

Impact of Non-Diet Approaches on Attitudes, Behaviors, and Health Outcomes: A Systematic Review

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ABSTRACT

Objective: To determine the overall effect of non-diet, weight-neutral interventions on factors such as weight, biochemical measures, food and activity behavior, body image, and mental health.

Design: Systematic review of intervention literature.

Setting: Group classes in community and worksite settings (14 studies), and individual counseling (1) and online education (1) in college settings.

Participants: Eighteen research articles (representing 16 studies) evaluating non-diet interventions using quasi-experimental and randomized study designs with either a comparison or control group.

Main Outcome Measures: Anthropometric, physiological, psychological, and dietary intake.

Analysis: Systematic search of 168 articles and review of 18 articles meeting inclusionary criteria.

Results: Non-diet interventions resulted in statistically significant improvements in disordered eating patterns, self-esteem, and depression. None of the interventions resulted in significant weight gain or worsening of blood pressure, blood glucose, or cholesterol, and in 2 studies biochemical measures improved significantly compared with the control or diet group. Primary limitations were inconsistent definitions of non-diet approaches and the use of different assessment instruments for measuring outcomes.

Conclusions and Implications: Because of the long-term ineffectiveness of weight-focused interventions, the psychological improvements seen in weight-neutral, non-diet interventions warrant further investigation.

Key Words: non-diet, weight management, eating disorders, body image, mental health, overweight (*J Nutr Educ Behav.* 2015;47:143-155.)

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INTRODUCTION

Dieting has become normative in Western culture, feeding a more than \$60 billion industry per year,¹ and includes a myriad of formal programs and plans. For many dieters, restriction by skipping meals, eliminating forbidden foods, or under-eating for the purpose of weight loss becomes a way of life. Regardless of the method used, weight loss attempts are often effective over the short-term, and yet over time weight is regained.²⁻⁸ Furthermore, emerging research is showing associations with dieting and weight

gain^{5,7,9,10} weight cycling¹¹ and disordered eating patterns.^{7,12}

Restricting food intake leads to a repetitive pattern of self-deprivation, which can result in disordered eating such as bingeing, weight changes including weight gain, and worsening self-image.^{13,14} Prospective studies indicate some risk factors for eating pathology including dietary restraint, perceived pressure for thinness, thin-ideal internalization, and body dissatisfaction.¹⁵

Despite mounting evidence of dieting failures, nutrition professionals continue to develop and implement

nutrition education interventions aimed at assisting audiences with weight loss. Public health nutrition campaigns in schools, worksite wellness programs, and programs at the federal level frequently emphasize weight management as necessary for improving health.

One repercussion of society's focus on weight loss is the stigmatization of and discrimination against overweight individuals¹⁶ in education,¹⁷⁻¹⁹ the workplace,^{20,21} and health care settings.^{22,23} Nutrition and health professionals as well as the lay public hold implicitly negative attitudes toward larger individuals²⁴⁻²⁷ without regard for the genetic, environmental, and sociocultural determinants of weight and health.²⁸ Weight-based discrimination has been linked to poor body esteem,²⁹ eating disorders,³⁰ bullying,³¹ and depression.³²

There is new evidence that weight-neutral, non-diet programming may be more effective at promoting permanent dietary and physical activity

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behavior change while minimizing weight stigma than traditional approaches.^{2,3,33-36} Non-diet-based interventions promote making healthful behavior changes, such as increased fruit and vegetable intake and increased physical activity, that result in improved fitness regardless of weight status.³⁷

The term *Health at Every Size* (HAES), trademarked by the Association for Size Diversity and Health in 2012, is often used synonymously with the term *non-diet*. The HAES paradigm is a weight-neutral approach centered on respecting body shape and size diversity, promoting a holistic approach toward wellness, ending weight discrimination and stigma, and promoting eating and exercise based on individualized hunger, satiety, nutritional needs, and pleasure.

Other concepts used in non-diet research include the Satter Eating Competence Model³⁸ measured by the Eating Competence Satter Inventory³⁹⁻⁴¹ and the Eating Competence Satter Inventory for Low Income,³⁹ which assess an individual's eating attitudes, food acceptance, internal regulation, and contextual skills around planning and preparing meals and snacks; Intuitive Eating⁴² measured by the Intuitive Eating Scale⁴³ and Intuitive Eating Scale-2,⁴⁴ which assess the ability to tune into internal cues of hunger and fullness; and Mindful Eating⁴⁵⁻⁴⁷ measured by the Mindful Eating Questionnaire,⁴⁵ which focuses on present moment awareness without judgment during the eating experience.

Competent eaters are more likely to be physically active,⁴⁰ report eating more fruits and vegetables,⁴⁰ have higher high-density lipoprotein (HDL) cholesterol and lower blood pressure,⁴⁸ have a lower body mass index, and be more content with body weight.⁴⁰ Intuitive eaters tend to enjoy a variety of foods, have better self-esteem and overall psychological well-being, and are less likely to internalize the thin ideal.^{44,49-51} In addition, intuitive eaters are less likely to engage in binge eating^{14,52,53} eat when they are anxious or stressed,⁵⁴ or exhibit eating disorder symptomatology.⁵⁰

Many researchers have been implementing non-diet interventions and assessing their effects on anthropometrics, cholesterol, blood pressure, body image, depressions, stress,

dietary restraint and disinhibition, dietary quality, and physical activity.^{23,33,34,36,55-67} The aim of this research was to conduct a systematic review to synthesize the peer-reviewed literature evaluating non-diet interventions to determine their effectiveness. Results are intended to guide the development of more effective intervention efforts and provide directions for future research.

