A meta-analysis of computer-tailored interventions for health behavior change

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CRD summary
The review concluded that computer-tailored interventions had potential to improve health behaviours and suggest strategies that may lead to greater effectiveness of these techniques. The authors' conclusions reflect the evidence presented, but the lack of validity assessment and differences between studies make the reliability of the conclusions uncertain.

Authors' objectives
To assess the efficacy of computer-tailored interventions for health behaviour change.

Searching
PsycINFO, PubMed, CINAHL and The Cochrane Library were searched for studies published between 1988 and 2009. Search terms were reported. Reference lists from retrieved articles were scanned for additional articles. Databases were searched again for articles published by previously identified authors.

Study selection
Controlled studies of computer-tailored interventions aimed at changing health behaviours compared with a non-tailored comparison group were eligible for inclusion. Computer-tailored interventions had to be provided primarily through communication channels that did not use live counsellors. Eligible studies had to report sufficient data to enable calculation of effect sizes.

In the included studies, computer-tailored interventions were aimed at smoking cessation, increased physical activity, improved dietary practices and mammography screening. Control groups included assessment only or minimal intervention (such as brochures, behavioural feedback only and no treatment). Most studies evaluated one health behaviour; some studies evaluated two or more health behaviours. Most of the included studies conducted a proactive recruitment strategy. Most interventions were delivered at home; other studies were delivered in clinics, schools and work sites. Measurement of outcomes varied widely between studies. Mean age of participants was 41.8 years. Most participants were female (70%). Most studies described nearly a quarter of recruited participants as being "non-white". Most studies were conducted in USA or Europe; other studies were conducted in Australia and New Zealand.

Two reviewers independently selected studies for inclusion.

Assessment of study quality
The authors did not conduct a formal methodological quality assessment. Some assessment of quality of reporting of data was reported.

Data extraction
Data on outcomes were extracted to enable calculation of effect sizes using Hedges g methods (small \( g=0.15 \), medium \( g=0.20 \) and large \( g=0.25 \)). Minimal intervention was chosen as the reference group for effect size calculation over assessment-only control groups where possible. For longitudinal analysis, effect sizes were grouped into categories by final outcome time point from baseline with each study contributing only one effect size. Studies that did not provide sufficient information for effect size calculation were excluded.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Data were pooled using random-effects and fixed-effect models. Heterogeneity was assessed with the Q test. Tailoring of intervention and demographic moderators were explored by analysing between-group variance using a fixed-effect model and meta-regression. Publication bias was assessed using Orwin’s fail-safe N and trim-and-fill methods.
Results of the review

Eighty-eight controlled studies (106,243 participants) were included in the review and 119 effect sizes were reported. Overall there was a significantly greater effect for tailored interventions compared to control groups (fixed effect \( g = 0.17, 95\% \text{ CI} \ 0.14 \text{ to } 0.19 \) and random effect \( g = 0.17, 95\% \text{ CI} \ 0.14 \text{ to } 0.20 \); 88 studies). There was evidence of significant statistical heterogeneity (\( p < 0.001 \)).

All health behaviours reported significantly greater effects (fixed-effect) for tailored interventions compared to control groups for smoking cessation (\( g = 0.16, 95\% \text{ CI} \ 0.12 \text{ to } 0.19 \); 32 interventions), dietary fat reductions (\( g = 0.22, 95\% \text{ CI} \ 0.18 \text{ to } 0.26 \); 26 interventions), fruit and vegetable intake (\( g = 0.16, 95\% \text{ CI} \ 0.10 \text{ to } 0.21 \); 25 interventions), mammography (\( g = 0.13, 95\% \text{ CI} \ 0.08 \text{ to } 0.18 \); 12 interventions) and physical activity (\( g = 0.16, 95\% \text{ CI} \ 0.10 \text{ to } 0.21 \); 25 interventions).

Longitudinal analysis reported that although effects declined over time, results remained statistically significant for long-term follow-up (\( g = 0.12, 95\% \text{ CI} \ 0.08 \text{ to } 0.16 \)).

Moderator analysis reported that effect size increased for every additional contact and dynamic tailoring was associated with larger effect sizes than static tailoring. Effect sizes increased across studies that intervened on one, two and three behaviours, but this trend did not continue with studies that intervened on four behaviours. No other moderator variables reported any significant differences. Orwin's fail-safe \( N \) showed that an additional 58 studies with null effects would be needed to reduce the overall effect size to a clinically non-significant outcome (\( g = 0.10 \)).

Authors’ conclusions

This review demonstrated that computer-tailored interventions had potential to improve health behaviours and suggested strategies that may lead to greater effectiveness of these techniques.

CRD commentary

The review question was clear. Inclusion criteria were broadly defined. Several relevant sources were searched. Inclusion of published studies only risked publication bias; formal assessment of publication bias found no significant evidence. It was unclear whether language restrictions were applied. Appropriate methods were used to select studies; whether similar steps were taken to extract data was unclear. No formal validity assessment was conducted. An overall number of points for each study for overall study reporting was reported in supplementary material. It may not have been appropriate to pool such statistically heterogeneous studies that had apparent differences in interventions and outcomes. It appeared that interventions had to have a sufficient number of studies (at least 10) before they were included in the review. Only controlled studies were included. Actual study designs were not reported. More than 70\% of the participants were women and generalisability of the results to different participant groups was unclear.

The authors’ conclusions reflect the evidence presented, but the lack of validity assessment and differences between studies of interventions and outcomes make the reliability of the conclusions uncertain.

One of the review authors was a founder and consultant to a company that develops and disseminates tailored interventions.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that further research was required to improve intervention maintenance and to define specific mechanisms that promoted optimal effectiveness of computer-tailored interventions, including content and depth of tailoring.

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