TITLE: Mindfulness Training for Weight Loss in Obese Adults: A Review of the Clinical Evidence and Guidelines

DATE: 12 January 2012

CONTEXT AND POLICY ISSUES

Obesity is typically defined as a body mass index (BMI) of over 30 kg/m². Individuals who are obese have an increased risk of a variety of chronic diseases including type 2 diabetes mellitus, cardiovascular disease, hypertension, and liver disease.¹ The number of people who are obese has been increasing worldwide and it is now considered to be a global epidemic.² The World Health Organization estimated that, in 2005, 9.8% of the world’s population was obese.² A 2007 Canadian Community Health Survey indicated that the self-reported rate of obesity in adults was 17%; however, researchers from the Public Health Agency of Canada suggested that actual rate of may be closer to 25%.¹ Obesity has been shown to have significant cost implications and, in 2005, the total cost associated with chronic conditions related to obesity was estimated to be $4.3 billion.¹

Obesity has been recognized as a complex problem that is influenced by behavioural, physiological, environmental, social, and economic factors.²,³ Interventions that seek to modify the dietary and exercise behaviour of obese individuals often fail to achieve long-term weight reduction. Mind-body therapies have been proposed as a possible weight-loss intervention for obese individuals. The National Center for Complementary and Alternative Medicine in the United States describes mind-body therapies as interventions which focus on the brain, mind, body, and behaviours with the intent to use the mind to affect physical function and promote health.⁴ The objective of this review is to summarize the clinical effectiveness and guidelines for the use of mindfulness training for the treatment of obesity in adults.

RESEARCH QUESTIONS

1. What is the clinical effectiveness of mindfulness training for weight management in obese adults?

2. What are the evidence-based guidelines regarding the use of mindfulness training for weight management in obese adults?

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KEY MESSAGE

RCTs failed to consistently demonstrate statistically significant or clinically-meaningful weight-loss with mindfulness training. Two evidence-based guidelines recommend the use of behavioural modification therapy for the management of obesity; however, neither guideline specifically addressed any particular mindfulness interventions.

METHODS

Literature Search Strategy

A limited literature search was conducted on key resources including MEDLINE, EMBASE, PsycINFO, PubMed, The Cochrane Library (2011, Issue 11), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and abbreviated list of major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between Jan 1, 2006 and Dec 1, 2011.

Selection Criteria and Methods

One reviewer screened the titles and abstracts of the retrieved publications and evaluated the full-text publications for the final article selection according to criteria presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Selection Criteria</th>
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<tbody>
<tr>
<td><strong>Population</strong></td>
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<td><strong>Intervention</strong></td>
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<td><strong>Comparator</strong></td>
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<td><strong>Outcomes</strong></td>
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<td><strong>Study Designs</strong></td>
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Exclusion Criteria

Studies meeting any of the following criteria were excluded: non-randomized primary studies, case series, case reports, non-English language publications.

Critical Appraisal of Individual Studies

Critical appraisal of the included studies was performed according to study design. Appraisal of full-text publications for primary studies was performed using the criteria described by Downs and Black.5 Clinical practice guidelines were assessed using the Appraisal of Guidelines for Research and Evaluation (AGREE) criteria.6 Numeric scores were not calculated. Instead, the
strengths and limitations of each guideline were described. No health technology assessments or systematic reviews were identified for critical appraisal.

SUMMARY OF EVIDENCE

Quantity of Research Available

A total of 229 citations were retrieved from the literature search. The abstracts for these reports were reviewed and 14 studies that could potentially fulfill the selection criteria were identified for further screening. Three additional references were retrieved from the grey literature. The screening process resulted in the selection of seven reports for inclusion in the present review. A summary of the screening results is provided in Appendix 1. Five reports\textsuperscript{7-11} described four unique RCTs and two reports were evidence-based guidelines.\textsuperscript{12,13}

Summary of Study Characteristics

A summary of the characteristics of the included studies is provided in Appendix 2 and a detailed description of study interventions is provided in Appendix 5. The mind-body interventions included the following: a mindfulness intervention for stress eating (10 sessions),\textsuperscript{7} relaxation response training (≥10 sessions),\textsuperscript{9} mindfulness and acceptance-based (one session),\textsuperscript{10} and mindfulness-based weight loss training (four sessions).\textsuperscript{11} Three of the RCTs\textsuperscript{7,9,11} included only women and one RCT\textsuperscript{10} included 90% women. The mean BMI of study participants ranged from 31 kg/m\textsuperscript{2} to 35 kg/m\textsuperscript{2}. Three RCTs\textsuperscript{9,11} were completely open-label and one was single blinded (assessors).\textsuperscript{7} All studies used a parallel-group design and sample sizes ranged from 47\textsuperscript{7} to 225.\textsuperscript{9} Follow-up was conducted at three months,\textsuperscript{10} four months,\textsuperscript{7} six months,\textsuperscript{11} one year,\textsuperscript{9} and two years.\textsuperscript{8}