METHODS

Literature Search

An initial search was conducted by a single author using the key terms *Non-diet*, *Intuitive Eating*, *Health at Every Size*, and *Mindful Eating* in the following databases over the course of a week from July 14 to July 20, 2013: Academic Search, Cumulative Index to Nursing and Allied Health Literature Plus, PubMed, and ScienceDirect. In addition, researchers searched for studies previously known to the authors and used backward searching from references of selected studies from July 15 to August 21, 2013. From these additional search methods, other studies were included that did not result from the search of key terms. No date cutoff criteria were established when searching, and the oldest study used was from 1998 (Figure).

Inclusion and Exclusion Criteria

Criteria for inclusion in the review were quasi-experimental or randomized study designs evaluating non-diet interventions with either a comparison or a control group. In addition, included studies were all published in English and involved human subjects. Studies were excluded if they were not published in full-text in peer-reviewed journals.

Selection and Review Process

The review process paralleled that of the PRISMA systematic review process.⁶⁸ Full articles of the selected studies were retrieved and the authors divided up and individually reviewed all studies that met the inclusion criteria. A summary table was created in which each author documented study design, dose, duration and follow-up if applicable, sample size, non-diet concepts used, and anthropometric, physiolog-

ical, psychological, and dietary intake outcome measures reported from the studies they reviewed (Table 1). Upon completion of this process, each author read and reviewed all studies to verify the key findings. Once the summary table was complete, 1 author verified all table data. Two authors reviewed full articles of the selected studies and reported individual findings of each outcome measure (Table 2). Both between- and within-group comparisons were reported comparing the non-diet group with either a diet group or a control group. If a study had 3 groups (non-diet group, diet group, and control group), comparisons between the non-diet group and the diet group were documented in Table 2. All significant and non-significant findings are reported in Tables 1 and 2. A third author reviewed the articles, and if there were discrepancies between the 2 completed tables, additional review was conducted to resolve the differences. All authors reviewed Table 2 for errors. Finally, to ensure accuracy, 3 authors reviewed the studies included in the analysis and summarized the overall findings, as evident in Tables 1 and 2. The summaries of findings from the 3 authors were compared and commonalities informed the overriding conclusions and implications for future research. Because of the diversity of study designs, outcome measures, non-diet approaches and intervention lengths, authors conducted a qualitative assessment of the current evidence.

DISCUSSION

A total of 168 abstracts were identified through the initial search. Once reviewed, 26 were categorized as intervention studies, 16 of which met the selection criteria and 10 of which were excluded because they were not quasi-experimental or randomized designs involving human subjects, did not include a control or comparison group, contained language consistent with a diet approach, or were not published in full text in peer-reviewed journals. The authors found 2 additional manuscripts that were not in the original search. The 18 research articles represented a total of 16 studies.^{2,3,33,34,36,55,57-67,69} Of the 16 studies, 14 were randomized

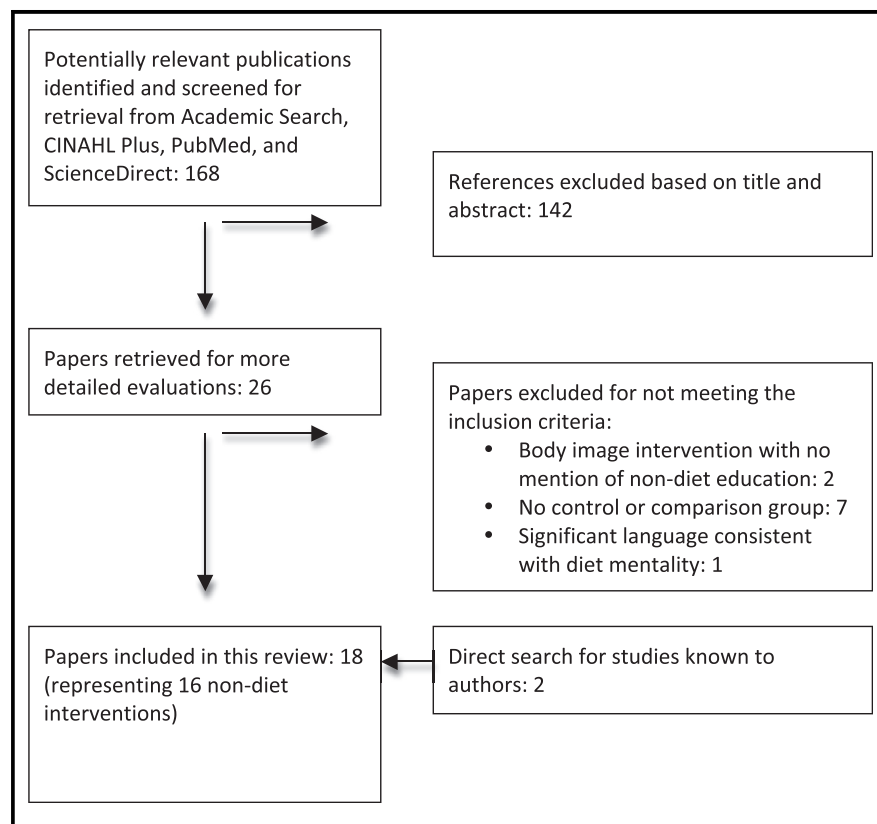


Figure. Flowchart of the search process. CINAHL indicates Cumulative Index to Nursing and Allied Health Literature.

