Computer-tailored weight reduction interventions targeting adults: a narrative systematic review

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CRD summary
The authors concluded that the effectiveness of second- and third-generation computer-tailored interventions was inconclusive for physical activity behaviour change, stronger for dietary behaviour and promising for weight reduction. Potential methodological limitations in the search and study selection, limited presentation of results data and the suboptimal quality of some studies made the reliability of these conclusions unclear.

Authors' objectives
To evaluate the effectiveness of second- and third-generation computer-tailored primary prevention interventions for weight reduction, physical activity and dietary behaviour change in adults.

Searching
MEDLINE, EMBASE, PsycINFO, CINAHL and EBM Reviews were searched for published English-language studies from January 1996 to January 2008. Search terms were reported. Previous systematic reviews and reference lists of relevant articles were searched to identify additional studies.

Study selection
Fully published English-language articles that contained randomised controlled trials (RCTs) or quasi-experimental designs that assessed second- or third-generation computer-tailored interventions for weight reduction, physical activity or dietary behaviour change in adults were eligible for inclusion. Second-generation interventions were those delivered by interactive technology or desktop applications. Third-generation interventions were delivered by mobile and remote devices. Studies had to report pre- and post-test outcome data. Eligible outcomes were weight-related measurements (such as body mass, body weight and waist circumference) and behavioural outcomes for physical activity and diet. Eligible interventions were those with limited interpersonal contact (such as computer-tailored feedback through telephone or email), initial one-off face-to-face sessions for instructing participants in use of the technology or data collection and interventions that had additional treatment arms (such as face-to-face sessions). Studies with significant face-to-face contact were excluded, as were studies in which the intervention was targeted at caregivers, health professionals and those either with a manifest chronic disease state or whose recruitment was based on chronic disease registries.

All except one of the studies described second-generation interventions. Delivery mechanisms for computer-tailored interventions included desktop computer programs, internet/intranet, telephone and multimedia. Interventions varied in terms of duration and exposure, intensity, use of theory and outcome measurement tools. In the dietary studies, behavioural outcomes included reduced fat intake and increased fruit, vegetable or fibre consumption. In the physical activity studies, the measurement of behaviour change was not reported beyond the direction of effect. In the weight reduction and dietary studies, higher intensity interventions were compared with lower intensity interventions or no treatment controls. Most included studies involved self-selected healthy adults recruited through community, workplace, primary health care settings and the military. Where stated, participants were predominantly Caucasian female and well educated.

The authors did not state how many reviewers carried out study selection.

Assessment of study quality
Study quality was assessed using a checklist of nine criteria of randomisation, baseline equivalence of groups, description of control group, follow-up, validity and reliability of outcome measures, power analysis, treatment of missing data and whether the intervention was theory based. Each criterion was equally weighted and scored ultimately as a percentage of the maximum obtainable score (18 points).
Two independent reviewers carried out the quality assessment. Disagreements were resolved by consensus.

**Data extraction**
Data were extracted in order to present the direction of effect on the range of pre- and post-test outcomes with significant findings highlighted. In some studies, data on outcome mediators were extracted.

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**Methods of synthesis**
A narrative synthesis of each outcome was provided and differences between the studies were discussed in the text.

**Results of the review**
Twenty-two studies (24 publications) were included in the review. Sample sizes ranged from 31 to 1,071.

**Weight reduction interventions (six studies):** Three studies reported short-term (follow-up six months or less) between-group differences for weight reduction in terms of percentage body fat decrease, weight loss, body mass index and waist-to-hip ratio. Quality assessment scores ranged from 56 to 89%.

**Physical activity interventions (eight studies):** Five of eight studies that focused on physical activity reported a significant difference between the intervention and comparator group in terms of positive behaviour change. Quality assessment scores ranged from 44% to 89%.

**Dietary interventions (13 studies):** Significant short- to medium-term positive effects on dietary behaviour outcomes were reported for computer-tailored interventions (seven studies). Five studies reported a significant between-group effect on fat intake in favour of the computer-tailored intervention over a control group: three of these studies reported within-group positive effects on fat intake, but no significant between-group effects; and two found positive between-group effects for mediators such as knowledge, awareness, self efficacy, stage of change and intention to change. The computer-tailored intervention yielded positive effects over the control group for increasing fruit and vegetable intake (four studies) and for increasing fibre intake (three studies). Quality assessment scores ranged from 33% to 78%.

**Cost information**
One study of dietary outcomes reported that the cost of setting up a website was at least $20,000 Australian dollars.

**Authors’ conclusions**
Evidence for effectiveness of computer-tailored interventions for physical activity behaviour change was inconclusive. The evidence of short-term effectiveness for computer-tailored dietary behaviour change interventions was fairly strong. Such interventions had potential to reach large self-selected groups of people. There was uncertainty about whether reported behaviour changes were generalisable or sustainable long term. The evidence for weight reduction outcomes was promising, but limited to a small number of heterogeneous studies. The relative success of different components of some efficacious interventions was unclear, as was optimal intervention intensity.

**CRD commentary**
The review question was clear and supported by potentially replicable inclusion criteria. The search strategy included some relevant data sources, although language and publication biases were possible. Appropriate quality assessment criteria were applied and the results were used to highlight the strength of the findings. Sufficient attempts were made to minimise reviewer error and bias in data extraction and quality assessment; the study selection process was not reported. Study details for dietary and weight reduction interventions were adequately presented, although (in many studies) the absence of numerical data to support the direction of effect made the validity of reported results difficult to verify. The chosen method of synthesis appeared appropriate in light of variability across the included studies.

The authors’ conclusions reflected the evidence presented. Potential methodological limitations in the search and study selection and the limited presentation of results data made the reliability of the conclusions unclear.
Implications of the review for practice and research

Practice: The authors stated that weight reduction interventions should be based on theory and tailored to the individual.

Research: The authors stated that (for physical activity interventions) studies should more effectively determine generalisability by replicating efficacy trials in different populations and settings. Studies with follow-up periods of at least a year were needed, as were studies that reported cost-effectiveness data, optimal intensity of interventions, effectiveness and timing of tailoring, and the best way of delivering interventions that targeted more than one behaviour change. For dietary interventions, the authors stated that further research that used objective outcome measures and on engagement and acceptability of such interventions was needed. Further research was warranted on weight-reduction studies that used telephone support or internet as an intervention and maintenance strategy.

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