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# Electronic communication based interventions for hazardous young drinkers: A systematic review

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## Highlights

- Within this systematic review, various modes of intervention delivery were discussed. Although most are Web-based, other modalities included text messaging, mobile phone apps and SNS, demonstrating the potential in reaching a large number of young people in a convenient and non-intrusive way.
- The ability to provide personalized feedback resulted in a reduction in (a) alcohol consumption (b) frequency of binge drinking and (c) drinking in a non-risky way
- Intervention length did not appear to have an impact on overall effectiveness

## Abstract

Previous reviews have specifically looked at computer-based or Internet-based approaches. However, there has been no systematic review focused upon electronic communication based interventions for hazardous young drinkers.

Out of 3298 relevant citations, 13 papers consisting of 11 studies met the inclusion criteria. Effectiveness of intervention delivery was assessed using behavioural outcomes. Eight papers delivered interventions using the Web, three implemented text messaging, one used a mobile phone app and the remaining paper used a social networking site.

The ability to provide personalized electronic feedback resulted in a reduction in alcohol consumption, frequency of binge drinking, and drinking in a non-risky way. However, intervention length did not appear to have an impact on overall effectiveness.

Usage of text messaging and Social Network Sites (SNS) increased accessibility and ease of engaging in an intervention that is appealing and acceptable for young adults.

## Abbreviations

SNS Social Network Sites

SMS Short Message Service

MMS Multimedia Message Service

NES National Health Service Education Scotland

NHS National Health Service

NICE National Institute for Health and Care Excellence

SIGN Scottish Intercollegiate Guidelines Network

WHO World Health Organisation

## **1. Introduction**

Heavy episodic drinking is a significant public health concern, tending to peak in late adolescence and early adulthood (Gmel, Kuntsche & Rehm, 2010). A high prevalence of excessive alcohol consumption has been reported by young people in the UK, with first year students consuming an average of 18.9 units per week (males 24.0 units, females 15.4 units) (Bewick *et al.*, 2008). One university has previously reported that over half of students have participated in binge drinking at least once in the previous week (Dodd *et al.*, 2010).

As the number of those engaging in heavy episodic drinking is rapidly increasing (Kypri *et al.*, 2005; McAlaney & McMahon, 2007), there is a disproportionate number of mortality and morbidity amongst young people through alcohol-related injuries (Anderson & Baumberg, 2006; Rehm *et al.*, 2011). The increased affordability of alcohol (Rabinovich *et al.*, 2009; The Information Centre, 2010), combined with a wider product range (Measham, 2006; Mintel International Group, 2005) and amended UK alcohol policies e.g. extension of opening hours (Office of Public Sector Information, 2003), has resulted in excessive alcohol consumption becoming the dominant trend within Western cultures (Farke & Anderson, 2007; Hibell *et al.*, 2009), particularly student populations (D'Alessio, Baiocco & Laghi, 2006).

The term hazardous drinking is defined as the regular consumption of 5 units per day for men and 3 units per day for women (SIGN, 2014), or through less frequent sessions of binge drinking (NHS Choices, 2013). This pattern of alcohol consumption can increase someone's risk of harm, resulting in physical or mental health consequences, whilst some would extend this definition to include social consequences (NICE, 2010a; WHO, 2016). Preventative measures and interventions have been identified as essential in order to reduce levels of hazardous alcohol consumption amongst younger adults.

There are a number of methods and recommendations for delivering alcohol interventions, consisting mainly of traditional face-to-face or group work sessions (NICE, 2010b). Evidence suggests that this technique is effective in reducing alcohol use of binge drinkers and levels of alcohol-related harm (Bernstein *et al.*, 2010; Daepfen *et al.*, 2011; Patton *et al.*, 2014). This has also been demonstrated within group sessions (LaBrie *et al.*, 2006), particularly when comparing motivational interviewing with information only sessions (LaChance *et al.*, 2009).

From a global perspective there has been a 23.5% increase in alcohol consumption from 2001 to 2005 and worldwide, 3.3 million deaths every year result from harmful use of alcohol. This represents 5.9 % of all deaths. Within the UK alcohol misuse has been estimated to cost £2.7 billion a year, and the estimated cost of alcohol-related harm upon society being £17-22 billion (Department of Health, 2013; NHS Information Centre, 2009). Interventions utilizing technology have demonstrated effectiveness in improving health outcomes across a number of domains: diabetes (Liang *et al.*, 2011), smoking cessation (Free *et al.*, 2011; Whittaker *et al.*, 2012), obesity (Bacigalupo *et al.*, 2013; Coons *et al.*, 2012), and HIV (Mustanski *et al.*, 2013). By delivering methods

via interactive devices such as mobile phones and personal electronic devices, a wider population can be targeted who may not have ordinarily been reached through traditional methods (Guse *et al.*, 2012; Lee *et al.*, 2014; Strecher *et al.*, 2007). Mobile phone and internet technology are becoming increasingly integrated into society, as an estimated 40% of the world's population have access to the internet, and the number of mobile broadband subscriptions will reach 2.3 billion globally by the end of 2015 (ITU, 2014). Consequently, utilising mobile and internet technology potentially can be a time and cost-effective method of delivery intervention, reaching a larger population.

Previous reviews have specifically investigated computer-based (Khadjesari *et al.*, 2011) or Internet-based approaches (White *et al.*, 2010), however, there has been no systematic review focused upon electronic communication based interventions for hazardous young drinkers. Such a review is therefore timely.

## **Objective**

To review the efficacy of electronic based communication interventions for alcohol misuse amongst hazardous young drinkers.