controlled trials (RCTs) and 2 were quasi-experimental. Articles that were excluded from the analysis were primarily due to a lack of control or comparison groups. Research by Marek et al⁶⁴ and Hendrickson et al⁶¹ were excluded from Table 2 because the outcome measures reported differed substantially from the anthropometric, physiological, psychological, and dietary intake measures evaluated in the other studies, which made it challenging to compare. The study of Marek et al was on participants with clinical eating disorders and the objective of Hendrickson et al was to measure impulsiveness using the Barratt Impulsiveness Scale.

Overview of Studies

The majority of interventions (14 of 16) involved a series of group classes.^{2,3,33,34,36,55,57-67,69} One intervention included individual counseling⁶³ and another was delivered through online learning modules.⁶⁰ Interventions ranged from 50 minutes to 18 months; most interventions lasted 8–16 weeks.

Although weight loss is not the focal point of most non-diet interventions, 13 of the 16 interventions summarized here reported weight data.^{2,3,33,34,36,55,57-59,61,65-67,69} Of those, 5 resulted in no changes in weight among the non-diet groups,^{2,3,36,55,57,58} 6 led to non-significant weight loss,^{32,33,56,62,65,67} 1 led to significant weight loss,⁶⁶ and 2 resulted in non-significant weight gain.^{59,60}

Of the 6 studies that reported blood lipid, blood glucose, and blood pressure data, 5 interventions led to improvements in some or all measures.^{2,3,57,65,66,69} One study reported no change in total blood pressure from pre- to postintervention,³⁶ 2 reported reductions in systolic blood pressure,^{2,3,66} 3 led to reductions in diastolic blood pressure,^{57,66,69} 2 led to no change in diastolic blood pressure,^{2,3,36} 2 reported reductions in total, low-density lipoprotein, and/or HDL cholesterol,^{2,3,56} 1 reported that HDL cholesterol was reduced more in the control group than the non-diet group,⁶⁶ and 1 reported a non-significant increase in total cholesterol postintervention.³⁶ Only 2

studies reported biochemical measures that improved significantly compared with the diet group^{2,3} or control group.⁵⁷

Of the 6 studies that reported dietary restraint, 2 non-diet interventions led to significant reductions in dietary restraint compared with the other group from pre- to posttest,^{2,3,57} 2 led to non-significant reductions in restraint,^{36,66} 1 led to no change in restraint,^{33,34} and 1 led to a non-significant increase in dietary restraint from pre- to posttest.⁵⁵ Provencher et al^{33,34} reported a significant decrease in disinhibition compared with the control group in their 2009 follow-up study, whereas Bacon et al^{2,3} and Rapoport et al⁶⁶ reported a non-significant decrease in disinhibition after their interventions.

Seven studies reported outcomes related to body image avoidance, dissatisfaction, concern, or preoccupation.^{2,3,36,55,57,63,66,69} Of these, 1 reported a significant reduction in body image avoidance,^{2,3} although the reduction was not maintained at 2-year follow-up, whereas 1 reported a non-significant reduction.⁶⁶ Two studies reported a significant reduction in body image dissatisfaction,^{2,3,57} 1 reported a non-significant reduction,⁶⁶ and 1 reported no change.⁶⁹ In addition, Steinhardt et al³⁶ and Alberts et al⁵⁵ reported non-significant reductions in body image preoccupation and concern, respectively, after their non-diet interventions.

Nine studies included in the review reported physical activity data.^{2,3,58,59,62,63,65-67,69} One study reported significant increases in energy expenditure from pre- to postintervention compared with controls.^{2,3} Carroll and colleagues⁶⁹ were the only researchers to obtain post data from most participants to measure changes in fitness levels from pre to post. They reported significant improvements in maximal oxygen consumption (peak VO₂) in the non-diet group compared with control. Although physical activity declined in both intervention and control groups in the WebHealth study, physical activity in the intervention group reduced significantly less than in the control group as college students adapted to their independent life stage.⁶⁰ Keeler and colleagues⁶³ found that reported physical activity stage of change increased significantly

