



A Review of Interventions that Promote Eating by Internal Cues

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ABSTRACT

Traditional diet programs that encourage individuals to consciously restrict their dietary intake have not only been ineffective in terms of weight outcomes, but have also been counterproductive, promoting psychological distress and unhealthy eating behaviors. Nondiet approaches shift the focus away from weight outcomes to the improvement of health outcomes and psychological well-being. One such approach, intuitive eating, promotes dietary intake based on internal cues of hunger and fullness, body acceptance, and making behavior choices based on health as well as enjoyment. Several studies have implemented such ideas into intervention programs. The purpose of our review was to examine the physical and psychological effects of these programs. Twenty interventions were identified. Overall, studies had positive results, demonstrating improvements in eating habits, lifestyle, and body image as measured by dietary restraint, restrictive dieting, physical activity, body satisfaction, and drive for thinness. Participants also experienced improved psychological health as measured by depression, ineffectiveness, anxiety, self-esteem, negative affect, and quality of life. Several improvements were sustained through follow-up periods as long as 2 years. Completion rates were as high as 92% in nondieting groups. In addition, improvements in eating behaviors and maintaining a nondiet approach, increased self-esteem, and decreased body dissatisfaction were sustained long-term. Overall, studies that encourage individuals to eat intuitively help participants abandon unhealthy weight control behaviors, improve metabolic fitness, increase body satisfaction, and improve psychological distress. Results from our review favor the promotion of programs that emphasize a nonrestrictive pattern of eating, body acceptance, and health rather than weight loss.

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DIETING AND THE PURSUIT FOR THINNESS IS entrenched in Western culture and leads to increasing numbers of programs that restrict dietary intake, promote maladaptive eating, and necessitate external food rules to induce weight loss. In addition, traditional diets that restrict energy, or particular nutrients, to induce weight loss have achieved little long-term success. These programs have high attrition rates; participants rarely maintain weight loss and sometimes gain back even more weight than they lost during the program.¹⁻⁵ In fact, there is evidence that frequency of dieting is directly associated with weight gain.⁶⁻⁹

In addition to being an ineffective means to weight loss, dieting is a well-established risk factor for unhealthy weight

control behaviors, binge eating and bulimic pathology, and eating disorders.^{7,10}

Physiologically, dieting or energy deprivation activates portions of the brain responsible for attention (anterior cingulate cortex) and reward (amygdala) of food.¹¹ Increasing the reward value of high-energy foods in the brain increases the likelihood of food intake and may result in binge eating. This may also explain why energy deprivation weight loss diets typically do not produce lasting weight loss. Frequency of dieting is also associated with negative psychological attributes such as body dissatisfaction, depression, lower self-esteem,^{12,13} and negative effect.¹⁴ Still, more than half of all adolescent girls and more than a quarter of adolescent boys report dieting⁷ with dieting reported in girls as young as 8 years old.¹⁵

Researchers are now raising attention to the serious ethical concern with recommending diets for weight loss due to long-term ineffectiveness and adverse effects.^{3,16} As a result, much attention has been brought to a health-centered nondiet approach, commonly referred to as intuitive eating.¹⁷ Researchers have identified four central features of intuitive eating: unconditional permission to eat, eating for physical rather than emotional reasons, reliance on internal hunger

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and satiety cues, and body–food choice congruence.^{17–19} Higher levels of intuitive eating are associated with a lower body mass index.^{18,20,21} As opposed to those identified as low intuitive eaters, high intuitive eaters have significantly higher high-density lipoprotein (HDL) cholesterol levels, but do not differ significantly in glucose, total cholesterol and low-density lipoprotein (LDL) cholesterol levels, or body fat.²⁰ In addition, there is a strong inverse relationship between intuitive eating and disordered eating attitudes, body dissatisfaction, pressure for thinness, thin-ideal internalization, and poor ability to respond to hunger and satiety in college-aged women.¹⁸ Intuitive eating is also associated with psychological well-being, as demonstrated by self-esteem, optimism, proactive coping, and overall life satisfaction.¹⁸

In a large cohort study of teens and young adults,²¹ those who report trusting their bodies to tell them how to eat were less likely to exhibit disordered eating habits and chronic dieting. In particular, two distinct components of intuitive eating—eating for physical rather than emotional reasons and reliance on internal hunger/satiety cues—uniquely contribute to psychological well-being and account for more variance in psychological measures than low eating disorder symptomology alone.²² This evidence supports the notion that intuitive eating is not simply a lack of eating disorder symptomology, but is a positive and adaptive eating style.

There are a number of interventions that implement intuitive eating and similar principles. In addition to intuitive eating,¹⁷ similar approaches have been termed Health at Every Size (HAES),^{23–26} nondiet,^{27,28} demand feeding,^{29,30} initial hunger meal pattern,³¹ mindful eating,^{32,33} natural eating,³⁴ and eating competence.³⁵ These approaches focus on reversing the fallouts from dieting while encouraging a healthy relationship with food and one's body. Studies that implement intuitive eating have been conducted for two decades, but have yet to be collectively evaluated.

METHODS

Inclusion Criteria

Studies that conducted an intervention that taught and encouraged participants to eat intuitively were included. Studies must have specified in the description of the intervention that participants were taught to recognize and follow internal cues of hunger, fullness, or satiety. Only studies with adults were included. Studies that involved participants with clinical eating disorders were excluded. All randomized controlled trials, quasi-experimental controlled trials, and prospective cohort studies were reviewed that had been published before December 2012. No date restrictions were enforced. Studies were not evaluated or eliminated based on methodologic quality because the purpose of our review was to conduct a preliminary evaluation of all intuitive eating programs. More specifically, we focused on dietary intake of program participants, health outcomes, long-term effects of program participation, and attrition rates. In addition, behavior change theories used as a theoretical framework in program development were identified.

Search Strategy

The databases Medline, Academic Search Complete, PsycInfo, and Cumulative Index to Nursing and Allied Health Literature were searched for this review. The search terms included

intuitive eating, mindful eating, nondiet, non-diet, Health at Every Size weight intervention, and attuned eating. The search produced 452 results. Abstracts were reviewed to determine relevance of these results and 28 potentially relevant studies were identified. Reference lists of these articles were also reviewed for further interventions, yielding 10 more articles.

RESULTS

Study Selection

Six studies were excluded because they included either adolescents³⁶ or populations with clinical eating disorders.^{37–41} Another six studies were excluded because although language was used such as “nondiet,” these studies did not specify the use of intuitive eating or referred only to dietary change that subtly implies dietary restraint.^{42–47} One study was a mindfulness program to be used alongside participants' own weight loss plans; that study included no instruction on intuitive eating and was eliminated.⁴⁸ Finally, one study was eliminated although researchers did train women to eliminate dieting and eat intuitively. That study was a laboratory experiment assessing immediate dietary intake following a preload to test restraint theory.⁴⁹ Thus, our review included 24 articles regarding 20 different studies (see the [Figure](#)).

Characteristics of Included Studies

Twenty peer-reviewed weight interventions were identified that encouraged participants to eat according to internal signals (see the [Table](#)). Most participants were white, overweight or obese women who struggled with dieting. Few studies implemented their intervention using behavior change theory, but most studies achieved positive outcomes.

Risk of Bias

Risk of publication bias should be noted in our review. Studies that encouraged intuitive eating that did not result in positive changes may have not been considered for peer-reviewed publication. Furthermore, only nine of the 20 studies were randomized, controlled trials.^{24,26,27,31,33,50–53} One was randomized, but did not include a control group.²⁸ One was quasi-experimental and nonrandomized, but included a control group.³⁰ The remaining nine prospective cohort studies did not include comparison groups.^{28,29,32,54–60} Results of all studies are discussed because the purpose of our review was to do a preliminary review of all evidence regarding intuitive eating.

Health Outcomes

One criticism of traditional dieting programs is that participants are instructed to focus on body weight. Conversely, intuitive eating discourages this focus and promotes body acceptance. Many studies still collected data regarding body weight for clinical purposes. In six studies, overweight or obese participants who learned to eat intuitively achieved significant decreases in weight or body mass index.^{24–26,31–33,56,59} In other studies, participants maintained their weight.^{23,27,28,30,51,52,57,61} In one study, normal weight participants were able to maintain body weight except those with high blood glucose levels, who lost