Summary of Critical Appraisal

Randomized controlled trials

All of the studies had a clearly stated objective with a well-described protocol and all reported the study eligibility criteria. The study populations were either 100% or 90% women which may limit the generalizability of the findings as it is unclear if the results would be replicated in overweight or obese men. Common limitations with the available evidence included poor reporting of randomization methods\textsuperscript{9,11} and a lack of clarity regarding allocation concealment.\textsuperscript{9-11} The interventions were unblinded in all studies. Given the complexity of the interventions in these studies, blinding of participants and clinical staff would likely be unfeasible; however, the lack of blinding remains an important source of potential bias for the included studies. Three RCTs\textsuperscript{7,10,11} reported the baseline characteristics of participants and all were similar between the different treatment groups. One study did not present the demographic and baseline characteristics individually for each treatment group.\textsuperscript{9} Three of the RCTs\textsuperscript{7,10,11} had a high proportion of participants complete the study (range 82% to 100%) and one\textsuperscript{9} had a high proportion of participants who were lost to follow-up (37% at one year and 48% at two years). Two studies\textsuperscript{8,10} reported sample size calculations.

Evidence-based guidelines

Both of the evidenced-based guidelines\textsuperscript{12,13} were of good quality and were formulated with a rigorous methodology (Appendix 4). Key limitations of the two guidelines were poor reporting of
the methods and search results of the systematic review(s) and a lack of specificity regarding the intervention(s) that should be considered when applying the recommendations.

Summary of Findings

Mind-body techniques combined with group sessions

One RCT compared the effects of three non-dieting interventions in overweight women (N = 225). The participants were randomized to one of the following intervention groups: 1) group non-dieting program based on relaxation response training; 2) group non-dieting program; or 3) a mail-delivered non-dieting program. Participants in the group sessions attended a two hour session every week for the first 10 weeks and then every two to four weeks for next eight months. The group program which included the relaxation component was based on a protocol from the Harvard Mind/Body Medical Institute\(^{14,15}\) and included instruction in the following mind-body techniques: meditation mindfulness, progressive muscle relaxation, abdominal breathing, hatha yoga, and visualization.

Follow-up was reported at 12 months by Katzer et al (2008)\(^9\) and at 24 months by Hawley et al (2008).\(^8\) There were no statistically significant changes from baseline in the mean body weight in any of the three treatment groups at 12 and 24 months follow-up (Table 2). Katzer et al (2008)\(^9\) reported that there was a statistically significant difference favouring the treatment arm that received the instruction in mind-body techniques compared with the arm which only participated in group sessions (\(P < 0.05\)); however, there was no difference in comparison with the group which received the mail-delivered program.

Table 2: Summary of findings from Katzer 2008\(^9\) and Hawley 2008\(^8\)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Body Weight at BL (kg) Mean (SD)</th>
<th>∆ from BL Body Weight (kg) Mean (SD)</th>
<th>Within Group Comparison P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12 months</td>
<td>24 months</td>
<td>12 months</td>
</tr>
<tr>
<td>Group NDP + MBT</td>
<td>95.5 (15.7)</td>
<td>-0.9 (5.9)</td>
<td>1.8 (6.2)</td>
</tr>
<tr>
<td>Group NDP</td>
<td>93.2 (14.7)</td>
<td>-1.2 (3.9)</td>
<td>-0.4 (5.8)</td>
</tr>
<tr>
<td>Mail-delivered NDP</td>
<td>93.9 (17.3)</td>
<td>-0.3 (4.9)</td>
<td>-2.0 (6.6)</td>
</tr>
</tbody>
</table>

\(\Delta = \text{change}; \ BL = \text{baseline}; \ MBT = \text{mind-body techniques}; \ NDP = \text{non-dieting program}; \ SD = \text{standard deviation}\)