Table 1. Studies of Non-Diet Interventions

Reference Group	Design	Non-Diet Concepts	Participants, n	Duration and Dose of Intervention	Follow-Up	Outcomes	Summary of Findings
Alberts et al, 2012 ⁵⁵	RCT	Mindful eating	26	2.5 h/wk for 8 wk	None	KIMS-E, DEBQ, BSQ, DTS, G-FCQ-T, Wt	Within-group reduction in food cravings, dichotomous thinking, body image concern, emotional eating, and external eating. No change in weight.
Bacon et al, 2002 ² Bacon et al, 2005 ³	RCT	HAES	78	1.5 h/wk for 24wk + 1 h/mo for 6 mo (12 mo)	2 y	Wt, BP, BL, SE, CR, Hgr, D, BI	Within-group improvements in blood lipid, hunger, disinhibition; between-group improvements in BP, cognitive restraint, self-esteem, and body image, disordered eating maintained at follow-up.
Carroll et al, 2007 ⁶⁹	RCT	HAES	62	1 session/wk for 12 wk	None	GWB, PSSc, BI	Within-group improvements in diastolic BP, HDL cholesterol, weight reduction. Between-group improvements in fitness, psychological well-being.
Ciliska, 1998 ⁵⁷	RCT	PSE	142	2 h/wk for 12 wk	none	JFIS, RSES, TRS, TFEQ, EDI, CES-D, SAS	Between-group improvements in diastolic BP, self-esteem, body image, dietary restraint, disordered eating, and depression.
Cole et al, 2010 ⁵⁸	RCT	IE	87	1 h/wk for 10 wk	6 mo	3DFR, DMS	No intervention effects for dietary intake, physical activity, or anthropometrics.
Goodrick et al, 1998 ⁵⁹	RCT	Non-diet	219	1 h/wk for 24wk + 26 biweekly meetings (18 mo)	None	Wt, PA, BES	Within-group improvements in physical activity and binge eating.
Hendrickson et al, 2013 ⁶¹	RCT	Mindful eating	102	50 min	None	%BF, Wt, Ht, SHQ, BIS, SILS	Increased self-control.
Leblanc et al 2012 ⁶²	RCT	IE, SA, JM	140	13 3-h sessions + 1 6-h session (14 wk)	None	3DFR, TFEQ	Within-group reduction in snack frequency and weight. No significant intervention effects.
Marek et al, 2013 ⁶⁴	Quasi-experimental	Mindful eating	40	2 sessions (1 wk)	None	VAS, PSS	Decrease in negative affect after mindfulness intervention.
Miller et al, 2012 ⁶⁵	RCT	Mindful eating	68	10 2.5-h sessions (3 mo)	After 3 mo	Wt, BMI, WCr, FBG, HbA1c, INS, FFQ, MPAQ	Within-group decrease in weight, HbA1c, kcal and glycemic index. Between-group differences in trans-fat, fiber, sugar.
Provencher et al, 2007 ³³ Provencher et al, 2009 ³⁴	RCT	HAES	144	13 3-h sessions + 1 6-h session (total of 14 wk)	1.5 y	TFEQ	Between-group reduction in susceptibility to disinhibition and hunger. No intervention effects for body weight.

Rapoport et al, 2000 ⁶⁶	RCT	SA, NEP	75	2 h/wk for 10 wk	12 mo	BL, BP, BG, AF, PA, GHQ, BDI, RSES, PSSc, BES, TFEQ, BSS, BIA-Q, FFQ,	Significant weight loss and reduced HDL compared with diet group. Similar within-group improvements in binge eating, hunger, disinhibition, restraint, body image, self-esteem, and dietary intake in both groups.
Steinhardt et al 1999 ⁶⁶	Quasi-experimental	HAES	357	1 h/wk for 10 wk	1 y	BP, BL, RES, DEBQ, RSES, BPr	No intervention effects for weight, BP, blood lipids. Within-group decrease in restrained eating, body preoccupation, and improved self-esteem.
Tanco et al, 1998 ⁶⁷	RCT	Non-diet	62	2 h/wk for 8 wk	6 mo	Wt, BDI, RSCS, EDI, STAI	Between-group improvement in depression, self-control, and anxiety. Within-group improvements in disordered eating and body image. No change in physical activity in either group; weight loss occurred in both groups.
Individual							
Keeler et al, 2013 ⁶³	Quasi-experimental	HAES	45	30-60 min for 8 wk	None	IES, SOC-Ex, ETQ, PBHE	Between-group improvements in stage of change for exercise, eating for physical rather than emotional reasons, and perceived barriers to healthy eating.
Online							
Greene et al, 2012 ⁷³	RCT	JM, SA	1,689	15 min/wk for 10 wk	15 mo	Wt, BMI, PDW, NCI, IPAQ, ECSI, GHQ	Between-group improvements in fruits and vegetables and reduced decline in physical activity levels. Weight gain in both groups.