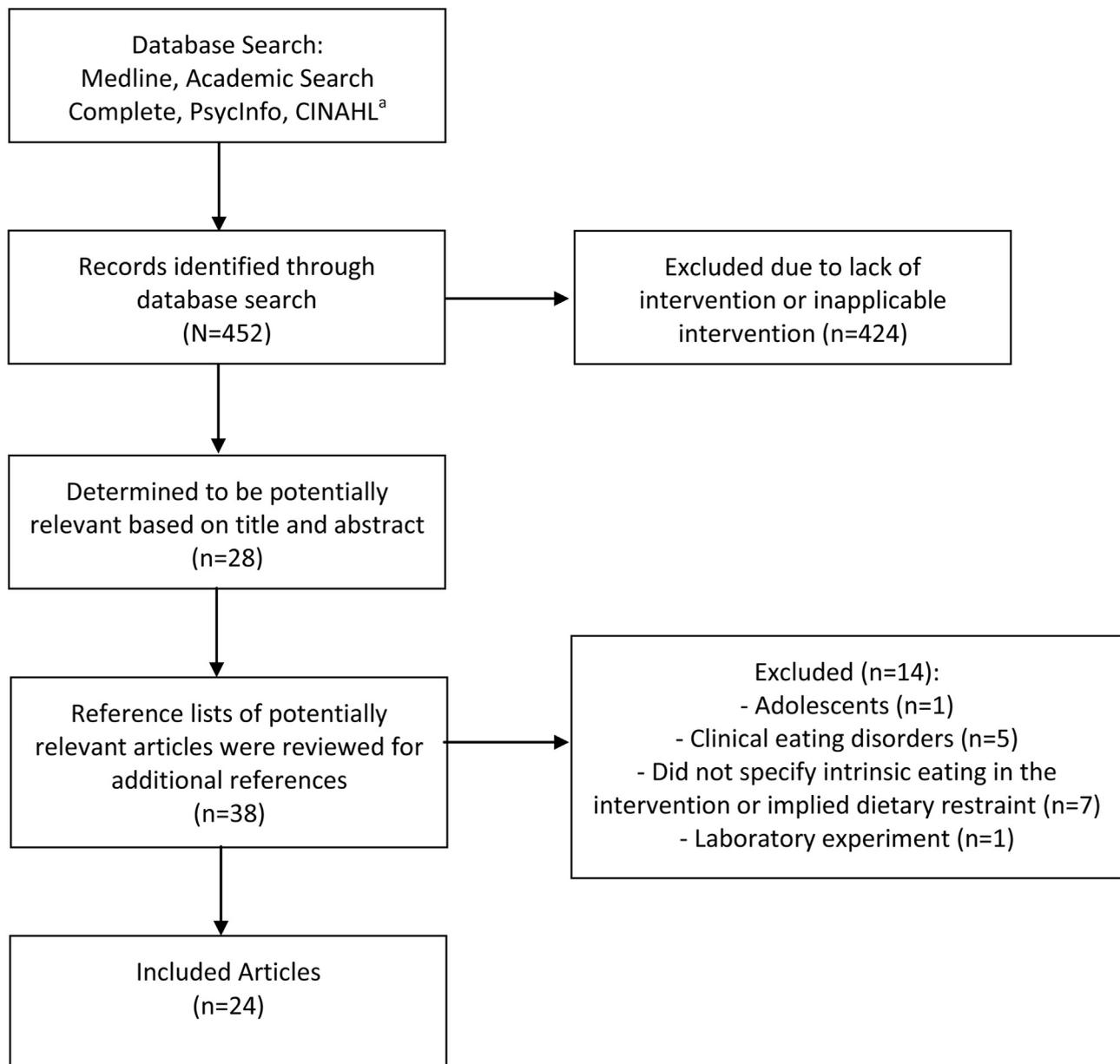


Figure. Flow diagram demonstrating selection of studies for systematic review of interventions that promote eating by internal cues. ^aCINAHL=Cumulative Index to Nursing and Allied Health Literature. NOTE: Information from this figure is available online at www.andjrn.org as part of a PowerPoint presentation.

weight.³¹ In another study, 59% of subjects lost or maintained weight, but at the 1-year follow-up, 41% had gained weight and 31% had lost weight.⁵⁴

Five studies assessed markers of cardiovascular risk, but findings were inconsistent. Despite a lack of weight loss, HAES participants in one study did significantly decrease total and LDL cholesterol, whereas the traditional diet group did not improve on either of these cholesterol measures at follow-up.²³ In another study, both the diet and nondiet groups improved blood pressure and blood lipid levels, but neither sustained change at follow-up.²⁷ Steinhardt and colleagues³⁰ did not observe a change in cholesterol in either the intuitive eating or the traditional weight control group. In yet another

study, although participants did significantly decrease weight, there were no changes observed in metabolic panel.³² The latter two studies had a 1-year and 3-month follow-up, respectively, whereas the former study followed participants for 2 years.²³ A longer period of time may be necessary to see changes in biomarkers of cardiovascular risk.

Carroll and colleagues⁵⁰ observed a significant increase in HDL cholesterol level, but no change in triglycerides level. They also saw an improvement in cardiorespiratory fitness as measured by peak oxygen uptake.⁵⁰ Despite these findings, there were no significant differences in the intervention compared with the control group in terms of symptoms of metabolic syndrome.⁵⁰ Several studies also assessed blood

Table. Description and results of interventions that encourage eating based on internal cues

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Bacon and colleagues, 2002 ²⁷ ; Bacon and colleagues, 2005 ²³	n=78 women	Participants were randomized to either 24 weekly sessions, 90 min each of either the Health at Every Size intervention or a traditional diet program, both followed by 6 mo aftercare group support sessions; 1-y follow-up conducted	<p>Health at Every Size</p> <ul style="list-style-type: none"> • Weight: no significant difference (101.1±13.3 kg to 101.5±16.3 kg) • BMI:^b no significant difference (35.9±4.6 to 36.0±5.4) • Total cholesterol: significantly decreased (4.61±0.80 mmol/L to 4.07±0.77 mmol/L)^c* • LDL:^d significantly decreased (3.01±0.83 mmol/L to 2.53±0.51 mmol/L)^c* • HDL:^e significantly decreased (1.29±0.29 mmol/L to 1.03±0.16 mmol/L)^c*** • Systolic blood pressure: significantly decreased (125.8±14.2 mm Hg to 119.5±11.7 mm Hg)* • Diastolic blood pressure: no significant difference (70.3±9.0 mm Hg to 68.3±8.0 mm Hg) • Cognitive restraint: significantly decreased (7.6±4.0 to 5.4±3.3)* • Disinhibition: significantly decreased (12.1±2.5 to 8.2±3.9)* • Susceptibility to perceptions of hunger: significantly decreased (8.4±2.9 to 6.1±4.0)*** • Drive for thinness: significantly decreased (7.1±6.1 to 2.6±3.6)** • Bulimia: significantly decreased (3.8±3.4 to 1.1±1.4)** • Body dissatisfaction: significantly decreased (17.9±4.5 to 11.9±6.6)** • Interoceptive awareness: significantly improved (4.6±4.5 to 2.4±3.1)* • Depression: significantly decreased (10.3±9.5 to 6.6±8.8)** • Self-esteem: significantly increased (30.9±3.8 to 33.7±4.5)** 	<p>Traditional diet program</p> <ul style="list-style-type: none"> • Weight: no significant difference (101.2±13.8 kg to 98.0±14.3 kg) • BMI: no significant difference (36.7±4.2 to 35.5±4.6) • Total cholesterol: no significant difference (4.50±0.74 mmol/L to 4.24±0.72 mmol/L) • LDL: no significant difference (2.99±0.95 mmol/L to 2.63±0.57 mmol/L) • HDL: significantly decreased (1.20±0.27 mmol/L to 1.01±0.25 mmol/L)** • Systolic blood pressure: significantly decreased (127.6±11.3 mm Hg to 121.3±16.9 mm Hg) • Diastolic blood pressure: no significant difference (73.2±8.0 mm Hg to 73.3±10.6 mm Hg) • Cognitive restraint: no significant difference (7.9±4.9 to 9.6±4.7) • Disinhibition: significantly decreased (12.2±2.1 to 10.3±3.1) • Susceptibility to perceptions of hunger: no significant difference (8.1±3.5 to 7.1±3.9)* • Drive for thinness: maintained (4.6±4.6 to 3.7±3.2) • Bulimia: no significant difference (4.6±4.0 to 2.7±3.7) • Body dissatisfaction: no significant difference (17.5±5.9 to 16.8±8.0) • Interoceptive awareness: no significant difference (3.5±4.3 to 2.3±3.2) • Depression: no significant change (7.5±7.2 to 6.6±5.6) • Self-esteem: significantly decreased (31.2±5.5 to 29.1±5.8)*

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Carrier and colleagues, 1994 ²⁹	n=79 (61 female; 18 men)	Twenty class sessions over 6 mo, 45 min each of the Eat for Long-term Change, Image of Self, Fun, Enjoyment of Eating program; 3-y follow-up	<ul style="list-style-type: none"> • Body image avoidance: significantly decreased (38.9±11.2 to 30.3±10.0)** • Results for ineffectiveness, interpersonal distrust, maturity fears, and perfectionism did not change (numeric results not reported) 	<ul style="list-style-type: none"> • Body image avoidance: no significant change (38.3±8.1 to 34.2±6.5) • Results for ineffectiveness, interpersonal distrust, maturity fears, and perfectionism did not change (numeric results not reported)
Carroll and colleagues, 2007 ⁵⁰	n=31 women	Twelve weeks of the Weight, Healthy Eating, and Exercise in Leeds intervention was delivered within a Health at Every Size framework; no follow-up	Eat for Eat for Long-term Change, Image of Self, Fun, Enjoyment of Eating ^f <ul style="list-style-type: none"> • Dieting behavior: frequency significantly decreased (6.29 to 2.86)*** • Self-acceptance: significantly increased (2.04 to 2.23)* • Self-esteem: significantly increased (3.09 to 3.49)*** • Physical activity: significantly increased (235 kcal/kg/wk to 239 kcal/kg/wk)* 	N/A ^g
			Weight, Healthy Eating, and Exercise in Leeds <ul style="list-style-type: none"> • Weight no significant change (110.7±16.3 kg to 108.8±18.3 kg) • BMI: no significant change (41.7±6.7 to 41.1±7.6) • VO₂^h: significantly increased (2,253±322 L/min to 2,381±382 L/min)** • VO₂: significantly increased (20.64±3.40 mL/kg/min to 22.3±3.70 mL/kg/min)* • Fasting glucose: no significant change (5.55±0.70 mmol/L to 5.71±0.79 mmol/Lⁱ) • HDL: significantly increased (1.08±0.15 mmol/L to 1.30±0.25 mmol/L)*** • Triglycerides: no significant change (1.80±0.84 mmol/L to 1.80±0.69 mmol/L^j) • Systolic blood pressure: no significant change (137.0±18.9 mm Hg to 134.2±17.3 mm Hg) • Diastolic blood pressure: significantly decreased (89.0±9.7 mm Hg to 84.0±11.5 mm Hg)* 	Control group <ul style="list-style-type: none"> • Weight: no significant change (102.4±26.3 kg to 104.6±24.1 kg) • BMI: no significant change (38.8±9.5 to 40.1±8.7) • VO₂: no significant change (2,157±321 L/min to 2,093±322 L/min) • VO₂: no significant change (21.69±3.5 mL/kg/min to 20.5±3.2 mL/kg/min) • Fasting glucose: no significant change (5.98±2.5 mmol/L to 5.88±0.93 mmol/Lⁱ) • HDL: significantly increased (1.35±0.34 mmol/L to 1.54±0.35 mmol/L)*** • Triglycerides: no significant change (1.72±0.81 mmol/L to 1.91±0.49 mmol/L^j) • Systolic blood pressure: no significant change (139.2±17.9 mm Hg to 136.6±19.2 mm Hg) • Diastolic blood pressure: significantly decreased (87.8±11.2 mm Hg to 85.0±8.3 mm Hg)*

