Efficacy of computer technology-based HIV prevention interventions: a meta-analysis

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CRD summary
The authors concluded that computer-technology based interventions showed promise for future prevention of HIV (human immunodeficiency virus). Continued development, testing and dissemination could increase the public health impact of HIV behavioural interventions and potentially avoid new infections. Potential limitations in the review process and uncertainties about the quality and pooling of studies make the reliability of the authors' conclusions unclear.

Authors' objectives
To assess the effectiveness of computer technology-based HIV prevention behavioural interventions in increasing condom use in at-risk populations.

Searching
MEDLINE and PsycINFO were searched up to March 2008. Search terms were reported. Citations of located articles were searched using Social Science Citation Index. Review articles were located to identify relevant studies. Reference lists of identified articles were searched manually. Experts in the field were contacted for unpublished data.

Study selection
Randomised controlled trials that assessed the efficacy of an HIV prevention behavioural intervention developed or delivered via computer technology to change sexual risk behaviours in individuals of HIV-negative or unknown serostatus were eligible for inclusion. Computer technology could include desktop or laptop computers, the Internet, interactive video, cell phones or personal digital assistants (PDAs). Primary outcomes of interest were condom use and unprotected sex.

Most studies were conducted in the United States between 2002 and 2008 in individuals from various ethnic backgrounds. Most studies were of heterosexual active individuals; other studies included homosexual males. Mean age of participants was 22.52 years. Interventions were individually tailored, virtual decision-making or targeted at groups and were based on various theories and models. Interventions were delivered over one to six sessions. Control groups received computer-based information, no treatment, usual care, content/topic-matched control, nutrition education and peer counselling. In addition to the primary outcomes of interest, outcomes reported included the number of sexual partners and incidence of sexually transmitted disease.

It was unclear how studies were selected for the review.

Assessment of study quality
Two reviewers independently assessed studies for length of follow-up, study retention and type of comparison group. Discrepancies were resolved through discussion between the two reviewers and the primary author.

Data extraction
Outcome data for the longest follow-up period were extracted from individual studies to calculate effect sizes (Cohen's d) and 95% confidence intervals (CIs), adjusted for baseline differences among treatment groups.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Both fixed-effect and random-effects models were used to combine effect sizes weighted by sample size, and their 95% CIs. Only fixed-effect results were reported in the review. Statistical heterogeneity was assessed using the Q statistic.

Further analyses were conducted to assess effects on effect sizes of moderator variables: gender, population,
intervention type and use of tailoring, behavioural theory, stages of change model, intervention dose (low dose=1 to 2 contacts, high dose=3 or more contacts), provision of skills training, comparison group and publication status. Sensitivity analyses were undertaken by removal of studies with low retention rates.

Publication bias was assessed using fail-safe N values (Orwin’s method and Rosenthal’s method).

Results of the review
Twelve RCTs (n=4,639) were included in the review. Follow-up duration ranged between one and 24 months. Retention rates (where reported) ranged from 37% to 95% (mean 70%).

Computer-based technology statistically significantly increased condom use (d=0.259, 95% CI 0.201 to 0.317; 12 RCTs). There was evidence of statistical heterogeneity (p=0.007). Sensitivity analysis did not significantly alter the results. Fail-safe N suggested that a large number of unpublished studies additional to those included in the meta-analysis would need to exist to nullify the reported effect size.

Computer-based technology had a statistically significant effect on reducing the frequency of sexual behaviour (d=0.427, 95% CI 0.251 to 0.602; three RCTs), incidence of sexually transmitted disease (d=0.140, 95% CI 0.035 to 0.245; three RCTs) and number of sexual partners (d=0.422, 95% CI 0.116 to 0.728; two RCTs).

Further analyses showed that there were statistically significant associations between effect size and gender (female-only interventions reported the largest effect size, p<0.01), individually tailored interventions (both p<0.001), stages of change model (p<0.001) and intervention dose (p<0.05).

Authors’ conclusions
Computer-technology based interventions showed promise for future prevention of HIV. Continued development, testing and dissemination could increase the public health impact of HIV behavioural interventions and potentially avoid new infections.

CRD commentary
The review question and inclusion criteria were clearly defined. The literature search was appropriate and included attempts to locate unpublished data. It was unclear whether the search was restricted by language. Assessment of publication bias showed low potential for bias. The authors identified certain methodological characteristics, but as this was limited it was difficult to determine the quality of the included studies. The authors did not state how many authors extracted data and it was unclear how studies were selected for inclusion in the review, so reviewer error and bias could not be ruled out. There was some evidence of statistical heterogeneity. The authors acknowledged the diversity among study populations and went some way to further investigate the sources of heterogeneity. It may have been more appropriate to report results from the random-effects model, although the authors stated that these were similar to the reported fixed-effect results. Only a small number of studies were included for some of the outcome comparisons. Follow-up durations were short for some studies. Attrition rates were high for most studies (>20%).

Limitations with the included studies, potential for bias in the review process and uncertainties about the quality and pooling of the studies make it difficult to determine the reliability of the authors’ conclusions.

Implications of the review for practice and research
Practice: The authors stated that because the interventions were successful with a number of diverse populations, this may bode well for the broad application of these types of interventions.

Research: The authors stated that further research was warranted to investigate individually tailored interventions in HIV prevention. Further RCTs were needed to develop improved online interventions.

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