%BF indicates % body fat; 3DFR, 3-day food record; AF, aerobic fitness; BDI, Beck Depression Inventory; BES, Binge Eating Scale; BG, blood glucose; BI, body image; BIA-Q, Body Image Avoidance Questionnaire; BIS, Barratt Impulsiveness Scale; BL, blood lipids; BMI, body mass index; BP, blood pressure; BPr, body preoccupation; BSS, Body Satisfaction Scale; BSQ, Body Shape Questionnaire; CES-D, Center for Epidemiologic Studies Depression Scale; CR, cognitive restraint; D, disinhibition; DEBQ, Dutch Eating Behavior Questionnaire; DMS, Diet Mentality Score; DTS, Dichotomous Thinking Scale; ECSI, Eating Competence Satter Inventory; EDI, Eating Disorder Inventory; ETQ, Exercise Thoughts Questionnaire; FFQ, 110-item block 2005 food frequency questionnaire; G-FCQ-T, General Food Craving Questionnaire Trait; GHQ, General Health Questionnaire; GWB, General Well-being Schedule; HAES, Health at Every Size; Hgr, hunger; Ht, height; IE, intuitive eating; IES, Intuitive Eating Scale; INS, insulin; IPAQ, International Physical Activity Questionnaire; JFIS, Janis and Field Feelings of Inadequacy Scale; JM, joyful movement; KIMS-E, Kentucky Inventory Mindfulness Skills Extended; LSP, lifestyle patterns; MPAQ, Modifiable Physical Activity Questionnaire; MS, medical symptoms; NCI, National Cancer Institute Fruit and Vegetables Screener; NEP, normalization of eating patterns; NDT, non-dieting treatment; PA, physical activity; PBHE, perceived barriers to healthy eating; PDW, perceived and desired weight; PSE, psychoeducation; PSS, Participant Satisfaction Survey; PSSc, Perceived Stress Scale; PsyD, psychological distress; RCT, randomized control trial; RES, Restrained Eating Scale; RRT, relaxation response training; RSCS, Rosenbaum Self-Control Schedule; RSES, Rosenberg Self-esteem Scale; RT, randomized trial (no control); SA, size acceptance; SAS, Social Adjustment Scale; SHQ, Subjective Hunger Questionnaire; SILS, Shipley Institute of Living Scale; SOC-Ex, stage of change for exercise ladder; STAI, State Trait Anxiety Inventory; TFEQ, 3-Factor Eating Questionnaire; TRS, Restraint Scale; VAS, visual analog scale; WC_r, waist circumference; Wt, weight.

Table 2. Outcome Variables in Non-Diet Group vs Diet Group/Controls

Reference	Sample	Comparison ^a	Weight	Biochemical	Restraint/ Disinhibition	Hunger/ Fullness	Stress Management	Emotional Eating	Body Image	Disordered Eating	Self- Esteem	Depression/ Emotional Well-Being	Physical Activity	Dietary Intake	Other Variables
Alberts et al, 2012 ⁵⁵	Women with disordered eating behavior, aged 18–65 y	NDG	NS	–	R ↑	ExtE ↓	–	↓	BIC ↓	–	–	–	–	–	M ↓, DT ↓, FC ↓
		CG	↓	–	R ↑	ExtE NS	–	NS	BIC NS	–	–	–	–	–	M NS, DT NS, FC NS
		Between groups	NS	–	NS	NS	–	NS	NS	–	–	–	–	–	NS
Bacon et al, 2002; Bacon et al, 2005 ^{2,3}	Obese females aged 30–45 y	NDG	NS	TotC ↓ HDL ↓ LDL ↓ SBP ↓ DBP NS	R ↓ Dis ↓	H ↓	–	–	BIA ↓ BD ↓	DFT ↓ B ↓	↑	D ↓	EE ↑	–	–
		DG	NS	TotC NS HDL ↓ LDL NS SBP NS DBP NS	R ↑ Dis ↓	H NS	–	–	BIA NS BD NS	DFT NS B NS	↓	D NS	EE NS	–	–
		Between groups	NS	TotC NS HDL NS LDL NS SBP* DBP NS	R* Dis ↓	NS	–	–	BIA* BD*	DFT* B*	* *	* *	* *	–	–
Carroll et al, 2007 ⁶⁹	Obese females aged 25–55 y	NDG	↓	HDL ↑ DBP ↓ Trig NS FBG NS	–	–	NS	–	BD NS	–	–	GWB ↑ ECS ↑	–	–	EL ↑, VO ² _{peak} ↑, MetS ↓
		CG	NS	HDL ↑ DBP ↓ Trig NS FBG NS	–	–	NS	–	BD ↑	–	–	GWB NS ECS NS	–	–	EL NS, VO ² _{peak} NS, MetS ↓
		Between groups	NS	NS	–	–	NS	–	NS	–	–	GWB* ECS*	–	–	EL*, VO ² _{peak} *, MetS NS
Ciliska, 1998 (psycho-ed only) ⁵⁷	Obese females aged ≥ 20 y	NDG	NS	DBP ↓	R ↓ TFEQ ↓	–	–	–	BD ↓	B ↓ DFT ↓	↑	D ↓ FOI ↓	–	–	SoA ↓
		CG	NS	DBP NS	R NS TFEQ NS	–	–	–	BD NS	B NS DFT NS	NS	D NS FOI NS	–	–	SoA NS
		Between groups	NS	DBP*	R* TFEQ*	–	–	–	BD*	B* DFT NS	* *	D* FOI*	–	–	SoA NS
Cole et al, 2010 ⁵⁸	Females, mean age 37 y	NDG	NS	–	–	NS	–	–	–	–	–	–	NS	NS	–
		CG	NS	–	–	NS	–	–	–	–	–	–	NS	NS	–

		Between groups	NS	-	-	NS	-	-	-	-	-	-	NS	NS	-
Goodrick et al, 1998 ⁵⁹	Overweight and obese binge-eating females aged 25–50 y	NDG	↑	-	-	-	-	-	-	BES ↓	-	-	↑	-	-
		DG Between groups	↑ NS	- -	- -	- -	- -	- -	- -	BES ↓ NS	- -	- -	↑ NS	- -	- -
Leblanc et al 2012 ⁶²	Premenopausal overweight/obese females, mean age 42 y	NDG	↓	-	-	-	-	-	-	-	-	-	NS	NS	SF ↓
		CG Between groups	NS NS	- -	- -	- -	- -	- -	- -	- -	- -	- -	NS NS	NS NS	SF NS NS
Miller et al, 2012 ⁶⁵	Overweight and obese males and females aged 35–65 y with type II DM	NDG	↓	HbA1C ↓	-	-	-	-	-	-	-	-	NS	Energy ↓ Saturated fat NS Trans NS Fiber NS Carb NS Sugar NS GL ↓ GI ↓ Pro ↑	
		DG	↓	HbA1C ↓	-	-	-	-	-	-	-	-	NS	Energy ↓ Saturated fat ↓ Trans ↓ Fiber ↑ Carb NS Sugar ↑ GL ↓ GI ↓ Pro NS	
		Between groups	NS	NS	-	-	-	-	-	-	-	-	NS	Energy NS Saturated fat NS Trans* Fiber* Carb NS Sugar* GL NS GI NS Pro NS	-