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Ciampolini and colleagues, 2010 ³¹	n=181 (79 women; 70 men)	Training of the Initial Hunger Meal Pattern over two instructional visits and a variable number of telephone calls over 7 wk; 3-mo follow-up	<p>Trained group^k</p> <ul style="list-style-type: none"> • General well-being: significantly increased (51.9±21.8 to 61.3±21.2; <i>P</i> value not reported) • Body image dissatisfaction: no significant change (3.5±1.0 to 3.5±1.2) • Perceived stress: no significant difference (27.9±10.6 to 26.8±7.3) • Premeal blood glucose: significantly decreased (86.8±8.7 mg/dL to 78.8±6.8 mg/dL)^{i***} • Vegetable intake: significantly increased (274±166 g/d to 449±218 g/d)^{***} • Fruit intake: no significant change (221±122 g/d to 266±174 g/d) • Energy intake: significantly decreased (1,756±585 kcal/d to 1,069±487 kcal/d)^{***} • BMI: significantly decreased (28.7±3.5 to 26.5±3.5)^{***} • Weight: no significant difference (78.0±10.2 kg to 72.2±10.1 kg)^{***} • Arm skinfold thickness: significantly decreased (25.8±9.2 mm to 19.9±7.7 mm)^{***} • Leg skinfold thickness: significantly decreased (32.1±12.6 mm to 25.1±10.2 mm)^{***} • Outdoor and gym hours: no significant change (3.2±3.2 h/d to 3.7±3.1 h/d) • Systolic blood pressure: significantly decreased (125.4±14.0 mm Hg to 112.2±15.3 mm Hg)^{***} • Diastolic blood pressure: significantly decreased (76.3±9.8 mm Hg to 68.6±9.5 mm Hg)[*] 	<p>Control group^k</p> <ul style="list-style-type: none"> • General well-being: no significant change (51.1±12.3 to 49.0±13.7; <i>P</i> value not reported) • Body image dissatisfaction: significantly increased (3.62±0.9 to 3.9±0.8) • Perceived stress: no significant difference (32.7±7.2 to 30.3±5.9) • Premeal blood glucose: significantly increased (85.7±9.0 mg/dL to 89.3±8.2 mg/dL)^{i**} • Vegetable intake: significantly increased (246±188 g/d to 427±263 g/d)^{**} • Fruit intake: no significant change (193±155 g/d to 173±160 g/d) • Energy intake: significantly decreased (1,728±551 kcal/d to 1,310±532 kcal/d)^{**} • BMI: significantly decreased (29.1±5.6 to 28.2±5.6)[*] • Weight: significantly decreased (76.1±16.6 kg to 73.8±16.2 kg)[*] • Arm skinfold thickness: significantly decreased (25.4±10.0 mm to 21.0±7.6 mm)^{**} • Leg skinfold thickness: significantly decreased (34.5±13.0 mm to 29.7±10.7 mm)^{**} • Outdoor and gym hours: no significant change (3.6±3.5 h/d to 3.0±3.0 h/d) • Systolic blood pressure: significantly decreased (123.8±18.7 mm Hg to 116.2±8.7 mm Hg)[*] • Diastolic blood pressure: no significant difference (73.8±8.7 mm Hg to 70.4±11.4 mm Hg)
Ciliska, 1998 ⁵¹	n=78 women	Twelve educational sessions once a week, 1 h each; no follow-up	<p>Psychoeducation</p> <ul style="list-style-type: none"> • Self-esteem: significantly increased (28.1±6.8 to 32.4±5.6)^{***} • Feelings of inadequacy: significantly decreased (57.5±16 to 49.3±14.9) 	<p>Control group</p> <ul style="list-style-type: none"> • Self-esteem: no significant change (26.4±26.7±5.9) • Feelings of inadequacy: no significant change (65.2±18 to 64.4±15.1)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Body dissatisfaction: significantly decreased (21.3±5.8 to 17±7) • Restraint scale: significantly decreased (23.9±3.8 to 18.3±3.4)** • Restraint, disinhibition, and susceptibility to hunger: significantly decreased (30.5±5.6 to 22.2±7) • Diastolic blood pressure: significantly decreased (79 mm Hg to 76 mm Hg)^f • Weight: no significant change (numeric results not reported) • Depression: significantly decreased (numeric results not reported)* • Social adjustment: significantly improved (numeric results not reported)* • Bulimia scores: significantly decreased (numeric results not reported)*** • Drive for thinness scores: significantly decreased (numeric results and <i>P</i> value not reported) 	<ul style="list-style-type: none"> • Body dissatisfaction: no significant change (21±5.8 to 19.3±7) • Restraint scale: no significant change (24±4.5 to 23±5.1) • Restraint, disinhibition, and susceptibility to hunger: no significant change (32±5.4 to 29.8±6.5) • Diastolic blood pressure: no significant change (numeric results not reported) • Weight: no significant change (numeric results not reported) • Depression: no significant change (numeric results not reported) • Social adjustment: no significant change (numeric results not reported) • Bulimia scores: no significant change (numeric results not reported) • Drive for thinness: no significant change (numeric results not reported)
			<p>Education</p> <ul style="list-style-type: none"> • Self-esteem: no significant change (25.5±5.4 to 28±5.5) • Feelings of inadequacy: no significant change (62.2±13.4 to 57.4±13.6) • Body dissatisfaction: no significant change (23.5±3.9 to 19.5±6.6) • Restraint scale: no significant change (26.6±3.8 to 20.8±3.5) • Restraint, disinhibition, and susceptibility to hunger: no significant change (31.5±3.9 to 25±7.1) • Diastolic blood pressure: no significant change (numeric results not reported) 	

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Weight: no significant change (numeric results not reported) • Depression: no significant change (numeric results not reported) • Social adjustment: no significant change (numeric results not reported) • Bulimia scores: significantly decreased (numeric results not reported)^{***} • Drive for thinness scores: significantly decreased (numeric results and <i>P</i> value not reported) 	
Cole and Horacek, 2010 ⁵²	n=61 women	Ten My Body Knows When sessions, once a week; 6-mo follow-up	My Body Knows When <ul style="list-style-type: none"> • Diet mentality: significantly decreased (83.1±10.7 to 73.5±21.7)* 	Control group <ul style="list-style-type: none"> • Diet mentality: change significance not reported (80.9±8.5 to 96.2±41.1)
Dalen and colleagues, 2010 ³²	n=10 (7 women; 3 men)	Six weekly sessions, 2 h each of the Mindful Eating and Living intervention; 12-wk follow-up	Mindful Eating and Living <ul style="list-style-type: none"> • Restraint: significantly increased (8.8±6.1 to 13.8±6.2)* • Disinhibition: significantly decreased (9.5±4.6 to 4.5±2.5)* • Susceptibility to hunger: no significant change (7.6±3.9 to 4.6±3.5)* • Binge eating: significantly decreased (16.2±5.4 to 7.2±2.3) • Depression: significantly decreased (12.5±9.6 to 7.8±5.5)* • Anxiety: no significant change (13.4±12.1 to 10.0±10.7) • Perceived stress: significantly decreased (18.0±7.6 to 13.9±7.8)* • Physical symptoms: significantly decreased (15.0±6.3 to 9.3±8.7)** • Negative affect: significantly decreased (23.9±8.9 to 17.8±8.7)* 	N/A