Mindfulness intervention for stress eating

Daubenmier et al (2011)\(^7\) conducted an RCT comparing a mindfulness intervention for stress eating against waiting list control in overweight and obese women (N = 47). The authors described the intervention as involving components from mindfulness-based stress reduction, mindfulness-based cognitive therapy, and mindfulness-based eating awareness training. After four months, there was no statistically significant difference between the two groups with respect to the change from baseline in body weight. The authors conducted subgroup analyses and reported that obese participants in the intervention group maintained their body throughout the trial (\(-0.4 \pm 3.5 \text{ kg}; P = 0.70\)) and those in the control group gained weight (\(1.7 \pm 1.5 \text{ kg}, P = 0.01\)); however, there was still no statistically significant difference between the two groups (\(P = 0.12\)). A subgroup analysis focusing on the overweight participants demonstrated that there was no statistically significant difference between the two groups (\(P = 0.47\)).
Table 3: Summary of findings from Daubenmier 2011

<table>
<thead>
<tr>
<th>Analysis</th>
<th>T – C (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight - ITT</td>
<td>−0.40 kg (−1.8, 1.0)</td>
<td>P = 0.56</td>
</tr>
<tr>
<td>Body weight - PP</td>
<td>−0.64 kg (−2.3, 1.0)</td>
<td>P = 0.45</td>
</tr>
</tbody>
</table>

C=control; CI=confidence interval; ITT=intention to treat; PP=per protocol; T=treatment

One-day mindfulness and acceptance-based workshop

Lillis et al (2009) conducted an RCT to compare the effectiveness of attending a one-day mindfulness and acceptance-based workshop versus a waiting list for patients who had completed at least 6 months of a weight loss program (N = 84). The workshop targeted obesity-related stigma and psychological distress and follow-up was conducted after three months. The patients in the intervention group showed greater improvement in percentage change in body weight (-1.5% vs. 0.3%) and BMI (-0.4 kg/m² vs. 0.20 kg/m²) compared to the waiting list control group (both p < 0.01). The authors concluded that their results provide preliminary evidence in support of the intervention and that more study is warranted in this area.

Addition of mindfulness-based interventions to existing weight loss plans

Tapper et al (2009) conducted an RCT to evaluate the efficacy of adding a mindfulness-based weight loss intervention to the weight loss plans of women (N = 62). The control group received no mindfulness-based intervention and the participants continued with their own weight loss plan. The intervention consisted of four two-hour workshops addressing issues such as values, cognitive diffusion, controlling feelings, acceptance, self-awareness, mindfulness, and committed action. Follow-up was conducted after six months and there was no statistically significant difference in weight loss between the two groups. The authors conducted a subgroup analysis by removing seven participants who reportedly did not apply the workshop principles. With these patients removed, there was statistically significant improvement in the BMI of the intervention group compared to the control group (P < 0.05). These results should be interpreted with caution as it is unclear if this subgroup was post-hoc or pre-specified. In addition, there were no adjustments made for multiple comparisons.

Evidence-based guidelines

The literature search identified two evidence-based guidelines that offer recommendations regarding the use of behavioural therapy for the treatment obesity. Neither guideline specified any particular behavioural therapies in their recommendations. The 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children included a section on the use of behaviour therapy. The guideline states that each recommendation is evidence-based, involved a systematic review of the literature, and represents a consensus of the expert review panel. The guideline specifies the following three recommendations with respect to behavioural therapies for the treatment of obesity:

1. We suggest that individuals willing to participate in weight management programs be provided with education and support in behaviour modification techniques as an adjunct to other interventions (Grade B; level 2)
2. We recommend comprehensive lifestyle interventions (combining behaviour modification techniques, cognitive behaviour therapy, activity enhancement and dietary counseling) for all obese adults (Grade A; level 1)
3. When treating obesity in children, we suggest using family-oriented behaviour therapy (Grade B; level 1)

The strength of each recommendation refers to the following: Grade A - strong recommendation where the benefits clearly outweigh risks (or vice versa); Grade B - intermediate recommendation where it is unclear whether benefits outweigh risks. The level of evidence refers to the following: level 1 - RCTs (or meta-analyses) without important limitations; level 2 - RCTs (or meta-analyses) with important limitations and/or observational studies with overwhelming evidence.

The Scottish Intercollegiate Guidelines Network (SIGN) has also published an evidence-based guideline for the management of obesity. The section regarding weight management programmes and support for weight loss maintenance in adults addresses the use of behavioural therapies and recommends the following:

- Weight management programmes should include physical activity, dietary change and behavioural components (Grade A).

The Grade A level of evidence indicates that the recommendation is supported by evidence from at least one meta-analysis, systematic review, or RCT with a low risk of bias and is directly applicable to the target population.

