcal restriction: 104	Drug + kcal restriction: −3.4 kcal restriction: −2.0	Drug + kcal restriction: no kcal restriction: yes	No	Cannot determine
Malone et al[10]	Healthy diet: 57.0	Healthy diet: 100.9	Healthy diet: −4.1	Healthy diet: yes	No	Cannot determine
Melanson et al[17]	Exercise: 59.6 kcal restriction: 49.8	Exercise: 84.3 kcal restriction: 88.8	Exercise: −0.4 kcal restriction: −7.1	Exercise: no kcal restriction: yes	Not stated	Cannot determine
Pope et al[13]	Standard rehabilitation + kcal restriction: 5.6	Standard rehabilitation + kcal restriction: 95.4	Standard rehabilitation + kcal restriction: −3.7	Standard rehabilitation + kcal restriction: no	Yes	No

Study Authors	Attrition by Study Group (%)	Baseline Weight, kg	Weight Change by Study Group, kg	Within-Group QOL Improvement	Between-Group Differences in QOL Change	QOL Independent of Weight Change? (Yes/No/Cannot Determine)
	High activity + kcal restriction: 2.6	High activity + kcal restriction: 93.5	High activity + kcal restriction: −8.2	High activity + kcal restriction: yes		
Rejeski et al[18]	Control: 22.0 kcal restriction: 20.0 Exercise: 18.0 Combination: 24.0	Control: 95.8 kcal restriction: 95.1 Exercise: 94.1 Combination: 91.9	control: −1.2 kcal restriction: −5.4 Exercise: −2.4 Combination: −4.0	Control: yes kcal restriction: yes Exercise: yes Combination: yes	Yes	Yes
Rippe et al[19]	Control: 35.0 Commercial: 25.0	Control: 82.1 Commercial: 81.2	Control: −1.3 Commercial: −6.1	Control: yes Commercial: yes	Yes	No
Ross et al[11]	kcal/fat restriction: 15.0	kcal/fat restriction: 96.3	kcal/fat restriction: −10	kcal/fat restriction: yes	NA	No
Villareal et al[20]	Control: 0.0 kcal restriction: 0.0	Control: 103.2 kcal restriction: 99.7	Control: +0.7 kcal restriction: −8.2	Control: yes kcal restriction: yes	Yes	Cannot determine
Villareal et al[21]	Control: 0.0 kcal restriction: 0.0 Exercise: 0.0 Combination: 0.0	Control: 101.0 kcal restriction: 104.1 Exercise: 99.2 Combination: 99.1	Control: −0.1 kcal restriction: −9.7 Exercise: −0.5 Combination: −8.6	Control: no kcal restriction: yes Exercise: yes Combination: yes	Yes	Cannot determine
Von Gruenighen et al[34]	Control: 10.0 Healthy diet, individual: 22.0	Control: 41.1 (BMI) Healthy diet, individual: 43.5 (BMI)	Control: −1.4 Healthy diet, individual: −3.5	Control: no healthy diet, individual: no	No	No
Williamson et al[25]	Control: 4.3 kcal/fat restriction: 2.9	Control: 100.8 kcal/fat restriction: 100.5	Control: −0.9 kcal/fat restriction: −8.7	Control: no kcal/fat restriction: yes	Yes	No
Wolf et al[22]	Control: 14.0 Healthy diet, individual: 26.0	Control: 107.6 Healthy diet, individual: 107.1	Control: −0.6 Healthy diet, individual: −2.4	Control: yes Healthy diet, individual: yes	Yes	Cannot determine
Womble et al[23]	kcal restriction, manual: 33.3 kcal restriction, commercial: 34.5	kcal restriction, manual: 87.9 kcal restriction, commercial: 93.4	kcal restriction, manual: −3.3 kcal restriction, commercial: −0.8	kcal restriction, manual: yes kcal restriction, commercial: yes	No	Cannot determine
Yancy et al[24]	Low CHO: 25.0 Fat restriction: 55.0	Low CHO: 97.8 Fat restriction: 96.8	Low CHO: none stated Fat restriction: none stated	Low CHO: yes Fat restriction: yes	Yes	Yes

BMI indicates body mass index; NA, not available; other abbreviations as in Table 1.