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Positive affect: no significant change (32.8±6.1 to 35.7±6.5) • Weight: significantly decreased (101 kg to 97 kg)^{f**} • BMI: significantly decreased (37 to 35.7)^{f**} • C-reactive protein significantly decreased (0.30 mg/dL to 0.24 mg/dL)^{f*} • Glucose: no significant change (numeric results not reported) • Adiponectin: no significant change (numeric results not reported) • LDL: no significant change (numeric results not reported) • Plasminogen activator inhibitor-1: no significant change (numeric results not reported) 	
Gagnon-Girouard and colleagues, 2010 ²⁴	n=144 women	Four months of the Health at Every Size intervention; 1-y follow-up	<p>Health at Every Size</p> <ul style="list-style-type: none"> • Weight: significantly decreased (78.84±1.34 kg to 77.45±1.34 kg)^{**} • Depression: significantly decreased (9.39±1.05 to 7.48±1.05)[*] • Self-esteem: significantly increased (28.63±0.80 to 30.56±0.80)^{***} • Quality of life: significantly increased (76.21±1.80 to 80.82±1.80)^{***} • Binge eating: significantly decreased (13.70±1.01 to 10.40±1.04)^{***} • Body satisfaction (appearance): significantly increased (1.31±0.09 to 1.73±0.09)^{***} • Body satisfaction (weight): significantly increased (0.87±0.08 to 1.27±0.08)^{***} 	<p>Social support only group</p> <ul style="list-style-type: none"> • Weight: no significant change (81.03±1.39 kg to 80.39±1.40 kg) • Depression: significantly decreased (8.69±1.08 to 8.61±1.08)^{**} • Self-esteem: significantly increased (29.27±0.83 to 30.51±0.83)[*] • Quality of life: significantly increased (78.15±1.87 to 79.92±1.87)[*] • Binge eating: significantly decreased (12.75±1.04 to 10.79±1.04)^{**} • Body satisfaction (appearance): significantly increased (1.34±0.09 to 1.53±0.09)^{***} • Body satisfaction (weight): significantly increased (0.82±0.09 to 1.02±0.09)^{***}

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
				Wait list group <ul style="list-style-type: none"> • Weight: no significant change (80.77±1.37 kg to 80.59±1.37 kg) • Depression: no significant change (9.41±1.06 to 7.96±1.07) • Self-esteem: significantly increased (28.58±0.81 to 29.67±0.82)* • Quality of life: significantly increased (76.56±1.84 to 79.36±1.84)*** • Binge eating: no significant change (12.99±1.03 to 11.79±1.03) • Body appearance: satisfaction significantly increased (1.45±0.09 to 1.62±0.09)** • Body weight satisfaction: significantly increased (0.96±0.08 to 1.14±0.08)**
Higgins and Gray, 1998 ⁵⁴	n=82 women	The Free From Dieting program was delivered over six 2-h sessions and a review meeting 2 wk later; 12-mo follow-up	Free From Dieting <ul style="list-style-type: none"> • Restrained eating: significantly decreased (3.28±0.53 to 2.45±0.71)** • Emotional eating: significantly decreased (3.83±0.91 to 2.72±0.92)** • External eating: significantly decreased (3.65±0.55 to 2.94±0.56)* • Body shape concern: no significant change (131.91±23.66 to 88.07±29.00) • Trait self-esteem: significantly increased (59.79±16.76 to 73.27±15.23)*** 	N/A ^m
Jackson, 2008 ⁵⁵	n=36 women	Thirteen weekly sessions of the course Eating Order, 2 h each; no follow-up	Eating Order <ul style="list-style-type: none"> • Eating disturbance: significantly decreased (19.3±6.1 to 5.1±5.4)*** • Problems with self-esteem: significantly decreased (43.2±18.8 to 29.0±15.0)*** • Restrained eating: significantly decreased (23.3±4.2 to 17.3±5.4)*** • Satisfaction with body and self-attributes: significantly increased (315.4±39.2 to 368.4±36.5)*** 	N/A

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Katzer and colleagues, 2009 ²⁸ ; Hawley and colleagues, 2008 ⁶⁴	n=225 women	Ten-week nondieting interventions were delivered in 3 forms: a group-based program with relaxation training (P1), a group-based program without relaxation training (P2), and a mail-delivered self-directed version of the first program (P3); 2-y follow-up	<p>Relaxation Group (P1)ⁿ</p> <ul style="list-style-type: none"> • Diet quality score: significantly increased by $1.7 \pm 2.8^*$; baseline: 10.9 ± 2.9 • Stress management behaviors: significantly increased by $0.50 \pm 0.61^{***}$; baseline: 2.1 ± 0.4 • Eating self-efficacy significantly: improved by $11.1 \pm 31.5^{**}$; baseline: 101.1 ± 30.0 • Perceived psychological distress: significantly decreased by $0.15 \pm 0.28^{***}$; baseline: 0.50 ± 0.36 • Depression symptoms: significantly decreased by $0.24 \pm 0.52^{**}$; baseline: 0.75 ± 0.62 • Frequency of medical symptoms: significantly decreased by $5.7 \pm 10.3^{***}$; baseline: 21.4 ± 14.4 • Discomfort from medical symptoms: significantly decreased by $9.5 \pm 20.0^{***}$; baseline: 26.2 ± 17.4 • Interference of medical symptoms: significantly decreased by $7.2 \pm 19.6^{**}$; baseline: 21.6 ± 20.1 • Body weight: no significant change (mean change: -1.8 ± 6.2 kg; baseline: 95.5 ± 15.7 kg) • Systolic blood pressure: significantly decreased by 3.5 ± 10.4 mm Hg^{**}; baseline: 133.2 ± 14.3 mm Hg • Diastolic blood pressure: significantly decreased by 6.3 ± 8.8 mm Hg^{**}; baseline 84.5 ± 9.7 mm Hg <p>Nonrelaxation group (P2)ⁿ</p> <ul style="list-style-type: none"> • Diet quality score: significantly increased by $2.4 \pm 3.5^{***}$ baseline: 11.0 ± 2.9 • Stress management behaviors: significantly increased by $0.18 \pm 0.41^{**}$ baseline: 2.2 ± 0.4 	N/A

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Eating self-efficacy: no significant change (mean change: -1.6 ± 38.0; baseline: 103.5 ± 30.9) • Perceived psychological distress: significantly decreased by $0.12 \pm 0.37^*$; baseline: 0.56 ± 0.44 • Depression symptoms: no significant change (mean change: -0.08 ± 0.50; baseline: 0.76 ± 0.65) • Frequency of medical symptoms: no significant change (mean change: 0.6 ± 13.7; baseline: 26.9 ± 19.3) • Discomfort from medical symptoms: no significant change (mean change: -3.0 ± 5.1; baseline: 34.9 ± 22.4) • Interference of medical symptoms: no significant change (mean change: -4.7 ± 14.0; baseline: 30.0 ± 23.4) • Body weight: no significant change (mean change: -0.4 ± 5.8 kg; baseline: 93.2 ± 14.7 kg) • Systolic blood pressure: significantly decreased by 9.3 ± 15.0 mm Hg^{**}; baseline: 136.0 ± 17.9 mm Hg • Diastolic blood pressure: significantly decreased by 5.4 ± 10.1 mm Hg[*]; baseline: 83.6 ± 11.2 mm Hg 	
			<p>Self-directed group (P3)ⁿ</p> <ul style="list-style-type: none"> • Diet quality score: significantly increased by $1.3 \pm 3.1^{***}$; baseline: 11.1 ± 2.7 • Stress management behaviors: significantly increased by $0.30 \pm 0.55^{***}$; baseline: 2.3 ± 0.5 • Eating self-efficacy: significantly improved by $12.9 \pm 36.4^{**}$; baseline: 98.9 ± 28.8 • Perceived psychological distress: no significant change (mean change: -0.05 ± 0.21; baseline: 0.41 ± 0.30) 	

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Depression symptoms: no significant change (mean change: -0.03 ± 0.40; baseline: 0.53 ± 0.46) • Frequency of medical symptoms: no significant change (mean change: -0.9 ± 9.8; baseline: 19.9 ± 12.6) • Discomfort from medical symptoms: no significant change (mean change: -1.1 ± 12.2; baseline: 24.8 ± 18.0) • Interference of medical symptoms: no significant change (mean change: -0.4 ± 5.8; baseline: 20.4 ± 17.2) • Body weight: no significant change (mean change: -2.0 ± 8.6 kg; baseline: 93.9 ± 17.3 kg) • Systolic blood pressure: significantly decreased by 5.7 ± 12.7 mm Hg^{**}; baseline: 134.0 ± 17.5 mm Hg) • Diastolic blood pressure: significantly decreased by 4.6 ± 10.1 mm Hg^{**}; baseline: 84.3 ± 10.4 mm Hg) 	
Mellin and colleagues, 1997 ⁵⁶	n=22 (21 women; 1 man)	Twelve weekly sessions of The Solution Method with the option of completing the program twice; 2-y follow-up	The Solution Method ^b <ul style="list-style-type: none"> • Weight significantly decreased by 7.9 kg (95% CI -12.5 to -3.3)^{**}; baseline: 93.0 ± 18.8 kg • Systolic blood pressure: significantly decreased by 13.8 mm Hg (95% CI -22.9 to 4.7)[*]; baseline: 134.8 ± 4.2 mm Hg • Diastolic blood pressure: significantly decreased by 15.1 mm Hg (95% CI -21.8 to -8.4)^{***}; baseline 93.3 ± 10.5 mm Hg • Exercise significantly increased by 189.1 min/wk (95% CI 109.5 to 269.7)^{***}; baseline: 103.4 ± 134.0 min/wk • Depression: no significant change; mean change: -2.6 (95% CI -6.2 to 1.0); baseline: 6.4 ± 4.6 	N/A