Limitations

There were no systematic reviews and only four RCTs identified in this review; therefore, there is limited evidence available to address the research questions. Each of the RCTs investigated a different mindfulness intervention so there is no replication of findings. Three of the RCTs had a small sample size and a short duration, and the longer term RCT was limited by a high proportion of participants who were lost to follow-up. The RCT evidence is also limited by the use of multiple mindfulness interventions in a single treatment group which makes it difficult to determine which components contributed to the effect. The most extreme example is the study by Daubenmier et al (2011) where the intervention involved components from mindfulness-based stress reduction, mindfulness-based cognitive therapy, and mindfulness-based eating awareness training. The studies all enrolled at least 90% women which may limit the generalizability of these findings to overweight and obese men. Further study would be required to determine how men would respond to mind-body therapies for weight management. The two evidence-based guidelines lacked specific information regarding which behavioural interventions should be considered for weight management.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:

The four open-label RCTs identified in this review had limited sample sizes and failed to consistently demonstrate statistically significant weight-loss with mindfulness training. Furthermore, the weight-loss reported for participants in the mindfulness groups was small (i.e., <2 kg) and of uncertain clinical significance. Larger studies with a longer duration would be required to accurately assess the effects of mindfulness training for managing obesity. In addition, the evidence identified in this review was restricted to obese women; therefore, the effectiveness of mindfulness training in obese men is uncertain. Two evidence-based guidelines recommend the use of behavioural modification therapy for the management of obesity; however, neither guideline specifically addressed any particular mindfulness interventions.
PREPARED BY:
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REFERENCES


12. Lau DC, Douketis JD, Morrison KM, Hramiak IM, Sharma AM, Ur E, et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and


Appendix 1: Selection of Included Studies

229 citations identified from electronic literature search and screened

215 citations excluded

14 potentially relevant articles retrieved for scrutiny (full text, if available)

3 potentially relevant reports retrieved from other sources (grey literature, hand search)

17 potentially relevant reports

10 reports excluded: -irrelevant intervention (5) -irrelevant outcomes (1) -irrelevant population (1) -review article (1) -comment (1) -review protocol (1)

7 reports included in review
### Appendix 2: Characteristics of the Included Randomized Controlled Trials

<table>
<thead>
<tr>
<th>Author, Year, Country</th>
<th>Description</th>
<th>Comparators</th>
<th>Endpoints</th>
<th>Population</th>
</tr>
</thead>
</table>
| Daubenmier, 2011 USA  | F/U at 4 month  
Single-blind  
Parallel-group  
N = 47 | Mindfulness intervention for stress eating  
Waiting list (control) | Mindfulness  
Stress  
Anxiety  
Body weight | Overweight women  
Mean BMI = 31 |
| Lillis 2009 USA       | F/U at 3 months  
Open label  
Parallel-group  
N = 87 | Mindfulness and acceptance-based workshop (1 day)  
Waiting list (control) | Body weight  
BMI  
Quality of life  
Mental health | Individuals who had completed ≥6 months of an weight loss program  
Mean BMI = 33 |
| Tapper 2009 United Kingdom | F/U at 6 months  
Open label  
Single center  
Parallel group  
N = 62 | Mindfulness-based weight loss training + Participants own weight loss plans  
Participants own weight loss plans | BMI  
Physical activity  
Mental health  
Eating behaviour | Women attempting to lose weight  
Mean BMI = 32 |
| Hawley 2008* Katzer 2008* New Zealand | F/U at 12 & 24 months  
Open label  
Parallel group  
N = 225 | Group NDP + MBT  
Group NDP  
Mail-delivered NDP | Body weight  
BMI  
Psychological distress  
Medical symptoms  
Eating behaviour  
Blood pressure | Overweight women  
Mean BMI = 35 |

BMI = body mass index (kg/m²); CBT = cognitive behavioural therapy; F/U = follow-up; NDP = non-dieting program; PTSD = post-traumatic stress disorder; MBSR = mindfulness-based stress reduction; MBT = mind-body techniques; PMR = progressive muscle relaxation
## Appendix 3: Critical Appraisal of Randomized Controlled Trials