(continued)

Table 2. Continued

Reference	Sample	Comparison ^a	Weight	Biochemical	Restraint/ Disinhibition	Hunger/ Fullness	Stress Management	Emotional Eating	Body Image	Disordered Eating	Self- Esteem	Depression/ Emotional Well-Being	Physical Activity	Dietary Intake	Other Variables
Provencher et al, 2007; Provencher et al, 2009 ^{33,34}	Premenopausal overweight/obese females, mean age 42 y	NDG	NS	–	R NS Dis ↓	H ↓ F NS	–	–	–	–	–	–	–	–	–
		CG	NS	–	R NS Dis NS	H NS F NS	–	–	–	–	–	–	–	–	–
		Between groups	NS	–	R NS Dis*	H* F NS	–	–	–	–	–	–	–	–	–
Rapoport et al, 2000 ⁵⁶	Overweight and obese females aged 18–65 y	NDG	↓	HDL ↓ LDL ↓ SBP ↓ DBP ↓ Trig NS FBG NS	Dis ↓ R ↓	H ↓	↓	–	BD ↓ BIA ↓	BES ↓	↑	D ↓	↑	Kcal ↓ %Fat ↓ %Pro ↑ %Carb ↑	STHR ↓
		DG	↓	HDL ↓ LDL ↓ SBP ↓ DBP ↓ Trig NS FBG NS	Dis ↓ R ↓	H ↓	↓	–	BD ↓ BIA ↓	BES ↓	↑	D ↓	↑	Kcal ↓ %Fat ↓ %Pro ↑ %Carb ↑	STHR ↓
		Between groups	NS	HDL* LDL NS SBP NS DBP NS Trig NS FBG NS	Dis NS R NS	H NS	NS	–	BD NS BIA NS	BES NS	NS	D NS	NS	Kcal NS %Fat NS %Pro NS %Carb NS	STHR NS
Steinhardt et al 1999 ³⁶	Worksite wellness males and females	NDG	NS	SBP NS DBP NS TotC NS	R ↓	ExtE NS	–	NS	BPr ↓	–	↑	–	–	–	–
		DG	NS	SBP NS DBP NS TotC NS	R ↑	ExtE NS	–	NS	BPr ↓	–	↑	–	–	–	–
		Between groups	NS	SBP NS DBP NS TotC NS	R NS	ExtE NS	–	NS	BPr NS	–	NS	–	–	–	–
Tanco et al, 1998 ⁵⁷	Obese females aged ≥ 19 y	NDG	↓	–	–	–	–	–	BD ↓	EDI ↓ B ↓ DFT ↓ InE ↓ IA ↓ P NS	–	D ↓	NS	–	SCS ↑, STAI ↓, TAI ↓
		DG	↓	–	–	–	–	–	BD NS	EDI NS B NS DFT NS InE NS	–	D NS	NS	–	SCS NS, STAI NS, TAI NS

Individual	Study	Population	Intervention	Comparison	Outcome	Significance	Notes
Keeler et al, 2013 ⁶³	College females	NDG	-	-	IA NS	NS	SCS*, STAI*, TAI NS
					P NS		
					EDI NS		
Keeler et al, 2013 ⁶³	College females	CG	-	-	B NS	D*	-
					DFT NS		
					InE NS		
Keeler et al, 2013 ⁶³	College females	Between groups	-	-	IA NS	-	-
					P NS		
					B NS		
Keeler et al, 2013 ⁶³	College females	NDG	-	-	BD NS	-	-
					EP _{phys} ↑		
					BWS NS		
Keeler et al, 2013 ⁶³	College females	CG	-	-	EP _{phys} ↓	-	-
					BWS NS		
					BWS NS		
Keeler et al, 2013 ⁶³	College females	Between groups	-	-	EP _{phys} *	-	-
					BWS NS		
					BWS NS		
Keeler et al, 2013 ⁶³	College females	NDG	-	-	SOC-Ex ↑	-	PBTHE ↓
					PA-SE NS		
					SOC-Ex ↓		
Keeler et al, 2013 ⁶³	College females	CG	-	-	SOC-Ex ↓	-	-
					PA-SE NS		
					SOC-Ex*		
Keeler et al, 2013 ⁶³	College females	Between groups	-	-	SOC-Ex*	-	-
					PA-SE NS		
					PA-SE NS		
Greene et al, 2012 ⁷³	College males and females	NDG	↑	-	ecSI NS	↓	F/V ↑
					CG		
					CG		
Greene et al, 2012 ⁷³	College males and females	Between groups	↑	-	ecSI NS	↓	F/V NS
					CG		
					CG		
Greene et al, 2012 ⁷³	College males and females	Between groups	NS	-	ecSI NS	↓	F/V*
					CG		
					CG		