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Polivy and Hermann, 1992 ⁵⁷	n=18 women	Ten weekly sessions of The Undieting Program, 2 h each	The Undieting Program ^o <ul style="list-style-type: none"> • Drive for thinness: significantly decreased (12.56±5.37 to 7.27±5.30)^{***} • Body dissatisfaction: no significant change (22.06±5.93 to 21.67±4.94) • Bulimia: significantly decreased (8.06±5.43 to 4.67±5.09)^{**} • Interoceptive awareness: significantly improved (8.06±6.26 to 4.13±4.05)^{**} • Ineffectiveness: significantly improved (7.11±6.44 to 3.60±4.85)[*] • Perfectionism: no significant change (6.56±4.85 to 6.40±4.14) • Interpersonal distrust: no significant change (2.00±2.22 to 2.13±2.88) • Maturity fears: no significant change (3.22±4.15 to 2.60±2.85) • Restrained eating: significantly decreased (25.28±3.06 to 19.87±4.41)^{**} • Depression: significantly decreased (14.67±11.82 to 6.50±6.20)^{**} • Self-esteem: significantly increased (77.28±24.18 to 89.00±22.69)^{**} • State self-esteem: significantly increased (57.61±15.41 to 78.54±18.30)^{***} • Weight: no significant change (228.67±41.82 lb to 241.14±48.56 lb) 	N/A
Omichinski and Harrison, 1995 ⁵⁸	n=208 (196 women; 12 men)	Ten weekly sessions of the HUGS nondiet lifestyle program, 1½ to 2 h each	HUGS ^f <ul style="list-style-type: none"> • Self-acceptance: significantly increased (28.1 to 40.2)^{***} • Self-nourishment: significantly increased (20.8 to 30.3)^{***} • Overall nondiet lifestyle: significantly increased (48.9 to 70.3)^{***} 	N/A

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Provencher and colleagues, 2007 ²⁶ ; Provencher and colleagues, 2009 ⁶¹ ; LeBlanc and colleagues, 2012 ²⁵	n=144 women	Fourteen weekly sessions of the Health at Every Size intervention; 1-y follow-up ^{pq}	Health at Every Size <ul style="list-style-type: none"> • BMI: no significant change • Cognitive restraint no significant change • Disinhibition significantly decreased^{***} • Susceptibility to hunger significantly decreased* • LDL: no significant change • HDL: no significant change • Triglycerides: no significant change • Diastolic blood pressure: no significant change • Systolic blood pressure: no significant change • Energy intake: no significant change (2,013±513 kcal to 1,998±474 kcal) • Percent of energy from fat: no significant change (34.5±5.5 to 34.8±7.1) • Percent of energy from carbohydrate: no significant change (47.3±5.4 to 46.2±7.0) • Percent of protein from protein: no significant change (17.5±3.5 to 17.7±3.3) • Percent of energy from alcohol: no significant change (3.0±2.7 to 3.9±3.5) • Fiber: no significant change (21.6±8.2 g to 22.6±8.8 g) • Sodium: no significant change (2,977±1,077 mg to 2,824±574 mg) • Calcium: no significant change (921±399 mg to 968±359 mg) • Meal frequency per day: no significant change (2.9±0.3 to 3.0±0.3) • Snack frequency per day: no significant change (2.8±2.0 to 2.2±1.6) • Percent energy from breakfast: no significant change (19.5±6.8 to 21.3±7.0) • Percent energy from snacks: no significant change (18.4±13.9 to 14.9±10.6) 	Social support only group <ul style="list-style-type: none"> • BMI: no significant change • Cognitive restraint: no significant change • Disinhibition: significantly decreased^{***} • Susceptibility to hunger: significantly decreased* • LDL: no significant change • HDL: no significant change • Triglycerides: no significant change • Diastolic blood: pressure no significant change • Systolic blood: pressure no significant change • Energy intake: no significant change (2,029±394 kcal to 1,976±365 kcal) • Percent of energy from fat: no significant change (33.5±4.5 to 35.4±4.7) • Percent of energy from carbohydrate: no significant change (47.6±5.0 to 47.0±7.6) • Percent of protein from protein: no significant change (17.3±3.2 to 16.6±3.4) • Percent of energy from alcohol: no significant change (3.8±4.3 to 3.3±4.5) • Fiber: no significant change (20.6±6.7 g to 21.3±7.8 g) • Sodium: no significant change (3,121±885 mg to 3,120±699 mg) • Calcium: no significant change (897±289 mg to 917±307 mg) • Meal frequency per day: no significant change (2.9±0.2 to 2.9±0.2) • Snack frequency per day: no significant change (2.2±1.2 to 1.8±1.1) • Percent energy from breakfast: no significant change (19.6±7.5 to 22.3±5.7) • Percent energy from snacks: no significant change (15.0±8.7 to 13.4±9.1)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Percent energy after 5:00 PM: no significant change (41.4±10.3 to 40.3±9.0) • Percent energy from snacks after 5:00 PM: no significant change (8.4±7.8 to 7.1±7.3) 	<ul style="list-style-type: none"> • Percent energy after 5:00 PM: no significant change (42.2±9.9 to 42.1±10.0) • Percent energy from snacks: after 5:00 PM no significant change (6.5±5.5 to 5.9±6.0) <p>Control group</p> <ul style="list-style-type: none"> • Energy intake: no significant change (2,006±399 kcal to 1,830±467 kcal) • Percent of energy from: fat no significant change (34.5±5.1 to 34.0±4.8) • Percent of energy from carbohydrate: no significant change (46.8±5.8 to 47.5±5.9) • Percent of protein from protein: no significant change (17.7±3.5 to 18.9±4.7) • Percent of energy from alcohol: no significant change (3.0±3.0 to 2.0±2.5) • Fiber: no significant change (19.9±4.8 g to 20.4±6.5 g) • Sodium: no significant change (3,052±851 mg to 2,872±914 mg) • Calcium: no significant change (860±318 to mg to 792±280 mg) • Meal frequency: no significant change (2.9±0.2 to 2.9±0.2) • Snack frequency: no significant change (2.1±1.7 to 1.7±1.3) • Percent energy from breakfast: no significant change (21.0±6.7 to 22.1±6.9) • Percent energy from snacks: no significant change (14.5±11.3 to 13.3±11.0) • Percent energy after 5:00 PM: no significant change (44.3±9.5 to 43.6±8.2) • Percent energy from snacks after 5:00 PM: no significant change (7.9±8.7 to 6.8±7.6) <p style="text-align: right;"><i>(continued on next page)</i></p>

Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Roughan and colleagues, 1990 ⁵⁹	n=87 women	Ten weekly sessions, 2 h each; 2-y follow-up	Intervention ^f <ul style="list-style-type: none"> • Weight: significantly decreased (87.6 kg to 84.5 kg)** • BMI: significantly decreased (31.7 to 30.7)* • Mastery: no significant change (2.44 to 2.55) • Assertion: significantly improved (−10.45 to −2.63)** • Disordered eating attitudes: significantly decreased (21.7 to 16.2)*** • Satisfaction with body: significantly increased (134.1 to 146.3)*** • Satisfaction with self: significantly increased (165.1 to 184.0)*** • Depression significantly: decreased (13.1 to 9.16)*** • Self-esteem significantly increased (3.64 to 4.64)*** 	N/A
Smith and colleagues, 2006 ⁶⁰	n=25 (20 women; 5 men)	Eight weekly sessions of a mindfulness-based stress reduction course	Mindfulness-Based Stress Reduction <ul style="list-style-type: none"> • Binge eating significantly: decreased (10.12±9.60 to 7.12±7.12)** • State anxiety: significantly decreased (37.72±9.03 to 32.20±9.99)* • Depressive symptoms significantly decreased (11.64±7.49 to 4.32±4.76)** • Mindful awareness and attention: significantly increased (3.70±0.85 to 4.23±0.76)** • Self-acceptance: significantly increased (4.46±1.12 to 5.00±0.96)** 	N/A
Steinhardt and colleagues, 1999 ³⁰	n=357 (180 women; 177 men)	Ten weeks of the Diet Free Forever program; 1-y follow-up	Diet Free Forever Program <ul style="list-style-type: none"> • Restrained eating (Restrained Eating Scale): significantly decreased for women only (men: 18.2±4.7 to 18.1±3.9; women: 19.1±4.9 to 16.9±3.9***) 	Traditional weight control program <ul style="list-style-type: none"> • Restrained eating (Restrained Eating Scale): no significant change (men: 15.9±4.3 to 16.9±3.8; women: 18.7±4.3 to 18.8±3.6)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Restrained eating (Dutch Eating Behavior Questionnaire): significantly decreased in overall group (men: 29.9±5.5 to 30.0±6.7; women: 29.0±25.1±6.6)^{***} • Emotional eating: no significant change (men: 33.9±31.4±13.2; women: 43.4±13.1 to 38.3±10.2) • External eating: no significant change (men: 32.5±4.7 to 31.0±4.6; women: 34.8±6.0 to 31.6±5.2) • Body preoccupation: significantly decreased in overall group (men: 23.5±5.6 to 20.1±5.1; women: 27.4±5.6 to 23.7±6.2)^{***} • Physical self-esteem: significantly increased in overall group (men: 34.9±6.6 to 39.5±7.3; women: 29.9±7.3 to 34.3±7.9)^{***} • Body weight: no significant change (men: 210±13 lb to 210±32 lb; women: 176±34 lb to 178±35 lb) • Systolic blood pressure: no significant change (men: 127±12 mm Hg to 126±15 mm Hg; women: 120±13 mm Hg to 118±14 mm Hg) • Diastolic blood pressure no significant change (84±10 mm Hg to 81±10 mm Hg; women: 78±8 mm Hg to 71±8 mm Hg) • Total cholesterol no significant change (men: 201±31 mg/dL to 213±37 mg/dL; women: 197±43 mg/dL to 204±44 mg/dL) 	<ul style="list-style-type: none"> • Restrained eating (Dutch Eating Behavior Questionnaire): significantly increased in overall group (men: 27.2±5.8 to 29.3±5.0; women: 30.0±5.6 to 32.1±5.5)^{***} • Emotional eating: no significant change (men: 29.2±9.4 to 26.7±11.6; women: 38.7±12.1 to 31.3±4.8) • External eating: no significant change (men: 31.7±4.3 to 30.5±4.1; women: 33.6±5.6 to 31.3±4.8) • Body preoccupation: significantly decreased in overall group (men: 22.8±4.8 to 20.3±4.8; women: 27.4±5.7 to 24.8±6.4)^{***} • Physical self-esteem: significantly increased in overall group (men: 35.8±6.0 to 38.9±7.3; women: 31.5±6.4 to 36.2±7.9)^{***} • Body weight: no significant change (men: 210±41 lb to 206±41 lb; women: 159±28 lb to 158±22 lb) • Systolic blood pressure no significant change (123±12 mm Hg to 124±13 mm Hg; women: 115±13 mm Hg to 114±12 mm Hg) • Diastolic blood pressure no significant change (men: 82±9 mm Hg to 75±11 mm Hg; women: 73±10 mm Hg to 69±9 mm Hg) • Total cholesterol: no significant change (men: 211±35 mg/dL to 216±29 mg/dL; women: 188±33 mg/dL to 199±31 mg/dL)
				<p>Nonvolunteer control group</p> <ul style="list-style-type: none"> • Restrained eating (Restrained Eating Scale): significantly increased in overall group (men: 13.8±3.7 to 15.6±3.8[*]; women: 13.8±3.7 to 15.6±3.8^{**})