[a]Attrition and baseline values for body weight were not provided by group. Thus, the overall sample average is reported for each group. Also, weight loss outcomes were combined as shown in the table.

Table 3

Summary of Dietary Interventions Used in Included Studies and Their Effect on QOL

Type of Dietary Intervention Recommendation	Summary of Intervention Effects on QOL and Supporting Quotations
Caloric restriction alone • 1,200–1,500 kcal/d • BMI based • Varying proportions of macronutrient intake	All study interventions of calorie restriction produced improved QOL. No studies clearly indicated whether QOL improvements were independent of weight loss.
Fat restriction alone • ≤ 25% of energy from fat	All intervention arms endorsing a low-fat diet produced improved QOL. Most evidence suggested that QOL improvements were not completely attributable to weight loss. *However, improvements in HRQOL did not appear to be dependent solely on weight loss.*[9] *Our findings suggest QOL improvement are limited to the domains of sexual function and energy and mobility independent of the dietary approach used and independent of changes in weight and A1C.*[15]
Low calorie, low-fat • ≤ 25% of energy from fat • kcal restriction based on baseline weight (1,200–2,000 kcal)	All but 1 study intervention arm endorsing calorie restriction with emphasis on fat reduction produced improved QOL. Evidence suggested that QOL improvements were mostly, but not completely, attributable to weight loss. *We also found significant associations between weight loss, increased aerobic fitness, and improvements in HRQOL and psychological factors, suggesting that these factors may explain, at least in part, the improved HRQOL observed in the diet and exercise interventions.*[27] *Our findings demonstrate that improvements in HRQOL occurring across different diabetes prevention interventions in the DPP were mediated primarily by weight loss, and no significant improvement in global HRQOL occurred through intervention pathways independent of weight loss.*[14]
Low carbohydrate • < 20 g/d	Both study intervention arms endorsing low-carbohydrate diets produced improved QOL. Evidence suggested that at least some aspect of QOL improvement was independent of weight loss. *Our findings suggest QOL improvement are limited to the domains of sexual function and energy and mobility independent of the dietary approach used and independent of changes in weight and A1C.*[15] *Compared with a low-fat diet, a low-carbohydrate diet led to similar improvements in the physical aspects of HRQOL and greater improvements in mental aspects of HRQOL as measured by the SF-36. The greater improvement in the mental aspects of HRQOL appeared to be related more to some aspect of the low-carbohydrate diet than to the greater weight loss that occurred on this diet.*[24]
High protein • 40% CHO, 30% protein, 30% fat	Evangelista et al[12] reported that improvements in QOL for those consuming a high protein diet were associated with weight loss. *The positive effects of short-term weight loss on QOL in overweight and obese individuals have been documented in the obesity literature and confirmed by data from the current study that showed improvements in overall and physical QOL at the end of the 12-week dietary intervention in which there was moderate weight loss.*[12]
Commercial diet	All interventions endorsing a commercial weight loss program such as Weight Watchers produced improved QOL and largely suggested that QOL improvements were related to weight losses. *The current study's investigators demonstrated that the beneficial effects of weight loss on physical and functional QOL extend to obese breast cancer survivors; however, whether that was a result of the weight loss or the exercise that was part of the weight loss program is difficult to determine.*[32] *Weight strongly predicted total score and all subscale scores, with the strongest relationships for public distress, physical function, and total score.*[16]
General healthy diet	All study interventions of generally healthy diets produced improved QOL. No studies clearly indicated whether QOL improvements were independent of weight loss.

BMI indicates body mass index; CHO, carbohydrates; HRQOL, Health-Related Quality of Life; QOL, quality of life; SF-36, Short Form–36 Health Survey.