Computer-delivered interventions to reduce college student drinking: a meta-analysis
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CRD summary
This review concluded that computer-delivered interventions reduced the quantity and frequency of drinking among college students in the short and long term, and were equivalent to alternative alcohol-related interventions. The methods were largely appropriate, but a lack of individual study results makes it difficult to confirm the authors' strong conclusions.

Authors' objectives
To evaluate the efficacy of computer-delivered interventions to reduce alcohol use in college students.

Searching
The following databases were searched: PubMed, PsycINFO, CINAHL, Dissertation Abstracts, ERIC, the Cochrane Library and CRISP (Computer Retrieval of Information on Scientific Projects). Search terms were reported, search dates were not specified. References of relevant papers and online journals were scanned. Listserv requests for papers were also made. Unpublished papers were considered for selection.

Study selection
Studies that compared an alcohol-related intervention delivered by computers or other electronic devices with a control condition were eligible for inclusion. Eligible studies had to report on behavioural outcomes in undergraduates in sufficient detail to allow calculation of effect sizes.

The outcomes of interest were alcohol consumption (quantity consumed over time; quantity per drinking day; maximum quantity on one occasion; frequency of heavy drinking; frequency of drinking days) and alcohol-related problems.

The majority of the included studies were randomised controlled trials (RCTs) and all reported pre- and post-intervention outcomes. Almost all studies were based in the USA. The participants were largely voluntary, although a small proportion of participants were targeted to take part. Most studies targeted at-risk groups such as heavy drinkers. The overall mean age of included participants was 19.71 years (range 18 to 22), 75% were white, and 50% were women.

A variety of computer-delivered interventions were assessed; over half were developed by the investigators; the majority were self-directed, with only a small number including group sessions or delivery. Full details of the intervention components were given in the paper. The typical intervention was a single session computerised task, delivered via the Internet, intranet or a CD/DVD, lasting a median of 20 minutes including alcohol consumption feedback, education, normative comparisons and tailored materials.

The authors did not report how many reviewers selected studies for inclusion.

Assessment of study quality
Study quality was assessed by two reviewers independently using 12 items adapted from two validated measures. The range of possible scores was 0 to 17 and included items from the Jadad scale (further details not reported). Inter-rater reliability was calculated and disagreements resolved through discussion.

Data extraction
Control conditions were classified as containing alcohol-related content or non-relevant content. Where a study reported on more than one comparator arm, the condition with least contact or no computer delivered component was extracted. Effect sizes (ES) were calculated as the mean difference between study arms divided by the pooled standard deviation (SD) or from other statistical information where means and standard deviations were not reported. Dichotomous outcomes were extracted as odds ratios and then transformed into effect sizes.
Authors were contacted for additional information. If insufficient information was reported by the authors, and no significant differences reported, the effect size between groups was assumed to be zero. Where a study reported multiple measures of the same outcome the effect sizes were averaged.

Two reviewers independently carried out data extraction and relevant calculations; any discrepancies were discussed.

**Methods of synthesis**
Fixed-effect and random-effects models were used to pool effect sizes and calculate weighted mean effect sizes for short- and long-term follow-up, alcohol consumption and alcohol-related problems. Effect sizes were grouped according to follow-up point: short term was five weeks or less; long term was six weeks or more. Heterogeneity was assessed by calculating $Q$ and $I^2$. Meta-regression was used to explore relationships between effect size and study characteristics. One study was noted to have a very large sample size in comparison to the others and this was reported to exert undue influence on the analyses of three variables, so its impact was explored in sensitivity analyses.

**Results of the review**
A total of 35 studies reporting on 43 interventions were included in the review (n=28,621 participants). Mean methodological quality score of the studies was 9.37 out of a maximum possible of 17 (range 3 to 13).

**Short-term follow-up:** College students who received a computer-delivered intervention significantly reduced the quantity of alcohol consumed on specific days/ intervals (ES 0.10, 95% CI 0.01 to 0.20), and the maximum quantity consumed (ES 0.16, 95% CI 0.01 to 0.31) compared with control groups. There were no significant differences between computer-delivered intervention groups and control groups on quantity of consumption, frequency of heavy drinking, drinking days or alcohol-related problems. Fixed-effect and random-effects models produced similar results. There was only significant heterogeneity only the alcohol-related problems variable ($I^2=51\%$).

**Long-term follow-up:** College students receiving a computer-delivered intervention significantly reduced their quantity of alcohol consumed (ES 0.15, 95% CI 0.05 to 0.25), frequency of drinking days (ES 0.16, 95% CI 0.03 to 0.29), and alcohol-related problems (ES 0.16, 95% CI 0.06 to 0.25) compared with control groups. There were no significant differences for any of the other outcome variables. Significant heterogeneity was noted only for the frequency of heavy drinking variable.

Further analyses were reported including comparing results by type of control (alcohol-relevant and non-relevant), moderators of alcohol consumption (study characteristics, gender, length of intervention) and within-group changes over time.

**Authors’ conclusions**
Computer-delivered interventions reduced the quantity and frequency of drinking among college students, but the effects depended on the nature of the comparison group. Computer-delivered interventions were generally equivalent to alternative alcohol-related comparison interventions.

**CRD commentary**
This review addressed a clear question with adequate inclusion criteria and searches. Unpublished studies were included to reduce publication bias, but it was unclear if papers not in English were considered for inclusion. Two reviewers performed data extraction, calculations and quality assessments, but the process of study selection was not fully described. It seemed likely that reviewer error/bias was minimised.

The primary studies were assessed for quality, but by using a single numerical score without reporting the criteria, it was difficult to judge reliability or validity. The analyses appeared to have been appropriate, but without forest plots or results of individual studies, the reliability of the pooled results could not be judged. Statistical significance was reported, although the effect sizes were relatively small. The review was focused on the USA, which may likely limit the generalisability of the conclusions.

The methods were largely appropriate, but a lack of individual study results makes it difficult to confirm the authors’ strong conclusions.
Implications of the review for practice and research

Practice: The authors did not make any recommendations for practice.

Research: The authors suggested that future research should focus on comparing computer delivered interventions (commercial and newly developed packages) against alternate interventions with varying levels of intensity, and they should also explore active components and modes of delivery.

Funding
National Institute on Alcohol Abuse and Alcoholism, grant numbers KO2-AA15574 and RO1-AA12518

Bibliographic details

PubMedID
19744139

DOI
10.1111/j.1360-0443.2009.02691.x

Original Paper URL
http://onlinelibrary.wiley.com/journal/122594636/abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Alcohol Drinking /prevention & control /trends; Alcohol-Related Disorders /prevention & control; Ethanol /poisoning; Female; Health Education /methods; Health Knowledge, Attitudes, Practice; Humans; Internet; Male; Program Evaluation /statistics & numerical data; Randomized Controlled Trials as Topic; Students; Therapy, Computer-Assisted /methods; Time Factors; Treatment Outcome; Universities; Young Adult

AccessionNumber
12009110307

Date bibliographic record published
03/02/2010

Date abstract record published
14/07/2010

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.