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
				<ul style="list-style-type: none"> • Restrained eating (Dutch Eating Behavior Questionnaire): significantly increased in overall group (men: 25.9±7.4 to 27.6±6.7; women: 28.0±6.7 to 29.2±6.7)* • Emotional eating: no significant change (27.1±10.4 to 26.4±8.4; women: 30.2±11.7 to 27.3±9.7) • External eating: no significant change (men: 30.7±4.9 to 29.8±4.6; women: 30.6±4.6 to 30.3±4.9) • Body preoccupation: no significant change (men: 18.8±4.3 to 18.4±4.0; women: 21.1±5.2 to 20.6±6.0) • Physical self-esteem: no significant change (men: 39.5±5.8 to 39.9±5.5; women: 37.2±6.4 to 38.6±7.8) • Body weight: no significant change (men: 194±46 lb to 192±38 lb; women: 148±33 lb to 152±36 lb) • Systolic blood pressure: no significant change (men: 127±14 mm Hg to 126±16 mm Hg; women: 116±11 mm Hg to 114±10 mm Hg) • Diastolic blood pressure: no significant change (men: 79±9 mm Hg to 78±9 mm Hg; women: 73±9 mm Hg to 67±12 mm Hg) • Total cholesterol: no significant change (men: 204±49 mg/dL to 209±39 mg/dL; women: 200±32 mg/dL to 210±34 mg/dL) <p>Control group</p> <ul style="list-style-type: none"> • Restrained eating (Restrained Eating Scale): no significant change (men: 13.4±5.4 to 12.8±4.7; women: 17.2±5.1 to 18.0±5.7) • Restrained eating (Dutch Eating Behavior Questionnaire): no significant change (men: 25.6±7.6 to 25.7±6.8; women: 30.2±6.7 to 31.8±5.8)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
Tanco and colleagues, 1997 ⁵³	n=50 women	Eight weekly sessions of cognitive therapy, 2 h each; 6-mo follow-up ^f	<p>Cognitive Treatment Program</p> <ul style="list-style-type: none"> • Proportion exercising regularly: no significant difference (0.42 vs 0.58)** • Weight: significantly decreased (111.2±15.7 kg to 106.3±13.5 kg)* • BMI: significantly decreased (39.2±5.2 to 37.5±4.9)* • Depression: significantly decreased (15.2±10.6 to 8.0±6.8)* • State anxiety: significantly decreased (41.8±14.2 to 34.9±11.0)* 	<ul style="list-style-type: none"> • Emotional eating: no significant change (men: 27.2±9.0 to 27.5±10.6; women: 35.5±10.9 to 34.2±11.2) • External eating: no significant change (men: 31.5±4.2 to 30.8±4.5; women: 32.1±5.0 to 30.9±4.7) • Body preoccupation: no significant change (men: 20.6±5.0 to 20.2±4.9; women: 24.8±4.8 to 23.6±4.8) • Physical self-esteem: significantly increased (men: 37.5±6.3 to 39.2±6.7; women: 34.8±8.0 to 36.3±7.9)** • Body weight: no significant change (men: 199±34 lb to 194±31 lb; women: 155±34 lb to 154±40 lb) • Systolic blood pressure: no significant change (men: 125±13 mm Hg to 122±14 mm Hg; women: 118±15 mm Hg to 114±19 mm Hg) • Diastolic blood pressure: no significant change (men: 80±13 mm Hg to 79±9 mm Hg; women: 76±9 mm Hg to 72±11 mm Hg) • Total cholesterol: significantly decreased in overall group (men: 221±43 mg/dL to 216±42 mg/dL; women: 208±35 mg/dL to 195±48 mg/dL)* <p>Standard behavior</p> <ul style="list-style-type: none"> • Proportion exercising regularly no significant difference (0.44 to 0.44) • Weight: significantly decreased (106.5±19.6 kg to 97.6±18.1 kg)** • BMI: significantly decreased (39.9±6.8 to 36.6±6.4)** • Depression: no significant difference (13.9±9.3 to 11.3±11.1) • State anxiety: no significant difference (36.3±16.7 to 35.4±9.3)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Trait anxiety: significantly decreased (47.0±11.9 to 36.5±11.4)* • Self-control: no significant difference (109.1±23.3 to 130.3±26.3)*** • Drive for thinness: no significant difference (5.8±5.9 to 4.4±3.9)*** • Bulimia: no significant difference (4.9±5.4 to 1.4±1.5)** • Body dissatisfaction: no significant difference (20.6±6.0 to 18.6±7.0)* • Inefficacy: no significant difference (7.3±7.4 to 3.4±4.1)* • Perfectionism: no significant difference (7.9±4.3 to 8.0±4.2) • Interpersonal distrust: no significant difference (6.1±7.4 to 2.8±2.6) • Maturity fears: no significant difference (1.4±1.7 to 1.3±1.8) 	<ul style="list-style-type: none"> • Trait anxiety: no significant difference (40.4±14.1 to 41.8±16.2) • Self-control: no significant difference (128.0±46.1 to 124.7±48.9) • Drive for thinness: no significant difference (5.7±3.7 to 7.1±5.2) • Bulimia: no significant difference (3.2±1.7 to 4.0±4.3) • Body dissatisfaction: no significant difference (20.6±5.9 to 18.4±6.0) • Inefficacy: no significant difference (5.2±4.8 to 5.9±6.2) • Perfectionism: no significant difference (4.8±3.1 to 4.8±5.0) • Interpersonal distrust: no significant difference (2.4±2.8 to 2.2±2.8) • Maturity fears: no significant difference (1.6±1.3 to 1.0±1.8)
Timmerman and Brown, 2012 ³³	n=35 women	Six weekly sessions of the Mindful Restaurant Eating intervention, 2 h each; no follow-up	Mindful Restaurant Eating Intervention ⁵ <ul style="list-style-type: none"> • Weight gain: significantly lower* • Waist circumference: no significant difference (102.0±14.2 cm to 99.3±13.9 cm) • Average energy intake: significantly lower (1,774.2±408.9 kcal to 1,417.1±330.1 kcal)** • Average fat intake: significantly lower (71.8±19.6 g/d to 52.1±14.3 g/d)*** • Total eating out episodes in 3 d: no significant difference (4.1±1.8 to 3.3±1.9) • Energy intake per eating out episode: no significant difference (690.6±339.8 kcal to 518.6±244.2 kcal) 	Control ⁵ <ul style="list-style-type: none"> • Weight gain: significantly greater* • Waist circumference: no significant difference (91.2±11.6 cm to 91.8±10.7 cm) • Average energy intake: significantly greater (1,806.2±351.7 kcal to 1,782.0±400.1 kcal)** • Average fat intake: significantly greater (74.6±26.5 g/d to 70.3±19.8 g/d)*** • Total eating out episodes in 3 d: no significant difference (4.2±1.8 to 4.6±2.3) • Energy intake per eating out episode: no significant difference (696.5±268.1 kcal to 687.3±338.6 kcal)

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Table. Description and results of interventions that encourage eating based on internal cues (*continued*)

Authors	Sample	Intervention description	Results of internal eating group ^a	Results of comparison group ^a
			<ul style="list-style-type: none"> • Fat intake per eating out episode: no significant difference (59.8±49.8 g to 22.2±12.8 g) • Emotional eating: no significant difference (53.2±16.5 to 53.1±15.0) • Self-efficacy for eating behavior: significantly greater (182.8±19.7 to 195.8±22.5)* • Barriers to weight management: significantly lower (61.6±14.3 to 47.6±11.8)*** 	<ul style="list-style-type: none"> • Fat intake per eating out episode: no significant difference (52.0±24.1 g to 29.8±16.8 g) • Emotional eating: no significant difference (47.9±17.9 to 51.3±17.5) • Self-efficacy for eating behavior: significantly greater (177.3±20.2 to 174.1±24.8)* • Barriers to weight management: significantly greater (62.7±14.5 to 60.4±16.9)***

^aResults over time are reported (preintervention to postintervention or latest reported follow-up); differences between groups not reported in the Table.

