



# The Effectiveness of Cellular Phone-based Interventions for Weight Loss in Overweight and Obese Adults: A Systematic Review

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### INTRODUCTION:

- Statistics Canada in 2010 states that over 4.5 million people were overweight or obese.
- The dramatic increase in obesity and its correlation with serious diseases has caused the World Health Organization (WHO) to declare an immediate need for effective and widely-accessible interventions.
- Cellular phone devices are portable, convenient, and popular among people of varying economic status and ethnicities, rendering this an ideal medium for a lifestyle intervention.

### PURPOSE:

- To determine the effectiveness of cellular phones for delivering weight loss interventions in the obese or overweight population.

### METHODS:

- **Literature Search:** An electronic database search of MEDLINE, EMBASE, CINAHL, the Cochrane Library, Web of Science and PsycINFO was conducted.
- Major search terms included: “overweight” or “obesity” and “weight loss” and “cellular phone”. The search strategy identified both published and unpublished studies and was limited to English.

Inclusion Criteria	Exclusion Criteria
<ol style="list-style-type: none"><li>1. Delivered a weight-loss intervention using a cellular or mobile phone</li><li>2. Reported absolute or percentage change in weight, BMI, waist circumference, body fat or any other proxy for weight loss</li><li>3. Participants age &gt; 18</li><li>4. Participants' BMI ≥ 25 kg/m<sup>2</sup></li><li>5. Published in English</li></ol>	<ol style="list-style-type: none"><li>1. Systematic review, opinion pieces and editorial studies</li></ol>

Table 1: Studies Inclusion and Exclusion Criteria

- **Data Extraction:** All eligible studies were screened and underwent data extraction by two independent reviewers.
- Any disagreements between the reviewers were resolved by a third independent reviewer.
- **Categorization of Studies:**
  - 1) **One-way interaction:** the researcher could contact the participants, but the participants could not respond
  - 2) **Two-way interaction – low:** open communication between researchers and participants, with less than 14 interactions per week
  - 3) **Two-way interaction – high:** open communication between researchers and participants, with greater than or equal to 14 interactions per week

Table 2: Study Characteristics of Mobile-Phone Delivered Interventions for Weight Loss (2007- 2011)