## **2. Methods**

### **Literature Search**

Systematic searches of Web of Science, PsycINFO and Scopus were conducted for English abstracts published (except dissertations) between January 2010 and January 2016. This specified time frame was selected as a review analysing similar papers of interest was conducted in 2010 (White *et al.*, 2010). The terms: (1) alcohol; (2) computer, online; (3) Internet, Web; (4) text message; (5) AND intervention; (6) AND young adult, student were used to search for relevant studies. The quality of papers was assessed using the Cochrane Collaboration's Tool for Assessing Risk of Bias, enabling reviewers to consider the potential limitations of the included studies, in relation to its design, conduct, analysis and presentation (Higgins *et al.*, 2011). This comprehensive and well-disseminated approach has demonstrated empirical evidence for detection bias, attrition bias, and reporting bias (Higgins & Green, 2008).

### **Inclusion criteria**

### *Study design*

Quantitative studies were included. Specifically, only randomised controlled trials and cohort studies with comparison groups were considered. Comparison groups consisted of treatment as usual, placebo groups, and no intervention groups.

### *Populations*

Those who were screened as being hazardous drinkers with the use of validated alcohol screening tools before intervention delivery were included. Hazardous drinking is defined as the regular consumption of 5 units per day for men and 3 units per day for women (SIGN, 2014), or through less frequent sessions of binge drinking (NHS Choices, 2013). This pattern of alcohol consumption can result in an increase in someone's risk of harm, (physical, mental health, or even social consequences) (NICE, 2010; WHO, 2016). Samples comprising of both males and females, aged 18-25 years old were included within this study.

### *Interventions*

Behavioural interventions delivered via electronic communication methods: (1) Web-based; (2) email; (3) text messages (SMS) and (MMS) and; (4) Social Network Sites (SNS).

### *Outcomes*

Studies measuring behavioural outcomes, consisting of both short- and long-term outcome measures.

### **Exclusion criteria**

Studies were excluded if they contained the following features: (i) mixed methodology (ii) individuals already in treatment for alcohol misuse; (iii) interventions requiring human involvement (e.g., researcher, psychologist) and (iv) interventions targeting specific sub-populations. All dissertations were excluded and articles not written in English.

### **3. Results**

A total of 3298 potentially relevant citations were found. The majority of these citations were unsuitable for this review, focusing on a combination of health behaviours and gender-specific interventions, or designed for the general population or alcohol dependent individuals. Following

extraction of 538 duplicates and pieces of grey literature, the abstracts of 73 studies were examined further for more information. Two papers were removed due to the intervention focusing on a range of health behaviours (Cameron *et al.*, 2015; Epton *et al.*, 2014). The utilisation of mixed methods was not part of this review's inclusion criteria (Fraeyman *et al.*, 2012), as was the use of therapist involvement (Postel *et al.*, 2010). One paper specifically discussed the use of behaviour change techniques (Garnett *et al.*, 2015), whilst another focused upon the use of a screening tool (Winters *et al.*, 2011).

The full papers of the remaining 64 studies were examined in order to confirm eligibility. Twenty-two papers were excluded due to lack of screening before intervention delivery (Bendtsen *et al.*, 2012; Bingham *et al.*, 2010; Bingham *et al.*, 2011; Collins *et al.*, 2014; Donovan *et al.*, 2015; Fazzino *et al.*, 2015; Foster, Neighbors & Pai, 2015; Hagger, Lonsdale & Chatzisarantis, 2012; Haug *et al.*, 2013; Hustad *et al.*, 2010; Jouriles *et al.*, 2010; LaBrie *et al.*, 2013; Lovecchio, Wyatt & DeJong, 2010; Murphy *et al.*, 2010; Neighbors *et al.*, 2010; Paschall *et al.*, 2011a; Paschall *et al.*, 2011b; Schuckit *et al.*, 2012; Schuckit *et al.*, 2015; Strohman *et al.*, 2015; Weaver *et al.*, 2014; Wyatt, DeJong & Dixon, 2013).

A further 16 studies did not meet the age range criteria (Bewick *et al.*, 2013; Enggasser *et al.*, 2015; Sinadinovic *et al.*, 2014., Bendtsen & Bendtsen, 2014., Bendtsen *et al.*, 2015; Bewick *et al.*, 2010; Dumas *et al.*, 2014; Ekman *et al.*, 2011; Kypri *et al.*, 2010; Kypri *et al.*, 2013; Lotfipour *et al.*, 2013; McCambridge *et al.*, 2013; Moreira, Oskrochi & Foxcroft, 2012; Schulz, Kremers & de Vries, 2012; Schulz *et al.*, 2013; Tensil, Jonas & Strüber, 2013). Four papers were simply commentaries on other studies, or reviews (Cronce *et al.*, 2014; Hustad & Borsari, 2010; Naimi & Cole, 2014; Rodriguez *et al.*, 2015), whilst one study discussed the method of designing a behaviour change intervention (Voogt *et al.*, 2014c), resulting in exclusion from this review. A further 4 papers did not include a treatment control condition (Alfonso, 2015; Bryant, Henslee & Correia, 2013; Canale *et al.*, 2015; Wodarski, MacMaster & Miller, 2012). Two papers used the same sample (Suffoletto *et al.*, 2014; Voogt *et al.*, 2013a) as other papers included within this review, thus were removed. Studies utilising a mixed methodology (Moore *et al.*, 2013), human involvement in the intervention (Wagener *et al.*, 2012) or targeting specific sub-populations, ranging from athletes (Martens *et al.*, 2010) to mandated college students (Reid *et al.*, 2015) were also excluded. Consequently, 13 papers were reviewed in this study, consisting of 11 studies.