^bBMI=body mass index.

^cTo convert mmol/L cholesterol to mg/dL, multiply mmol/L by 38.6. To convert mg/dL cholesterol to mmol/L, multiply mg/dL by 0.0259. Cholesterol of 5.18 mmol/L=200 mg/dL.

^dLDL=low-density lipoprotein.

^eHDL=high-density lipoprotein.

^fNo standard deviations were reported in the results.

^gN/A=not available.

^hVO₂=oxygen uptake.

ⁱTo convert mmol/L glucose to mg/dL, multiply mmol/L by 18.0. To convert mg/dL glucose to mmol/L, multiply mg/dL by 0.0555. Glucose of 3.9 mmol/L=70 mg/dL.

^jTo convert mmol/L triglyceride to mg/dL, multiply mmol/L by 88.6. To convert mg/dL triglyceride to mmol/L, multiply mg/dL by 0.0113. Triglyceride of 1.80 mmol/L=159 mg/dL.

^kResults presented are for overweight participants.

^lTo convert mg/L C-reactive protein to nmol/L, multiply mg/L by 9.524. To convert nmol/L C-reactive protein to mg/L, multiply nmol/L by 0.105. C-reactive protein of 0.08=0.76 nmol/L.

^mNo follow-up data were collected for the control group because the control participants received the intervention when the experimental group completed the intervention.

ⁿResults presented as baseline score and average change from baseline.

^oResults presented are for postintervention because follow-up data were available for fewer than half of the participants.

^pNumeric values for 1-year follow-up were not reported.

^qNo follow-up data were collected for dietary intake variables.

^rFollow-up was not completed for the control participants.

^sSignificant differences over time were not presented; only significant differences between groups at postintervention were reported.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

pressure; most resulted in an improvement,^{23,27,31,50,51,56} although one did not observe a change.³⁰

According to Tribole and Resch,¹⁷ one principle of intuitive eating is to “feel the difference that exercise can make by moving the body rather than focusing on burning calories. Feeling energized from regular exercise can be a better motivating factor than trying to lose weight.” In addition, Tribole and Resch¹⁷ explain that when linked with a weight loss diet, exercising can be a struggle, but when honoring one’s hunger and feeding the body through intuitive eating, exercise can feel good, enhance mood, and be enjoyable. Several interventions promoted finding ways to be physically active that are fun and enjoyable while decreasing barriers such as negative body attitudes.^{23,27,50,52,56} Most studies demonstrate a significant increase in physical activity^{28,29,50,53,56} or energy expenditure.²⁷ In one study HAES participants significantly increased moderate (but not rigorous or very rigorous) and overall activity levels at follow-up, whereas the traditional diet group initially increased activity after the intervention but did not sustain effects at follow-up.²³ In only two studies, levels of physical activity did not improve.^{25,52} Because increases in physical activity often contribute to an elevation in mood, programs that result in increased activity levels may also help participants feel more confident and invigorated.

Contrary to dieting, intuitive eating also has positive effects on measures of eating behaviors and eating pathology. Individuals are encouraged to abandon dieting behaviors in the hopes of refuting the effects of dieting. One proxy to measure this behavior is through dietary restraint, the conscious control of food intake due to concerns about body weight. Participants in most studies decreased dietary restraint^{23,26,27,29,30,51,54,55,57} or restrictive dieting.⁵² Several increased interoceptive awareness, the ability to recognize and respond to internal states such as emotions, hunger, and satiety.^{23,27,53,57} In only one study, cognitive restraint significantly increased³² and in one other study, dietary restraint did not change.²⁵ Provencher and colleagues²⁶ used an appetite rating system and found that those in the intuitive eating group increased desire to eat and feelings of hunger in a fasting state, whereas no changes were observed in the comparison and control groups. Those who learned to eat intuitively also decreased disordered eating behaviors such as disinhibition, the loss of control that follows self-imposed rules,^{16,26,27,32,51} binge eating,^{23,27,32,51,53,57,60,62} and signs and symptoms of anorexia nervosa.⁵⁹ Others measured emotional and external eating; a significant decrease was observed in one study,⁵⁴ whereas no significant changes were found in the other.³⁰ Omichinski and Harrison⁵⁸ helped participants increase self-nourishment, a construct that included intuitive eating, satisfaction with food, and staying active, all consistent with the intuitive eating lifestyle.

Some studies evaluated whether or not a change occurred with psychological well-being. In programs that addressed and encouraged body satisfaction, participants improved self-acceptance,^{23,29,58} decreased body image avoidance,²⁷ improved body satisfaction,^{24,27,51,53-55,59} decreased body preoccupation,³⁰ decreased drive for thinness,^{23,27,51,53,57} and decreased negative self-talk.⁵² One study found an improvement in the general psychological well-being scores of participants at posttest, suggestive of a potential improvement in quality of life.^{50,57} Although no improvement

in body satisfaction was found among the intervention participants, body dissatisfaction increased in control participants.^{50,57} Because body satisfaction often decreases for adults, particularly if frequent self-weighing occurs,⁶³ an intuitive eating program may help to prevent decreases in body satisfaction. In addition, several studies observed improvements in depression,^{23,24,27,28,32,51,53,56,57,60,62} self-esteem,^{23,24,27,29,30,51,54,55,57,59} negative affect,³² and quality of life.²⁴ Still others improved measures of ineffectiveness,⁵⁷ anxiety,^{28,53,60,62} interpersonal sensitivity,²⁸ and general well-being.⁵⁰

Attrition

Programs that implement the intuitive approach to eating show lower dropout rates than comparison groups.^{23,26,27,51,52} Completion rates were as high as 92% in nondieting groups.^{23,26,54} Furthermore, participants in the intuitive eating groups evaluated the programs much more positively.^{23,27} In two studies, researchers experienced relatively high attrition rates.^{28,52} Although Cole and Horacek⁵² observed a seemingly high attrition rate of 39% in the intervention group, the control group observed a 67% attrition rate. Greater participation was associated with greater improvement in outcomes.^{28,29,58}

Long-Term Effects

Follow-up data are important in assessing long-term benefits of program participation compared with the short-term outcomes. Some studies did not report any follow-up.^{25,33,50,55,58} Other studies reported significant results at 3 to 6 months’ follow-up.^{32,53,57} In one study, mindful eating was maintained at 3 months.³² In two additional studies, positive response to hunger⁵⁷ and normalized, nondiet eating was maintained at 6-month follow-up.⁵³ Several studies followed participants for 1 year.^{24,26,27,30,51,54,61} Lower cholesterol level and blood pressure, increased physical activity, improved eating behaviors, increased self-esteem, decreased body dissatisfaction, weight loss, and maintaining a nondiet approach were sustained after 12 months.^{24,26,27,30,51,54,61} Four studies followed participants for 2 years.^{23,56,59,64} Decreased cholesterol level, blood pressure, restrained eating, thin-ideal internalization, body dissatisfaction, disordered eating, and depression in addition to increased diet quality, physical activity, stress management, and self-esteem were factors maintained after 2 years. One study followed participants for 3 years and found participants maintained an increase in physical activity, self-esteem, and a decrease in restrained eating.²⁹ In one study, researchers were able to contact 17 of 26 participants 10 years after the intervention was completed.³¹ Fourteen subjects maintained intuitive eating and the ability to successfully identify hunger.³¹

Nutrition and Dietary Intake

The effect of the intervention on nutrition or dietary intake was measured by five studies.^{25,28,31,33,52} Katzner and colleagues²⁸ used the nutrition subscale of the Health-Promoting Lifestyle Profile⁶⁵ and observed a significant improvement in nutrition behaviors. LeBlanc and colleagues²⁵ used a 3-day food log to assess dietary intake with no significant differences seen after intervention. The authors cite compliance among other limitations with using a

self-report method.²⁵ For this reason, Timmerman and Brown³³ used a multiple pass 24-hour recall to enhance accuracy. The researchers collected data on 2 weekdays and 1 weekend day to measure a representative intake.³³ The assessment determined that mindful eaters significantly decreased their energy and fat intake and consumed significantly less energy and fat than the control group after the intervention.³³ Ciamolini and colleagues³¹ identified an increase in fruit and vegetable intake among subjects able to identify initial hunger.

Theory

In addition to generally being more effective,⁶⁶ interventions that employ a theoretical framework provide an opportunity to further the understanding of which components work and which do not.⁶⁷ Only five studies specified the use of a behavior change theory. Carroll and colleagues⁵⁰ designed their intervention within the theoretical psychological framework of Self-Determination Theory, a theory of motivation supporting natural tendencies to behave in healthy ways. The intervention was intended to build competence and foster intrinsic motivation to change. Cole and Horacek⁵² implemented the comprehensive Precede/Proceed Health Promotion Model, a public health model introduced by Green and Kreuter.⁶⁸ That model is used in planning community health promotion interventions based on the premise that behavior change is voluntary and programs should be planned and evaluated with those who will implement them and others who will be affected by them.