B indicates bulimia; **BD**, binge eating scale; **BES**, binge eating scale; **BIA**, body image avoidance; **BIC**, body image concern; **BPr**, body preoccupation; **BWS**, body weight satisfaction; **CG**, control group; **D**, depression; **DBP**, diastolic blood pressure; **DFT**, Drive for Thinness; **DG**, diet group; **Dis**, disinhibition; **DT**, dichotomous thinking; **ECS**, emotional control and stability; **ecSI**, Eating Competence Satter Inventory; **EDI**, Eating Disorder Inventory; **EE**, energy expenditure; **EL**, energy level; **EPhys**, Eating For Physical Rather Than Emotional Reasons; **ExtE**, external eating; **F**, fullness; **FBG**, blood glucose; **FC**, food cravings; **FOI**, feelings of inadequacy; **FV**, fruit and vegetable intake; **GI**, glycemic index; **GL**, glycemic load; **GWB**, general well-being; **H**, hunger; **IA**, interoceptive awareness; **InE**, inefficacy; **MetS**, metabolic syndrome; **M**, mindfulness; **NDG**, non-diet group; **NS**, not significant; **P**, perfectionism; **PBTHE**, Perceived Barriers to Healthy Eating; **R**, restraint; **SoA**, social adjustment; **SBP**, systolic blood pressure; **SCS**, self-control schedule; **SF**, snack frequency; **SOC-Ex**, stage of change for exercise ladder; **STAI**, State Anxiety Inventory; **STHR**, Step Test Heart Rate; **TAI**, Trait Anxiety Inventory; **TFEQ**, 3-Factor Eating Questionnaire; **Trig**, triglycerides; **TotC**, total cholesterol; **VO_{2peak}**, peak oxygen uptake; *between-group significance.

^aPre to post for NDG and CG within the group comparison.

Notes: ↑ = statistically significant within group increase from pre to post; ↓ = statistically significant within group decrease from pre to post; - = not measured. Significance set at $P < .05$.

compared with controls. Two interventions resulted in non-significant increases in physical activity^{59,66} and 4 reported no change.^{58,62,65,67}

Greene and colleagues⁶⁰ were the only researchers to report a significant improvement in diet quality (increased fruit and vegetable intake) after the intervention compared with controls.

All studies that tracked changes in disordered eating reported improvements in the non-diet groups from pre to post.^{2,3,57,59,66,67} Bacon et al^{2,3} and Ciliska⁵⁷ reported significant reductions in self-reported bulimic behaviors in the non-diet groups compared with the diet and control groups, respectively. Disordered eating behaviors remained unchanged in most studies; however, binge eating scores were reduced in both non-diet groups and diet groups.^{59,66} Self-esteem improved from pre to post in all 4 studies^{3,36,57,66} that included this measure, with 2 studies finding significant improvements compared with the diet group^{2,3} or control.⁵⁷ Emotional health improved in all 5 interventions that tracked such outcomes.^{2,3,57,66,67,69} Reductions in depression were statistically significantly lower from pre to post compared with the other group in 3^{40,41,66,70} of the 4⁶⁷ studies that tracked components of emotional health. Furthermore, Carroll and colleagues⁶⁹ found that emotional control and stability and general well-being improved significantly from pre to post compared with a control group.

Overall, differences in biochemical measures and weight outcomes between the diet and non-diet groups were inconsistent, with more consistent differences in psychological measures. For example, Tanco et al⁶⁷ found a similar weight reduction between diet and non-diet groups, but the non-diet group had a statistically significant improvement in depression scores compared with the diet group. In general, most between-group differences are found in psychological assessments such as depression, self-esteem, disordered eating, and body image, especially when the non-diet intervention is compared with a diet intervention. These overall findings were similar to conclusions made by Schaefer and Magnuson,⁷⁰ who reviewed 20 interventions that encouraged participants

to eat according to internal signals. They also noted the consistent psychological advantages of programs that emphasize a non-diet approach and the lower attrition rates of non-diet programs compared with diet programs. Because an individual's health and well-being is affected by more than just diet and exercise, this primary finding warrants further investigation of non-diet approaches for health promotion.

Limitations

Considering that non-diet interventions are in their infancy of being implemented by researchers and practitioners, this systematic review presents inherent limitations. With limited non-diet interventions available to assess, all studies were included in the analysis that had a comparison or control group, regardless of the design quality or mention of statistical power.

Another limitation is the wide range of outcomes measured (Table 2). As an example, some studies used weight as an outcome variable^{2,3,33,36,55,57-59,62,65-67,69,71-73} whereas others did not.^{61,63,64} Some researchers used the non-diet approach of intuitive eating^{2,3,36,57,59,63,66,67,72,74} whereas others used mindful eating^{55,61,64,65} and yet others articulated their intervention with HAES^{33,62,69,71,73} or the Satter Eating Competence Model.⁶⁰ Restraint and/or disinhibition were variables measured individually or together in some studies,^{2,3,33,36,55,57,62,66,71} whereas other studies did not measure these behaviors.^{59,61,63-65,67,69,73-75} These variables also lack consistency in terms used to describe the non-diet approach. A contributing factor was that various assessment tools were used to measure similar study variables, which make it challenging to offer generalized statements about validity and reliability.