Authors; Country	Study Design	Sample Characteristics	Intervention	Results <sup>1</sup>	Level of Evidence
<b>One-way Interaction; [Overall Oxford Level of Evidence: Grade C]</b>					
Joo and Kim; Korea (2007)	One group pre-post design	n= 927 (female=89%) • EG (n=297): Age: > 30, n=99.9% • CG: Not applicable	EG: A 12 week weight reduction program including behaviour modification, individually prescribed exercise and diet. Participants received a weekly SMS message on behaviour modification by mobile phone and brochures about exercise and diet by post weekly. Participants might borrow exercise equipment without charge.	<b>Weight:</b> EG weight loss = 1.5kg ± 3.0 <b>BMI:</b> EG: decrease of 0.6 ± 1.2 <b>Waist Circumference:</b> EG: decrease of 4.3cm ± 1.2	4
Lombard, C. et al.; Australia (2010)	Cluster RCT	n= 250 (female=100%) • EG (n= 127): Age: 40.56 ± 4.75 • CG (n = 123): Age: 40.26 ± 4.8	EG: Interactive group sessions that focused on goal setting, and behavioural change. Pedometers + text messages were given to reinforce nutrition, physical activity and behavioural change. The program ran for 52 weeks. CG: One non-interactive lecture with general dietary and physical activity guidelines. Participants were given brochures + a pedometer to use at their discretion.	<b>Weight [ES=0.23]:</b> EG: decrease of 0.2kg; 95% CI [-0.9, 0.49] CG: increase of 0.83kg; 95%CI [0.12, 1.54] <b>Waist Circumference [ES=0.33]:</b> EG: decrease of 1.3cm; 95% CI [-2.4, -0.15] CG: increase of 0.12cm; 95% CI [-0.96, 1.2]	2b
Lee et al.; Korea (2011)	Controlled clinical trial	n= 108 (female=100%) • EG (n=60): Age: 47 • CG (n=48): Age: 45	EG: A 12 week home-based obesity-control program including exercise, diet, monthly group workshops & phone counseling, 2 health education sessions, and bi-weekly SMS messages. CG: structured exercise intervention (three 1-h walking classes per week) with an exercise coordinator as well as the same orientation and 2 health education sessions as the EG	<b>Weight:</b> EG: decrease of 1.85kg CG: decrease of 3.1kg <b>BMI:</b> EG: decrease of 1.05; CG: decrease of 1.22 <b>% BF:</b> EG: decrease of 2.64% CG: decrease of 2.98%	4
<b>Low Two-way Interaction; [Overall Oxford Level of Evidence: Grade C]</b>					
Hurling et al.; England (2007)	RCT	n= 77 (female=66%) • EG (n=47): Age: 40.5 ± 7.1 • CG (n=30): Age: 40.1 ± 7.7	EG: A 9 week PA intervention delivered through an Internet-based behavior change system addressing barriers to PA, self-report of exercise level, tailored feedback, weekly schedule for PA planning with automated assessor, and email/phone reminders. Participants wore an accelerometer for activity monitoring. CG: Participants received one-time verbal advice on recommended physical activity levels. Participants also wore an accelerometer for activity monitoring	<b>BMI [ES=0.265]:</b> EG: decrease of 0.24; SE=0.11 CG: decrease of 0.10; SE: 0.14 <b>%BF [ES=0.283]:</b> EG: decrease of 2.18%; SE: 0.59 CG: decrease of 0.17%; SE: 0.81	1b
Haapala et al.; Finland (2009)	RCT	n= 125 (female=76.8%) • EG (n=62): Age: 38.1 ± 4.7 • CG (n=63): Age: 38 ± 4.7	EG: A 52 week weight reduction program delivered via text messages weekly advising the participants to reduce their food intake and increase their PA, and report their weight daily via text messages or through the programme's website; and provided immediate automatically-generated tailored feedback. CG: Participants were offered no advice on diet or PA.	<b>Weight change [ES=0.62]:</b> EG: decrease of 4.5kg ± 5.0 CG: decrease of 1.1kg ± 5.4 <b>Waist Circumference [ES=0.72]:</b> EG: decrease of 6.3cm ± 5.3 CG: decrease of 2.4cm ± 5.4	1b
Joo et al.; Korea (2010)	Controlled clinical trial	n= 925 (female=72%) • EG (n= 410): Age: 36.9 ± 10.4 • CG (n= 515): Age: 41.9 ± 9.8	EG: A 12 week internet-based obesity control intervention involving educational information, two weekly SMS prompts for behaviour modification and access to a website which provided a weekly diet regimen, a daily food diary, and information/answers about nutrition and exercise. CG: Regular visits to the local public health centre at 1- or 2-week intervals and were instructed on behaviour modification, nutrition and exercise by registered nurses, nutritionists and exercise trainers.	<b>Weight [ES=1.42]:</b> EG: decrease of 1.09kg ± 3.70 CG: decrease of 4.71kg ± 2.55 <b>BMI [ES = 1.47]:</b> EG: decrease of 0.40 ± 1.38 CG: decrease of 1.88 ± 1.01 <b>Waist Circumference [ES = 1.35]:</b> EG: decrease of 2.61cm ± 4.27 CG: decrease of 6.73cm ± 3.05	4
Rossi et al.; Italy (2010)	One Group Pre-post design	n=140 (female=58.3%) • EG (n=140): Age: 42.9 ± 12.2 • CG: Not applicable	EG: A 20 week customized diet intervention, SMS messages (pictures sent to participants) to aid in food choices - The software also encourage physical activity. The proactive call center - called participants to reinforce concepts about nutrition and physical activity	<b>Weight:</b> decrease of 2.5kg; 95% CI [-3.2, -1.8] <b>BMI:</b> decrease of 1; 95% CI [-1.2, -0.7] <b>Waist circumference:</b> decrease of 3.7cm; 95% CI [-4.6, -2.9]	4
Morak et al.; Austria (2008)	One Group Pre-Post Design	n=25 (female=60%) • EG (n=25): Age: 48 (range 24-71) • CG: Not applicable	EG: Therapy Management System application on the participant's mobile phone to monitor abdominal girth, weight and activity + neutrally expressed feedback messages for sending in values at least once a week. The programme was 12 weeks.	<b>Weight:</b> decrease of 2.39kg ± 2.67 <b>Abdominal girth:</b> decrease of 2.37cm ± 2.08 <b>BMI:</b> decrease of 0.78 ± 0.85	4
<b>High Two-way Interaction; [Overall Oxford Level of Evidence: Grade D]</b>					
McGraa, Karen Lee; USA (2010)	Controlled clinical trial	n = 65 (female=80%) • EG (n=33): Age: > 30, n= 84.8% • CG (n=32): Age: > 30, n=100%	EG: Sending motivational text messages 3x a day, in addition to control measures for 5 week. CG: Weekly emails of their progress	<b>BMI % Change [ES=0.004]:</b> EG: decrease of 0.023 ± 0.33 CG decrease of 0.024 ± 0.031 No significant difference between groups.	4
Turner-McGrievy and Tate; USA (2011)	RCT	n=96 (female=75%) • EG (n=47): Age: 42.6 ± 10.7 • CG (n=49): Age: 43.2 ± 11.7	EG: Podcast + enhanced mobile media (instructed to download diet and PA monitoring app and to add Twitter to their mobile device) for 27 weeks CG: Podcast + book with calorie and fat gram amounts of food	<b>3 months (% Weight Change):</b> EG: decrease of 2.6 ± 3.5 CG: decrease of 2.6 ± 3.8 <b>6 months (% Weight Change):</b> EG: decrease of 2.7 ± 5.6 CG: decrease of 2.7 ± 5.1	1b
Patrick et al.; USA (2009)	RCT	n=65 (80% female) • EG (n=33): Age: 47.4 ± 7.1 • CG (n=32): Age: 42.4 ± 7.5	EG: Personalized SMS and MMS messages sent two to five times daily for 16 weeks, printed materials, and brief monthly phone calls from a health counselor CG: receipt of monthly printed materials about weight control. Printed material differed from that given to the EG	<b>Weight [ES=3.33]:</b> EG: decrease of 2.1kg ± 0.51 CG: decrease of 0.4kg ± 0.51	1b

### RESULTS:

- The studies were identified based on figure 1.