Timmerman and Brown³³ implemented their intervention following the Health Promotion Model by reducing barriers, increasing perceived benefits, increasing self-efficacy, committing to a plan of action, and goal setting. Likewise, Mellin and colleagues⁵⁶ based their intervention on Family Systems Theory. The authors designed their intervention following the philosophy that the mind, body, and lifestyle skills addressed in their intervention are usually developed during childhood in those raised with authoritative parenting style and are less likely to be developed in those raised with an authoritarian or permissive parenting style.⁵⁶ The authors theorize that these skills can be mastered at any age, triggering adaptive behaviors and a healthier lifestyle.⁵⁶ In addition to weight loss, the authors also attribute decreased substance abuse (smoking and alcohol use) to this model.⁵⁶

Finally, Higgins and Gray⁵⁴ implemented their intervention through Control Theory, which asserts four key elements. First, behavior is a proactive choice rather than a reactive response to personal circumstances. Second, behaviors chosen in different situations are adaptive and likely to preserve the match between desired and perceived circumstances. Third, behavior must achieve a balance across the basic needs of survival, power/competence, freedom, love/belonging, and fun. Fourth, effective and lasting behavior is achieved when individuals are able to review and evaluate their circumstances and choose new behavior compatible with their perceptions. Their intervention was initially effective in achieving positive effects on eating behaviors and psychological outcomes and these effects were maintained 1 year later.⁵⁴ Overall, studies that implemented theory had inconsistent results. The studies that implemented the Health Promotion Model³³ and Family Systems Theory⁵⁶ achieved

particularly positive outcomes. These theories warrant further investigation in this area.

Social Support

Although five studies implemented theory, four studies included an element of social support.^{23,27,29,61} In one study that compared an intuitive eating group with a social support group, only intuitive eaters improved physical and psychological outcomes.²⁴ Provencher and colleagues^{26,61} observed improvements in their social support group as well as their HAES group. The authors caution that social support alone runs the risk of some members spreading inappropriate dietary messages and encouraging maladaptive behaviors.⁶¹ As a result, they recommend that a social support group be implemented after a nondiet intervention to enhance sustainability of effects and behaviors.⁶¹

DISCUSSION

Overall, encouraging intuitive eating seems to achieve positive physical and psychological effects. The studies in our review found a decrease in several disordered eating habits. Participants were able to decrease dietary restraint or dieting behavior. In only one study did cognitive restraint significantly increase; however, disinhibition and binge eating decreased in this study.³² In addition, only one study reported weight gain in subjects during the 1-year follow-up period.⁵⁴ The remaining studies demonstrated significant weight loss or weight maintenance. Because traditional programs tend to focus unsuccessfully on losing weight, several programs emphasized body acceptance instead.^{23,27,29,51,55,57-59} It has been widely documented that obesity is related to a variety of negative health consequences, including diabetes, hypertension, and high cholesterol.⁶⁹ This relationship is the primary reason that weight loss is often recommended to improve health. Although weight remains a highly regarded clinical indicator of health, it is important to note that intuitive eating programs often take a more health-centered approach. The focus is on overall well-being and improving physical and mental health—weight loss may or may not occur. Essentially, studies demonstrated that weight loss is not necessary for improving systolic blood pressure,^{23,27} diastolic blood pressure,⁵⁰ total cholesterol level,^{23,27} HDL cholesterol level,^{23,50} LDL cholesterol level,^{23,27} triglyceride level,²⁷ and cardiorespiratory fitness (eg, oxygen consumption during exercise).^{23,27,50,51} The psychological and physical health of patients are key concerns for health professionals and research suggests that intuitive eating may be superior in this respect compared with approaches that focus on weight.

One concept common to these studies and one of the key principles of intuitive eating, is unconditional permission to eat.^{18,19} Generally diets rely on external rules such as following portion sizes or avoiding “bad” foods, which often results in weight obsession and disordered eating patterns.⁵⁸ By removing all diet rules and dietary restrictions, participants in almost all of the studies were still able to lose or maintain weight. Only one study identified in our review observed weight gain during follow-up.⁵⁴ Even though weight loss was not always achieved in these programs, many of the negative psychological outcomes and maladaptive dietary behaviors associated with dieting were resolved.

One intuitive eating principle described by Tribole and Resch¹⁷ is that of respecting your body. This principle promotes acceptance of body size and shape and encourages realistic expectations with weight and weight loss. Eating intuitively will likely be easier if one is less critical of his or her weight or shape.¹⁷ Body dissatisfaction may lead to disordered eating behaviors,⁷⁰ making it extremely difficult to eat intuitively while appropriately identifying and honoring hunger. One study demonstrated that body esteem was the only significant psychological predictor of weight maintenance during a 1-year follow-up, supporting the assumption that an increase in body acceptance could lead to further improvement in weight and health management.²⁴ Another reported that self-esteem and self-acceptance increased in nondiet participants, whereas depressive symptoms and the incidence of eating-related psychopathology decreased.⁵⁴ This entry in the literature supports the notion that unrealistic weight loss goals are associated with high dropout rates in weight programs,⁷¹ whereas intuitive eating programs encourage acceptance of size and shape. Furthermore, body image issues, in the form of body acceptance and body appreciation, may play a key role in the development of intuitive eating, as demonstrated by Avalos and Tylka.^{72,73}

Another nondiet approach that often goes hand in hand with intuitive eating and HAES is to eat consciously; that is, mindfully.¹⁷ Mindful eating has been described as nonjudgmental awareness of the physical and emotional sensations associated with eating.⁷⁴ Mindfulness has been shown to be an effective technique to improve psychological and physiologic symptoms.^{75,76} In mindful eating, individuals are encouraged to eat according to internal cues of hunger and satiety and recognize, but not respond to, external cues such as advertisements or emotions.⁷⁴ Mindful eating training has been effective in treating binge eating disorder,^{38,39} and other eating disorders.^{40,41} Two studies in our review applied meditation techniques or mindfulness training to eating habits.^{32,60}

Concepts that are often associated with mindfulness are relaxation and spirituality. Kater and colleagues²⁸ incorporated relaxation into a nondieting program and found significantly greater improvement in stress management²⁸ and depression at 2-year follow-up.⁶⁴ Another study identified a strong correlation of intuitive eating with women who regularly practice yoga and have a high spiritual readiness (eg, meaningfulness, spiritual seeking, and purpose). Those women also scored high on body satisfaction.⁷⁷ Hawley and colleagues⁶⁴ found improvements in stress management behaviors, depression, and eating self-efficacy after incorporating relaxation training into a nondiet program for overweight women.⁶⁴ There appears to be evidence that relaxation and spirituality can be incorporated into nondiet approaches to promote intuitive eating principles,^{28,64,64} including body satisfaction.⁷⁷

One limitation of many of the programs is that it is difficult to measure adoption of an intuitive eating lifestyle. Because it is a combination of attitudes and behaviors, intuitive eating cannot be simply measured by one distinct behavior.⁵² Two validated intuitive eating scales currently exist,^{18,78} one of which has been recently updated.¹⁹ No study in our review used these scales to assess to what degree participants actually changed their behaviors. Although half of the studies

were published after these tools were available, it is possible that these tools were not available at the start of the studies. Several studies used proxy measures such as interoceptive awareness.^{23,27,51,57} Interoceptive awareness refers to the ability to recognize and respond to all internal states, not simply hunger and satiety. Others simply measured the construct as a decrease in dietary restraint.^{23,25,27,51,55,57} Previous research has demonstrated that intuitive eating is not simply a lack of disordered eating²²; thus, to assume that a decrease in dietary restraint is equivalent to an increase in intuitive eating may be inaccurate.

Another limitation of the studies is that only a few actually measured the effect of the intervention on nutrition or dietary intake.^{25,28,31,33,52} Future research should focus on assessing the dietary influence of adopting a nondiet lifestyle. One of the principles of intuitive eating is “gentle nutrition,” which reflects the tendency for intuitive eaters to choose foods that taste good while honoring their health and body function.¹⁷ The updated version of the Intuitive Eating Scale recently developed by Tylka and Kroon Van Diest¹⁹ reflects this principle as a subscale. Using this subscale could help advance the research regarding the effect of intuitive eating on nutritional quality of dietary intake.

In addition, a majority of the studies only included women. Only two studies included men in their sample.^{30,31} Only three other studies were open to men.^{56,59,60} More research is needed to examine the effects of a nondiet approach in men. There is also evidence that men are less likely to diet and thus, may respond better to an intuitive eating approach.^{62,79} Similarly, most participants in these studies are white. Research efforts should be made to include more diverse populations.

CONCLUSIONS

Findings in the studies we reviewed support the notion of shifting the focus from dieting for weight loss to adopting an intuitive eating lifestyle. Interventions that encourage intuitive eating decrease unhealthy eating behaviors such as dietary restraint and binge eating, signifying a healthier relationship with food. Results regarding physiologic markers of cardiovascular risk are less clear and merit further research, but improvements have been identified in blood pressure,^{23,27,50} blood lipid levels,^{23,27,50} and cardiorespiratory fitness^{23,27,50,51} in the absence of weight loss. Overall, physical activity levels increased, but were not consistently addressed in all programs. Furthermore, although dieting is associated with negative psychological effects, intuitive eating programs decrease depression and anxiety, increase self-esteem, and improve body image. More research is needed on these programs, especially regarding adoption of intuitive eating, effects on diverse populations, and whether or not programs that employ a theoretical framework are more effective than those without a framework. Overall physical, psychological, and emotional well-being should be considered when assessing health, rather than body weight alone. Our review of studies indicates that a nondiet approach shows promise for an effective, long-term solution to improve these imperative dimensions of health.

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