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| Daubenmier 2011⁷ | • Objective and methods were clearly stated  
• Eligibility criteria was clearly stated  
• Interventions were clearly described  
• Single blinded (nurses)  
• Methods of randomization were appropriate and well-reported  
• Randomization was stratified by key baseline characteristics (e.g., BMI)  
• Baseline characteristics were well described and were similar between the two groups  
• Compliance was systematically assessed  
• 85% of participants completed the trial | • 100% of participants were women (limited generalizability for men)  
• No sample size calculations provided  
• Limited sample size (N = 47)  
• Included both an ITT and PP analysis; however, the ITT analysis was not based on all randomized patients  
• Multiple statistical tests performed without correction for multiple comparisons |
| Lillis 2009²⁰ | • Objective and methods were clearly stated  
• Eligibility criteria was clearly stated  
• Interventions was clearly described  
• Sample size calculation provided  
• Baseline characteristics were similar between the two groups with the exception of previous weight-loss success (difference was addressed using an adjusted analysis)  
• Patient disposition was well reported  
• No participants who received the intervention and no one in the control group was lost to follow-up | • Treatments were open-label  
• Unclear if randomization was adequately concealed from the investigators  
• 90% of participants were women (limited generalizability for men) |
| Tapper 2009¹¹ | • Objective and methods were clearly stated  
• Eligibility criteria was clearly stated  
• Methods of randomization were provided  
• Baseline characteristics were similar between the two groups  
• Patient disposition was well reported  
• 84% and 81% of participants completed the trial for the intervention and control groups, respectively  
• Compliance was reported for the intervention group based on workshop attendance.  
• Included an ITT analysis based on all randomized participants | • Treatments were open-label  
• Unclear if randomization was adequately concealed from the investigators  
• No sample size calculation provided  
• 100% of participants were women (limited generalizability for men) |
| Hawley 2008⁸⁹  
Katzer 2008⁹⁸ | • Objective and methods were clearly stated  
• Eligibility criteria was clearly stated  
• Interventions were clearly described  
• Sample size calculation provided  
• Methods of randomization were provided  
• 99% of participants were included in the ITT analysis | • Treatments were open-label  
• 37% and 48% of participants were lost to follow-up at one and two years, respectively  
• 100% of participants were women (limited generalizability for men)  
• Unclear if randomization was adequately concealed  
• Demographic and baseline characteristics were not presented for the groups individually |

BMI = body mass index; ITT = intention to treat; PP = per protocol
## Appendix 4: Critical Appraisal of Evidence-based Guidelines

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
</table>
| Lau 2006     | - The objectives of the guideline are specifically described  
- The population to whom the guideline is meant to apply is specifically described  
- Individuals from relevant professional groups were included in development of the guideline group  
- The target users of the guideline were clearly defined  
- Systematic methods were used to search for evidence  
- The methods used for formulating the recommendations were clearly described  
- The strength of evidence is clearly described | - Unclear if patient input was considered in the development process  
- Research questions were not clearly stated  
- Methods and search results for the systematic review were poorly reported  
- The recommendations lack specificity regarding the intervention(s) that should be considered |
| SIGN 2010    | - The objectives of the guideline are specifically described  
- Research questions were clearly stated  
- The population to whom the guideline is meant to apply is specifically described  
- Individuals from relevant professional groups were included in development of the guideline group  
- Patients were involved throughout the guideline development process  
- The target users of the guideline were clearly defined  
- Systematic methods were used to search for evidence  
- The methods used for formulating the recommendations were clearly described  
- The strength of evidence is clearly described | - Methods and search results for the systematic review were poorly reported  
- The recommendations lack specificity regarding the intervention(s) that should be considered |
Appendix 5: Detailed Description of Study Interventions