**Insert Figure 1 Here**

### **Study characteristics**

In total, 13 papers were included from 11 studies (see Table 1) representing a range of methods of intervention delivery. Six used web-based intervention approaches, whilst the remainder applied text messages, mobile phone apps and SNS in order to deliver alcohol interventions. Outcome measures predominantly focused upon frequency of alcohol consumption, normative beliefs about alcohol, and behavioural intentions. Baseline measures were taken in all 11 studies, however, length of follow-up varied from 1 month to 12 months.

**Insert Table 1 HERE**

The delivery of interventions falls into four main areas.

#### **1. Web-based interventions**

Nine papers discussed delivering interventions using the Web, varying in length from 5 minutes to 35 minutes. Personalised feedback was found to reduce possible effectiveness among specific sub-groups of students (Cunningham *et al.*, 2012; Palfai, Zisserson & Saitz, 2011), with some evidence to suggest that this type of feedback could prevent the uptake of alcohol among those who do not drink (Palfai *et al.*, 2014). Hester *et al.*'s (2012) study comprising of personalised feedback along with decisional balance exercises, social norms and risk factors, found that reductions in drinking and alcohol-related problems tended to be significantly greater in the intervention group compared to the assessment only control group ( $p < .01$ ).

Kypri *et al.*'s (2014) study consisting of personalised feedback indicated a slight reduction in the amount consumed per typical drinking occasion, providing support that a brief intervention can have some impact upon alcohol consumption (Kaner *et al.*, 2007). However, there was no decrease in the frequency of drinking, overall volume consumed, or in related academic problems.

Although some of these studies demonstrated a number of strengths, achieving a diverse selection of student population and drinking cultures (Kypri *et al.*, 2014), utilising a randomised controlled design (Hester *et al.*, 2012), and achieving high retention rates (Palfai, Zisserson & Saitz, 2011), some had issues of being underpowered (Cunningham *et al.*, 2012), and potential social desirability bias (Hester *et al.*, 2012)

Improving knowledge, self-efficacy and awareness of social norms was found to significantly reduce weekly alcohol consumption (Voogt *et al.*, 2014b), and was particularly effective in lowering drinking levels for subgroups of heavy drinking students in the short-term (Voogt *et al.*, 2013b). It was also found that those in the experimental condition experienced higher social pressure Drinking Refusal Self-Efficacy (DRSE) compared to participants in the control condition, which was sustained after 6 months (Voogt *et al.*, 2014a).

Voogt *et al.*, (2013b; 2014a; 2014b) employed a rigorous methodology throughout each of the 3 papers. A high retention rate of the large sample size ( $N = 907$ ) ensured stable findings and the ability to detect significant differences, however, the generalisability of the study is reduced by the university specific population and convenience sampling strategy. Long outcome measures of 6 months were implemented, providing an enhanced knowledge of the lasting effects of the intervention.

## **2. Text message**

Automated text messages were found to have positive effects in the 3 papers included in this review. Personalised interventions, including tailored feedback and prompts, was associated with an increase in willingness to reduce alcohol use (Mason *et al.*, 2014), and a reduction in the number of Heavy Drinking Days (HDD) and Drinks Per Drinking Day (DPDD) (Suffoletto *et al.*, 2012; Suffoletto *et al.*, 2015). However, it was found that self-monitoring alone was not effective at decreasing alcohol consumption (Suffoletto *et al.*, 2015).

Although one study used a small sample size ( $N = 18$ ) (Mason *et al.*, 2014), thus limiting the ability to detect significance, Suffoletto *et al.*, (2015) employed a diverse and substantial sample size ( $N = 765$ ) with a 9-month follow-up, providing a better understanding of this method of intervention delivery. Overall, this approach was well received by participants, as 93% of those in the assessment and intervention groups replied to weekly drinking queries at least once over the 12 week period (Suffoletto *et al.*, 2012), whilst approximately 33% of participants completed all text queries in Suffoletto *et al.*,’s (2015) study. However, there are risks of self-selection bias (Mason *et al.*, 2014; Suffoletto *et al.*, 2012), and recall and social desirability bias (Suffoletto *et al.*, 2015) as only self-report were used.

### 3. Mobile Phone App

Gajecki *et al.*, (2014) delivered an alcohol intervention through the use of two smartphone apps; (1) *Promillekol app* (tr. “Check your BAC”) and (2) *PartyPlanner app*. The *Promillekol* app enabled users to register alcohol consumption in real time, along with information on risky levels of estimated blood alcohol concentration (eBAC), and strategies to maintain alcohol consumption at a non-harmful level. The *PartyPlanner* app also allowed users to register alcohol consumption in real time, as well as simulate an event where alcohol would be consumed ahead of time. During a drinking occasion, the app displayed the eBAC level with colour codes indicating a risky level.

No significant time-by-group interactions for any outcome measures were found for the *PartyPlanner* group, whereas male *Promillekol* participants reported an increase in their drinking frequency, but not larger quantities, at follow-up ( $p = 0.001$ ). Attrition rates were relatively low in this large study ( $N = 1929$ ). Significant differences in attrition rates were demonstrated between the two smartphone apps. Outcomes were self-reported in this study, and although computerised data collection may minimise social desirability bias (Booth-Kewley, Larson & Miyoshi, 2007; Gnamb & Kaspar, 2014). There is a need to study the validity of self-reported data in brief alcohol intervention trials to increase reassurance of the effects reported (Northcote & Livingston, 2011).