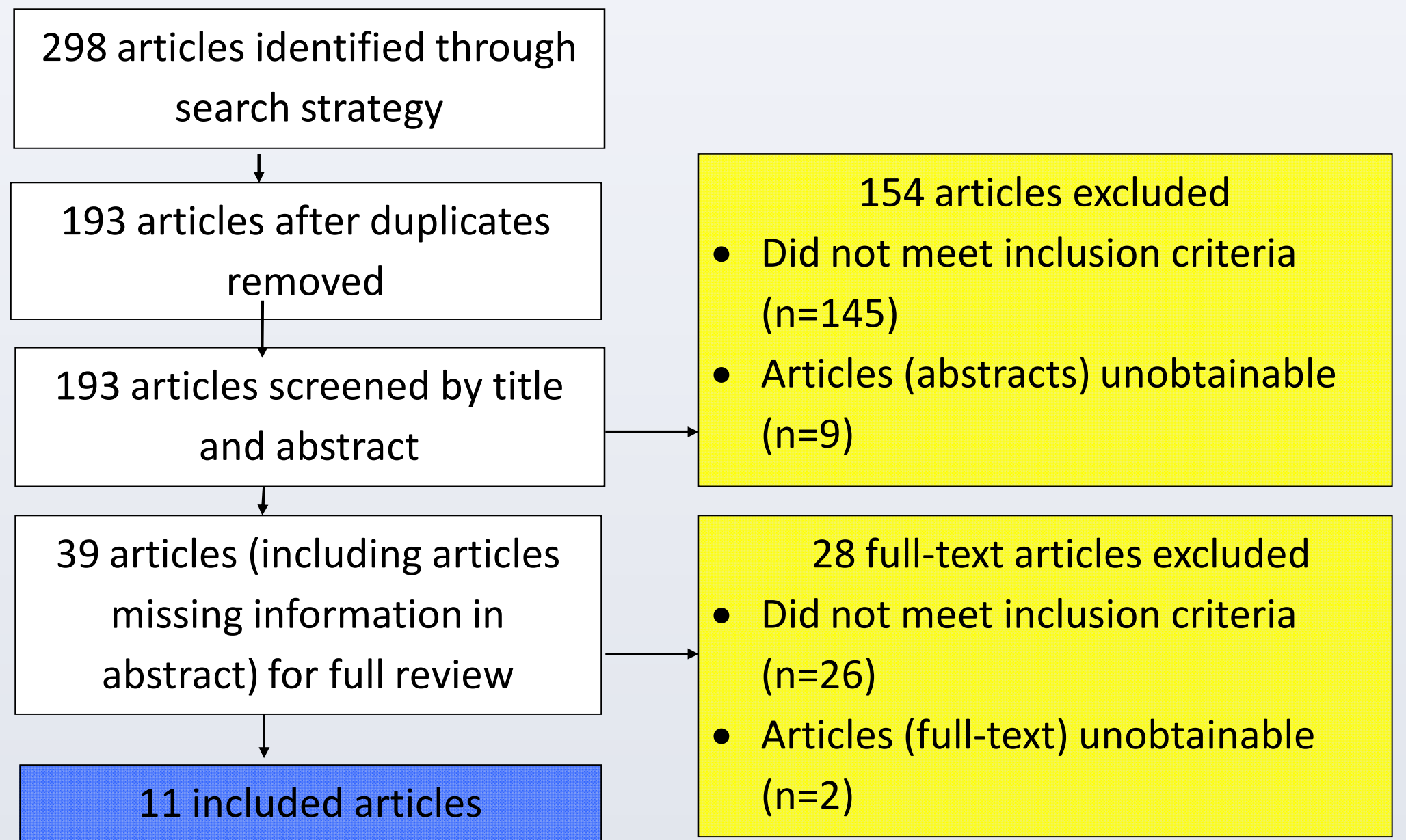


Figure 1: Identifying Studies For Inclusion

- Overall level of evidence showed a **Grade C** in the one-way interactivity group as well as in the low frequency two-way interactivity group, and a **Grade D** in the high frequency two-way interactivity category
- Modest evidence was found for the effectiveness of mobile phones in the deliverance of weight loss interventions.

### DISCUSSION:

- Publication dates range from 2007 to 2011, with the majority after 2007, indicating an increase in this type of intervention for lifestyle changes
- Inconsistencies in quality of studies with ~1/3 good quality and ~2/3 poor quality
- Variety of mobile interventions with the majority using mobile phones to their full potential
- 4 high quality studies had interventions including an accountability component, as well as a comparator group of no or minimal care

### LIMITATIONS OF STUDIES:

- Quality of studies varied greatly.
- Weaknesses of studies include: high dropout rates, lack of randomization, small sample sizes, company-funded study, heterogeneity of sample populations, interventions, and control methods.

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