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Interventions</th>
<th>Key Findings</th>
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<tbody>
<tr>
<td>Daubenmier, 2011</td>
<td>Mindfulness Intervention&lt;br&gt;“Nine 2.5-hour classes and one 7-hour silent day of guided meditation practice after class 6. Classes were held on a weekly basis on the weekend. Participants were instructed in the body scan, mindful yoga stretches, sitting and loving kindness meditations as taught in MBSR, and the “3 minute breathing space” as taught in MBCT. Participants were also led through guided meditations as a way to introduce mindful eating practices of paying attention to physical sensations of hunger, stomach fullness, taste satisfaction, and food cravings; identification of emotional and eating triggers; self-acceptance; and inner wisdom. Meditations on awareness of negative emotions in general and loving kindness and forgiveness towards others were included as supplemental meditations. Each session opened with a mindfulness practice followed by a discussion of the practice and review of progress and challenges over the previous week, and then guided meditations and discussions were used to introduce new eating or emotional awareness practices. On the retreat day, participants entered into silence to practice the meditations they had been taught and had a potluck meal to practice mindful eating skills. Participants were encouraged to engage in daily home assignments that included up to 30 minutes per day of formal mindfulness practices 6 days per week and mindful practices before and during meals.”&lt;br&gt;(page 3)</td>
<td>No statistically significant difference between the two groups with respect to the change from baseline in body weight</td>
</tr>
<tr>
<td>Lillis 2009</td>
<td>Mindfulness Intervention&lt;br&gt;“Participants were given a 1 day, 6 hour workshop utilizing exercises and material that have been shown to be helpful in similar ACT protocols. Each workshop used a structured sequence of lecture and exercises. Two workshop leaders led every group. The specific methods used taught acceptance, mindfulness, and defusion skills as applied to difficult thoughts, feelings, and bodily sensations. Weight-related stigmatizing thoughts and distress were the primary focus. The workshop also sought to clarify life values, especially those related to health and relationships, identify barriers to their implementation, and to foster behavioral commitments related to life values. A general ACT workbook was also distributed to participants to encourage further implementation of the methods presented.”&lt;br&gt;(page 61)</td>
<td>Patients in the intervention group showed greater improvement in percentage change in body weight (-1.5% vs. 0.3%) and BMI (-0.4 kg/m² vs. 0.20 kg/m²) compared to the waiting list control group (both P &lt; 0.01)</td>
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Waiting-list (control)<br>Did not receive the intervention.
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<tr>
<th>Author, year</th>
<th>Interventions</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapper 2009</td>
<td>Mindfulness Intervention</td>
<td>No statistically significant difference in weight loss between the two groups.</td>
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</table>

"Key intervention components were (a) values, to enhance motivation, (b) cognitive defusion, to help break links between food- and exercise-related thoughts and behaviour, and (c) acceptance, to help the individual tolerate negative feelings. The intervention was delivered via a series of 3 workshops conducted over 3 consecutive weeks with a fourth follow-up session taking place approximately 3 months later. Each session lasted 2 hours and included a powerpoint presentation and explanation of key concepts using metaphors, exercises and pen and paper tasks. Questions were encouraged during the session to ensure concepts were understood. Participants were also asked to complete a series of homework exercises in between each session. A manual was provided to accompany the workshops. This included details of key concepts and exercises, forms for pen and paper-based tasks and details of homework. Participants also received a CD containing the four ‘eyes-closed’ exercises: ‘Leaves on a Stream’, ‘Giving Feelings a Form’, ‘The Tin Can Monster Exercise’ and ‘Being Where You Are’. This was designed to support participants’ practice at home." (page 398-400)

**Participants own weight loss plans (control group)**

Asked to continue their weight loss attempt as normal. No further information was provided to control participants but they were given the opportunity to attend a 1 day weight loss workshop at the end of the study.

| Hawley 2008  | Katzer 2008  | Mindfulness Intervention | No statistically significant changes in mean body weight in any treatment group |

"Weekly two-hour sessions during the initial 10 weeks of the intervention, followed over the next 8 months by 12 two-hour group sessions. The Intervention was modeled on the Harvard Mind/Body Medical Institute ‘Medical Symptom Reduction Program’. Each session included intensive instruction and practice using various mind-body techniques including; progressive muscle relaxation, abdominal breathing, meditation, hatha yoga, visualization, and mindfulness. Group sessions were conducted by a psychotherapist trained in and experienced with mind-body techniques and a nutritionist. The nutritionist had undertaken training in mind-body medicine with the Harvard Mind/Body Medical Institute." (page 595)

**Group non-dieting program (control)**

"Weekly two-hour sessions during the initial 10 weeks of the intervention, followed over the next 8 months by 12 two-hour group sessions. The intervention involved a greater focus on nutrition and physical activity than the mindfulness intervention. Participants were taught to use goal-setting, self-monitoring (diary) and stimulus control strategies in order to develop healthy non-dieting, eating and activity behaviors. Sessions were conducted by an experienced dietitian, with a psychotherapist and a lifestyle activity consultant brought in for specific topics.” (page 595)

**Mail-delivered non-dieting program (control)**

“A 10-week mail-delivered, self-directed program with a focus on nutrition and physical activity. Materials included a reflective diary (for goal-setting and monitoring), a variety of recipe leaflets, shopping guides and physical activity brochures. Participants received program material for first 10 weeks, followed by monthly newsletters for the remaining 8 months.” (page 595)

ACT=acceptance and commitment therapy; BMI=body mass index; MBSR=mindfulness-based stress reduction; MBCT=Mindfulness-Based Cognitive Therapy