### 4. Social Networking Site

One study (Ridout *et al.*, 2014) delivered an alcohol intervention through an SNS, providing social norms feedback through the website’s private messaging facility, 1 week following a screening questionnaire. Statements included the comparison of participants’ perceptions of classmates’ use and approval of alcohol use, with actual descriptive and social norms calculated from their classmates’ survey questionnaire responses. In order to demonstrate their level of understanding of these statements, participants were required to complete an online form detailing their interpretation of the figures they received regarding their own and their classmates’ alcohol use and approval of heavy drinking. The research team addressed any errors in the participants’ responses with immediate follow-up through a second private message.

Results indicated that the intervention group improved their accuracy of social norms significantly more than the control group on three of the four social norms questions at 3 months follow-up. It

was also found that the intervention group reduced their monthly drinking quantity and frequency at follow-up significantly more compared with the control group ( $P < 0.01$ ). These findings are similar to that of Bryant *et al.*'s (2013), whereby personalised feedback results in a significant reduction in the number of drinks consumed per week. The study employed a rigorous methodology; however, 80% of the sample consisted of women, limiting the generalisability of the findings. Furthermore, there is a high risk of self-selecting bias, as respondents received course credits for participating in the follow-up surveys.

### **Quality Rating**

Quality of the 13 papers was assessed using the Cochrane Collaboration's Tool for Assessing Risk of Bias, in accordance with Higgins and Altman's (2008) approach. The majority of papers had some element of risk of bias, particularly with regards to the following domains (i) blinding, (ii) allocation concealment and, (iii) adequate sequence allocation, which raises some doubt about the results. A high risk of bias was found in the domain, free of other bias, across a number of papers, which may alter the results seriously. The results are presented in Table 2.

**Insert Table 2 Here**

## **4. Discussion**

Within this systematic review, various modes of intervention delivery were discussed. Although most are Web-based, other modalities included text messaging, mobile phone apps and SNS, demonstrating the potential in reaching a large number of young people in a convenient and non-intrusive way.

Intervention length did not appear to have an impact on overall effectiveness. The web-based approaches included within this review varied in duration, however, all produced a moderate effect on drinking amongst a specific subgroup sample. Modalities delivering interventions over an on-going period, ranging from a number of days to several weeks, were effective in reducing frequency of drinking. Due to the real time and pervasive aspects of mobile technology, delivering

interventions via this approach may act as a regular prompt and additional support in maintaining behaviour change (Dowshen *et al.*, 2012; Nundy *et al.*, 2013; Rodgers *et al.*, 2005; Shaw *et al.*, 2013).

The ability to provide personalized feedback resulted in a reduction in alcohol consumption (Kypri *et al.*, 2014), frequency of binge drinking (Voogt *et al.*, 2014b), and drinking in a non-risky way (Suffoletto *et al.*, 2015). Addressing the varying knowledge gaps of young people through an adaptable and tailored intervention is evidently effective; as this can help individuals better understand their own drinking behaviours and the associated health risks. Research indicates that targeting interventions for young adults is important developmentally, as psychosocial capacities that improve decision making and moderate risk taking are not fully developed until the age of 25 (Kelley, Schochet & Landry, 2004; Steinberg, 2004; Steinberg, 2007). Consequently, tailored interventions can serve to prevent individuals from further alcohol-related harm, or as some studies have found, prevent the uptake of alcohol amongst non-drinking students (Palfai *et al.*, 2014).

College and university students tend to misperceive their peer norms by overestimating the amount of alcohol consumed by peers (Mcalaney & McMahon, 2007). Preliminary findings from Ridout *et al.*'s (2014) social networking study found correcting misperceptions of peer drinking norms reduced monthly drinking quantity and frequency at 3 month follow-up. Additional factors have also been found to negatively impact upon alcohol use, such as peer pressure (Trucco *et al.*, 2011), tolerant community norms (Kuntsche, Kuendig & Gmel, 2008; Song *et al.*, 2012), and exposure to alcohol advertising (Jones & Magee, 2011; Smith & Foxcroft, 2007). A large body of evidence has demonstrated that the need to correct misperceptions is essential across a broad range of populations and health behaviours e.g. sun protection (Reid & Aiken, 2013), vaccinations (Nyhan & Reifler, 2015), breastfeeding (Reinsma *et al.*, 2015) and obesity (Duncan *et al.*, 2011). Consequently, identifying misperceptions and rectifying them through modern technology would appear to provide an opportunity to overcome barriers associated with more traditional modes of programme delivery.

Research indicates that interventions, to reduce alcohol consumption, based on mobile phone apps are associated with more weight loss than other types of interventions (Mateo *et al.*, 2015), and significantly higher rates of abstinence (Ubhi *et al.*, 2015). Interestingly, the implementation of a mobile phone app had very little effect on overall alcohol consumption, and in the case of the *Promillekol* app, frequency of drinking increased amongst male participants (Gajecki *et al.*, 2014). The significant difference between attrition rates of the two smartphone apps highlights the possible

importance of app content and design. Consequently, the need for both appealing features and low burden is essential in order for apps to be used over an extended period of time (Dennison *et al.*, 2013).

Interactive interventions have been found to successfully maintain behavioural change (Aneja *et al.*, 2012; Williams *et al.*, 2012). The act of responding to a series of text messages resulted in a decrease in the number of Heavy Drinking Days and maximum drinks per drinking days (Suffoletto *et al.*, 2012; Suffoletto *et al.*, 2015), whilst booster texts increased intentions to reduce alcohol use (Mason *et al.*, 2014). Consequently, a more interactive approach may prompt the individual to actively consider their current drinking behaviour, almost acting as a ‘teachable moment’, whereby behaviour change is triggered by a specific event, experience, or as a consequence of risky behaviour (Boudreaux, Bock & O’Hea, 2012).