Some researchers chose to compare a non-diet intervention with a diet intervention^{2,3,36,59,65-67} whereas others compared the non-diet group with a control group who did not receive an intervention.^{33,34,55,57,58,62,63,69,73} These differences limit comparisons between studies and are noted in Table 2.

An inherent limitation includes the self-reported nature of the dietary intake and physical activity data. Duration of

interventions also varied. In addition, studies that included follow-up of ≥ 1 year were limited.^{3,33,36,66,73} Also, only 2-year follow-up was conducted; longer follow-up (eg, 5 years) is recommended before making conclusive statements about long-term benefits.³ Furthermore, a lack of consistency was evident in the populations studied, with samples ranging from a general student population to those with a diagnosed eating disorder. The samples also greatly varied in size. Control groups were different between studies and attrition rates varied, thus influencing final outcomes.

Confounding factors may have also influenced results of various studies. As an example, the study by Marek and colleagues⁶⁴ reported a significant increase in negative affect from a clinical sample after the mindfulness intervention. At first glance, this implies that the mindfulness-based intervention had a negative effect. However, this was a clinical sample of individuals diagnosed with anorexia nervosa, bulimia nervosa, or eating disorders not otherwise specified, who most likely presented with psycho-comorbidities possibly influencing the cognitive process that occurs with mindfulness.

Another possible confounding factor was how the non-diet programs were actually implemented. The study by Carroll et al⁶⁹ used the WHEEL intervention that was "designed to be in line with HAES," yet the acronym stands for Weight, Healthy Eating, and Exercise in Leeds. Although HAES is considered a weight-neutral approach, this acronym implies that the intervention had a weight management focus. This suggests that there is significant variation in the attitudes of non-diet researchers toward the objective of weight-neutrality.

The 16 studies included in this systematic review included RCT and quasi-experimental designs to determine the impact of non-diet interventions on various anthropometric, physiological, psychological, and dietary intake outcomes. Despite the numerous limitations outlined that limit the generalizability of this summary, the literature suggests potential efficacy of non-diet interventions on several outcomes including improved blood lipids, glucose, and blood pressure; decreased dietary restraint and

disinhibition, emotional eating, and eating disorder symptoms; increased body image, self-esteem, physical activity; and improved dietary patterns. In addition, these improvements are made without the negative effects often associated with weight-based interventions, including increased dietary restraint and subsequent disinhibition, weight cycling, increased body dissatisfaction, and high program attrition rates.

IMPLICATIONS FOR RESEARCH AND PRACTICE

A call to action is evident from this systematic review for more RCTs using non-diet approaches with standardized outcome variables and assessment tools. However, the studies included in this systematic review provide evidence that various non-diet interventions influence variables beyond weight. These include eating behavior, biochemical indices, fitness, anthropometrics, nutrient and energy intake, body image, depression, anxiety, and disordered eating.

In addition, the use of a standardized definition of non-diet is warranted. The HAES principles written by members of the Association for Size Diversity and Health can serve as a consistent definition that can guide future non-diet research.⁷⁶ Skills training for these methods must stay true to the HAES message, which "acknowledges that good health can best be realized independent from considerations of size. It supports people—of all sizes—in addressing health directly by adopting healthy behaviors."⁷⁷

This systematic review provides evidence in support of non-diet approaches, but more research is needed in this area. Obtaining research funding is needed to continue building the science base for non-diet approaches. Practitioners and researchers must think outside the box when searching for potential grant opportunities. These opportunities may present themselves under the auspices of obesity prevention and treatment. Because the term *obesity prevention* is directly at odds with a weight-neutral approach, researchers aiming to evaluate the effectiveness of non-diet

interventions may struggle to obtain funding, further biasing the research.

Non-diet approaches that include HAES concepts provide a nontraditional paradigm of achieving behavior change through a focus on overall health. Traditional weight management paradigms have shown to be ineffective in the long term²⁻⁸ and psychologically damaging.^{7,12} This review highlights the psychological improvements often seen in non-diet interventions. Psychological distress may be a factor contributing to high metabolic risk,⁷⁸ and non-diet interventions may at least minimize the increased psychological stress associated with behavior change.

Non-diet approaches to health promotion provide an alternative means of influencing psychological, emotional, and physiological change while also affecting eating behavior. The results of this systematic review suggest that future research developing and evaluating standardized methods, assessment tools, and non-diet terminology is needed to strengthen the evidence base for practitioners implementing interventions aimed at enhancing the health and overall well-being of individuals and groups served.

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Erratum

The July/August 2014 abstract supplement issue of the *Journal of Nutrition Education and Behavior* carried an abstract (P57) titled Introductory Nutrition Concepts as Perceived by College Students and Professors

(JNEB 2014;46:S128-S129. <http://dx.doi.org/10.1016/j.jneb.2014.04.087>) that should have listed Lindsay Gulley as co-author. Another abstract (P95) titled Teacher and Administrator Perceptions of Nutrition Education

During Mealtime in Head Start Preschools (JNEB 2014;46:S144. <http://dx.doi.org/10.1016/j.jneb.2014.04.125>) should have listed Amanda Peterson as first author. The authors regret any inconvenience caused.

CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.