The preference for using mobile technology was highlighted in Cunningham *et al.*,’s (2012) study, whereby 27% of respondents accessing the web-based intervention did so by using a mobile phone platform, even though the personalized feedback intervention was designed to be completed in a computer-based environment. This is supported by the high response rate in Suffoletto *et al.*,’s (2012) text message intervention, as 80% of respondents in the intervention group completed the 12 week study, indicating the ease and accessibility of mobile phones are favoured by young people. Additionally, an eHealth app developed by Carrà *et al.*, (2015), (D-ARIANNA, Digital-Alcohol Risk Alertness Notifying Network for Adolescents and young adults), incorporated evidence-based risk/protective factors in order to develop a risk estimation model for binge drinking in young people. There was a noted reduction in binge drinking following the use of the app (Carrà *et al.*, 2016), and the findings of this study provide further support for the acceptability of mobile technology, as a response rate of 82% was achieved, with 98% of participants reporting that the eHealth app was easy to use (Carrà *et al.*, 2015). A wealth of evidence demonstrates that electronic communication based interventions are widely accepted by both young people (Britto *et al.*, 2012; Dennison *et al.*, 2013; Lim *et al.*, 2012) and a number of other population groups (Arora *et al.*, 2012; Patrick *et al.*, 2009; Proudfoot *et al.*, 2010). This would indicate that the high acceptability rate of mobile technologies may result in a higher engagement, as supported by the findings in this review.

## Limitations

Due to the varying methodologies and heterogeneity of outcome measures, accurate comparisons are difficult, particularly as one study within this review contained very small sample sizes. Only 3 studies obtained follow-up measures at 6 months or longer, resulting in an insufficient assessment of sustainability of the interventions, due to the lack of long-term follow-up. Four studies (Mason *et al.*, 2014; Ridout *et al.*, 2014; Suffoletto *et al.*, 2012; Suffoletto *et al.*, 2015) reported detailed demographic characteristics of the participants, providing little insight as to whether or not minority groups were reached in the remaining 7 studies. The majority of studies comprised of university students only, a specific sample tending to be heavier drinkers than their non-university peers (Carter, Obremski-Brandon & Goldman 2010; Dawson *et al.*, 2004; Kypri & McAnally, 2005), resulting in a lack of generalisability to the general young adult population.

Studies employing more interactive methods of intervention delivery (Mason *et al.*, 2014; Suffoletto *et al.*, 2015), potentially attracted individuals more motivated to address personal drinking behaviour, resulting in a self-selecting sample. Additionally, the high rate of follow-up reported by several studies may be due to incentives (Ridout *et al.*, 2014), making attitudes of interventions difficult to assess.

## 5. Conclusion

The array of intervention modalities highlights the flexibility that technology has in delivering alcohol interventions for young people. This adaptability by introducing more interactive approaches, such as text messaging, email and SNS resulted in significant reductions in frequency of drinking, indicating that the increased accessibility and ease of engaging in the intervention is appealing and acceptable for young adults.

Due to the relatively low cost and convenience of mobile technology, there is potential for a larger proportion of the population to be accessed, including smaller minorities who would otherwise not be reached through traditional methods. However, as the majority of the studies included within this review did not explicitly report participant demographics, this is inconclusive. More research is needed on longer-term follow-ups with well-validated outcome measures, that are explicitly stated, to identify whether such modes of delivery can sustain an effect over time. The appropriateness of outcome measures requires attention to reflect the intervention focus and for consideration of adopting clinical interviewing and physiological confirmation (e.g. urine liver function testing).

There is also a need for young people's attitudes to be explored regarding the use of interactive technology, including the type of modality, level of contact and length of intervention overall.

**Conflicts of Interest**

None

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## References

- Alfonso, J. (2015). The role of social norms in personalized alcohol feedback: a dismantling study with emerging adults. *Journal of Child & Adolescent Substance Abuse*, 24(6), 379-386.
- Anderson, P. & Baumberg, A. (2006). *Alcohol in Europe: A public health perspective*. London: Institute of Alcohol Studies.
- Aneja, S., Brimhall, A. K., Kast, D. R., Aneja, S., Carlson, D., Cooper, K. D. & Bordeaux, J. S. (2012). Improvement in patient performance of skin self-examinations after intervention with interactive education and telecommunication reminders: A randomized controlled study. *Archives of Dermatology*, 148(11), 1266-1272.
- Arora, S., Peters, A. L., Agy, C. & Menchine, M. (2012). A mobile health intervention for inner city patients with poorly controlled diabetes: proof of concept of the TExT-MED program. *Diabetes Technology & Therapeutics*, 14(6), 492-496.
- Bendtsen, P., McCambridge, J., Bendtsen, M., Karlsson, N. & Nilsen, P. (2012). Effectiveness of a proactive mail-based alcohol internet intervention for university students: Dismantling the assessment and feedback components in a randomized controlled trial. *Journal of Medical Internet Research*, 14(5), e142.
- Bendtsen, M., & Bendtsen, P. (2014). Feasibility and user perception of a fully automated push-based multiple-session alcohol intervention for university students: randomized controlled trial. *JMIR mHealth and uHealth*, 16(6), e30.
- Bendtsen, P., Bendtsen, M., Karlsson, N., White, I. R., & McCambridge, J. (2015). Online Alcohol Assessment and Feedback for Hazardous and Harmful Drinkers: Findings From the AMADEUS-2 Randomized Controlled Trial of Routine Practice in Swedish Universities. *Journal of Medical Internet Research*, 17(7), e170.
- Bernstein, J., Heeren, T., Edward, E., Dorfman, D., Bliss, C., Winter, M. & Bernstein, E. (2010). A brief motivational interview in a pediatric emergency department, plus 10-day telephone follow-up, increases attempts to quit drinking among youth and young adults who screen positive for problematic drinking. *Academic Emergency Medicine*, 17(8), 890-902.
- Bewick, B. M., Mulhern, B., Barkham, M., Trusler, K., Hill, A. J & Stiles, W. B. (2008). Changes in undergraduate student alcohol consumption as they progress through university. *BMC Public Health*, 8, 163.
- Bewick, B. M., West, R., Gill, J., O'May, F., Mulhern, B., Barkham, M., & Hill, A. J. (2010). Providing web-based feedback and social norms information to reduce student alcohol

- intake: a multisite investigation. *Journal of Medical Internet Research*, 12(5). e59. doi: 10.2196/jmir.1461
- Bewick, B. M., West, R. M., Barkham, M., Mulhern, B., Marlow, R., Traviss, G. & Hill, A. J. (2013). The effectiveness of a web-based personalized feedback and social norms alcohol intervention on United Kingdom university students: Randomized Controlled Trial. *Journal of Medical Internet Research*, 15(7), e137.
- Bingham, C. R., Barretto, A. I., Walton, M. A., Bryant, C. M., Shope, J. T., & Raghunathan, T. E. (2010). Efficacy of a web-based, tailored, alcohol prevention/intervention program for college students: initial findings. *Journal of American College Health*, 58(4), 349-356.
- Bingham, C. R., Barretto, A. I., Walton, M. A., Bryant, C. M., Shope, J. T., & Raghunathan, T. E. (2011). Efficacy of a web-based, tailored, alcohol prevention/intervention program for college students: 3-month follow-up. *Journal of Drug education*, 41(4), 405-430.
- Booth-Kewley, S., Larson, G. E. & Miyoshi, D. K. (2007). Social desirability effects on computerized and paper-and-pencil questionnaires. *Computers in Human Behavior*, 23(1), 463-477.
- Boudreaux, E. D., Bock, B. & O'Hea, E. (2012). When an event sparks behavior change: An introduction to the sentinel event method of dynamic model building and its application to emergency medicine. *Academic Emergency Medicine*, 19, 329-335.
- Britto, M. T., Munafo, J. K., Schoettker, P. J., Vockell, A. L., Wimberg, J. A. & Yi, M. S. (2012). Pilot and feasibility test of adolescent-controlled text messaging reminders. *Clinical Pediatrics*, 51(2), 114-121.
- Bryant, Z. E., Henslee, A. M. & Correia, C. J. (2013). Testing the effects of e-mailed personalized feedback on risky alcohol use among college students. *Addictive Behaviors*, 38, 2563-2567.
- Cameron, D., Epton, T., Norman, P., Sheeran, P., Harris, P. R., Webb, T. L., Steven, A., Julious, S. A., Brennan, A., Thomas, C., Petroczi, A., & Naughton, D. (2015). A theory-based online health behaviour intervention for new university students (U@ Uni: LifeGuide): results from a repeat randomized controlled trial. *Trials*, 16(1), 555.
- Canale, N., Vieno, A., Santinello, M., Chieco, F., & Andriolo, S. (2015). The efficacy of computerized alcohol intervention tailored to drinking motives among college students: a quasi-experimental pilot study. *The American Journal of Drug and Alcohol Abuse*, 41(2), 183-187.
- Carrà, G., Crocamo, C., Schivalocchi, A., Bartoli, F., Carretta, D., Brambilla, G., & Clerici, M. (2015). Risk Estimation Modeling and Feasibility Testing for a Mobile eHealth Intervention

- for Binge Drinking Among Young People: The D-ARIANNA (Digital-Alcohol Risk Alertness Notifying Network for Adolescents and young adults) Project. *Substance Abuse*, 36(4), 445-452.
- Carrà, G., Crocamo, C., Bartoli, F., Carretta, D., Schivalocchi, A., Bebbington, P. E., & Clerici, M. (2016). Impact of a Mobile E-Health Intervention on Binge Drinking in Young People: The Digital–Alcohol Risk Alertness Notifying Network for Adolescents and Young Adults Project. *Journal of Adolescent Health*, 58(5), 520-526.
- Carter, A. C., Obremski-Brandon, K. & Goldman, M. S. (2010). The college and noncollege experience: A review of the factors that influence drinking behaviour in young adulthood. *Journal of Studies on Alcohol and Drugs*, 71(5), 742-750.
- Collins, S. E., Kirouac, M., Lewis, M. A., Witkiewitz, K., & Carey, K. B. (2014). Randomized controlled trial of web-based decisional balance feedback and personalized normative feedback for college drinkers. *Journal of Studies on Alcohol and Drugs*, 75(6), 982-992.
- Coons, M. J., DeMott, A., Buscemi, J., Duncan, J. M., Pellegrini, C. A., Steglitz, J., Pictor, A. & Spring, B. (2012). Technology interventions to curb obesity: A systematic review of the current literature. *Current Cardiovascular Risk Reports*, 6(2), 120-134.
- Cronce, J. M., Bittinger, J. N., Liu, J., & Kilmer, J. R. (2014). Electronic Feedback in College Student Drinking Prevention and Intervention. *Alcohol Research: Current Reviews*, 36(1), 47-62.
- Cunningham, J. A., Hendershot, C. S., Murphy, M. & Neighbors, C. (2012). Pragmatic randomized controlled trial of providing access to a brief personalized alcohol feedback intervention in university students. *Addiction Science & Clinical Practice*, 7, 21.
- Daeppen, J., Bertholet, N., Gaume, J., Fortini, C., Faouzi, M. & Gmel, G. (2011). Efficacy of brief motivational intervention in reducing binge drinking in young men: A randomized controlled trial. *Drug and Alcohol Dependence*, 113, 69-75.
- D'Alessio, M., Baiocco, R. & Laghi, F. (2006). The problem of binge drinking among Italian university students: A preliminary investigation. *Addictive Behaviors*, 31(12), 2328-2333.
- Dawson, D. A., Grant, B. F., Stinson, F. S. & Chou, P. S. (2004). Another look at heavy episodic drinking and alcohol use among college and non college youth. *Journal of Studies on Alcohol and Drugs*, 65, 477-489.
- Dennison, L., Morrison, L., Conway, G. & Yardley, L. (2013). Opportunities and challenges for smartphone applications in supporting health behavior change: qualitative study. *Journal of Medical Internet Research*, 15(4).

- Department of Health. (2013). *Policy: Reducing Harmful Drinking*.  
<https://www.gov.uk/government/policies/reducing-harmful-drinking> (accessed 14.02.2016)
- Dodd, L. J., Al-Nakeeb, Y., Nevill, A. & Forshaw, M. J. (2010). Life risk factors of students: A cluster analytical approach. *Preventive Medicine, 51*, 73-77.
- Donovan, E., Das Mahapatra, P., Green, T. C., Chiauzzi, E., McHugh, K., & Hemm, A. (2015). Efficacy of an online intervention to reduce alcohol-related risks among community college students. *Addiction Research & Theory, 23*(5), 437-447.
- Doumas, D. M., Nelson, K., DeYoung, A., & Renteria, C. C. (2014). Alcohol- Related Consequences Among First- Year University Students: Effectiveness of a Web- Based Personalized Feedback Program. *Journal of College Counseling, 17*(2), 150-162.
- Dowshen, N., Kuhns, L. M., Johnson, A., Holoyda, B. J. & Garofalo, R. (2012). Improving adherence to antiretroviral therapy for youth living with HIV/AIDS: a pilot study using personalized, interactive, daily text message reminders. *Journal of Medical Internet Research, 14*(2).
- Duncan, D. T., Wolin, K. Y., Scharoun-Lee, M., Ding, E. L., Warner, E. T. & Bennett, G. G. (2011). Does perception equal reality? Weight misperception in relation to weight-related attitudes and behaviors among overweight and obese US adults. *International Journal of Behavioral Nutrition and Physical Activity, 8*(1), 20.
- Ekman, D. S., Andersson, A., Nilsen, P., Ståhlbrandt, H., Johansson, A. L., & Bendtsen, P. (2011). Electronic screening and brief intervention for risky drinking in Swedish university students—A randomized controlled trial. *Addictive Behaviors, 36*(6), 654-659.
- Enggasser, J. L., Hermos, J. A., Rubin, A., Lachowicz, M., Rybin, D., Brief, D. J., Roy, M., Helmuth, E., Rosenbloom, D., & Keane, T. M. (2015). Drinking goal choice and outcomes in a web-based alcohol intervention: results from VetChange. *Addictive Behaviors, 42*, 63-68.
- Epton, T., Norman, P., Dadzie, A. S., Harris, P. R., Webb, T. L., Sheeran, P., Julious, S. A., Ciravegna, F., Brennan, A., Meier, P. S., & Naughton, D. (2014). A theory-based online health behaviour intervention for new university students (U@ Uni): results from a randomised controlled trial. *BMC Public Health, 14*(1), 563.
- Farke, W. & Anderson, P. (2007). Binge drinking in Europe. *Addictions, 102*(4), 333-339.
- Fazzino, T. L., Rose, G. L., Pollack, S. M., & Helzer, J. E. (2015). Recruiting US and Canadian college students via social media for participation in a web-based brief intervention study. *Journal of Studies on Alcohol and Drugs, 76*(1), 127-132.

- Foster, D. W., Neighbors, C., & Pai, A. (2015). Decisional balance: alcohol decisional balance intervention for heavy drinking undergraduates. *Substance use & misuse*, 50(13), 1717-1727.
- Fraeyman, J., Van Royen, P., Vriesacker, B., De Mey, L., & Van Hal, G. (2012). How is an electronic screening and brief intervention tool on alcohol use received in a student population? A qualitative and quantitative evaluation. *Journal of Medical Internet Research*, 14(2).
- Free, C., Knight, R., Robertson, S., Whittaker, R., Edwards, P., Zhou, W., Rodgers, A., Cairns, J., Kenward, M. G. & Roberts, I. (2011). Smoking cessation support delivered via mobile phone text messaging (txt2stop): A single-blind, randomized trial. *Lancet*, 378(9785), 49-55.
- Garnett, C., Crane, D., West, R., Brown, J., & Michie, S. (2015). Identification of behavior change techniques and engagement strategies to design a smartphone app to reduce alcohol consumption using a formal consensus method. *JMIR mHealth and uHealth*, 3(2).
- Gmel, G., Kuntsche, E. & Rehm, J. (2010). Risky single-occasion drinking: Bingeing is not bingeing. *Addiction*, 106, 1037-1045.
- Gnambs, T. & Kaspar, K. (2014). Disclosure of sensitive behaviors across self-administered survey modes: A meta-analysis. *Behavior Research Methods*, 1-23.
- Guse, K., Levine, D., Martins, S., Lira, A., Gaarde, J., Westmorlands, W. & Gilliam, M. (2012). Interventions using new digital media to improve adolescent sexual health: A systematic review. *Journal of Adolescent Health*, 51(6), 535-543.
- Hagger, M. S., Lonsdale, A., & Chatzisarantis, N. L. (2012). A theory-based intervention to reduce alcohol drinking in excess of guideline limits among undergraduate students. *British Journal of Health Psychology*, 17(1), 18-43.
- Haug, S., Schaub, M. P., Venzin, V., Meyer, C., John, U., & Gmel, G. (2013). A pre-post study on the appropriateness and effectiveness of a web-and text messaging-based intervention to reduce problem drinking in emerging adults. *Journal of Medical Internet Research*, 15(9), 126-137.
- Hester, R. K., Delaney, H. D. & Campbell, W. (2012). The College Drinker's Check-Up: Outcomes of two randomized clinical trials of a computer-delivered intervention. *Psychology of Addictive Behaviors*, 26(1), 1-12.
- Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A. & Ludwig, K. (2009). *The 2007 ESPAD Report: Substance use among students in 35 European countries*. Stockholm: Swedish Council for Information on Alcohol and Other Drugs (CAN) and the Pompidou Group of the Council of Europe.

- Higgins, J. P. T. & Altman, D. G. (2008). Assessing risk of bias in included studies. In J. P. T. Higgins & S. Green (Eds.). *Cochrane handbook for systematic reviews of interventions*. (pp. 187-241). Wiley.
- Higgins, J. P., Altman, D. G., Gøtzsche, P. C., Jüni, P., Moher, D., Oxman, A. D., Savović, J., Schulz, K.F., Weeks, L. & Sterne, J. A. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*, *343*, d5928.
- Hustad, J. T., & Borsari, B. (2010). Web-based screening and brief motivational intervention reduces alcohol use in heavy-drinking undergraduates at up to 6 months. *Evidence-based Medicine*, *15*(1), 17-18.
- Hustad, J. T., Barnett, N. P., Borsari, B., & Jackson, K. M. (2010). Web-based alcohol prevention for incoming college students: A randomized controlled trial. *Addictive Behaviors*, *35*(3), 183-189.
- ITU (2014). International Telecommunication Union. The World in 2014: ICT Facts and Figures. <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2014-e.pdf> (accessed 11.08.2015)
- Jones, S. C. & Magee, C. A. (2011). Exposure to alcohol advertising and alcohol consumption among Australian adolescents. *Alcohol and Alcoholism*, *46*(5), 630-637.
- Jouriles, E. N., Brown, A. S., Rosenfield, D., McDonald, R., Croft, K., Leahy, M. M., & Walters, S. T. (2010). Improving the effectiveness of computer-delivered personalized drinking feedback interventions for college students. *Psychology of Addictive Behaviors*, *24*(4), 592.
- Kaner, E. F. S., Dickinson, H. O., Beyer, F. R., Campbell, F., Schlesinger, C., Heather, N., Saunders, J. B., Burnand, B. & Pienaar, E. D. (2007). Effectiveness of brief alcohol interventions in primary care populations. *Cochrane Database of Systematic Reviews*, *2*, Art. No.: CD004148.
- Kelley, A. E., Schochet, T. & Landry, C. F. (2004). Risk taking and novelty seeking in adolescence: Introduction to part I. *Annals of the New York Academy of Sciences*, *1021*, 27-32.
- Khadjesari, Z., Murray, E., Hewitt, C., Hartley, S. & Godfrey, C. (2011). Can stand-alone computer-based interventions reduce alcohol consumption? A systematic review. *Addiction*, *106*, 267-282.
- Kuntsche, E., Kuendig, H. & Gmel, G. (2008). Alcohol outlet density, perceived availability and adolescent alcohol use: A multilevel structural equation model. *Journal of Epidemiology and Community Health*, *62*, 811-816.
- Kypri, K., Cronin, M. & Wright, C. S. (2005). Do university students drink more hazardously than their non-student peers? *Addiction*, *100*(5), 713-714.

- Kypri, K. & McAnally, H. M. (2005). Randomized controlled trial of a web-based primary care intervention for multiple health risk behaviors. *Preventive Medicine, 41*(3-4), 761-766.
- Kypri, K., McCambridge, J., Cunningham, J. A., Vater, T., Bowe, S., De Graaf, B., Saunders, J. B., & Dean, J. (2010). Web-based alcohol screening and brief intervention for Māori and non-Māori: the New Zealand e-SBINZ trials. *BMC Public Health, 10*(1), 781.
- Kypri, K., McCambridge, J., Vater, T., Bowe, S. J., Saunders, J. B., Cunningham, J. A., & Horton, N. J. (2013). Web-based alcohol intervention for Māori university students: double-blind, multi-site randomized controlled trial. *Addiction, 108*(2), 331-338.
- Kypri, K., Vater, T., Bowe, S. J., Saunders, J. B., Cunningham, J. A., Horton, N. J. & McCambridge, J. (2014). Web-based alcohol screening and brief intervention for university students: A randomized trial. *JAMA, 311*(12), 1218-1224.
- LaBrie, J. W., Lamb, T. F., Pedersen, E. R. & Quinlan, T. (2006). A group motivational interviewing intervention reduces drinking and alcohol-related consequences in adjudicated college students. *Journal of College Student Development, 47*(3), 267-280.
- LaBrie, J. W., Lewis, M. A., Atkins, D. C., Neighbors, C., Zheng, C., Kenney, S. R., Napper, L. E., Walter, T., Kilmer, J. R., Hummer, J. F., & Grossbard, J. (2013). RCT of web-based personalized normative feedback for college drinking prevention: are typical student norms good enough?. *Journal of Consulting and Clinical Psychology, 81*(6), 1074.
- LaChance, H., Feldstein Ewing, S. W., Bryan, A. D. & Hutchison, K. E. (2009). What makes group MET work? A randomized controlled trial of college student drinkers in mandated alcohol diversion. *Psychology of Addictive Behaviours, 23*(4), 598-612.
- Lee, H. Y., Koopmeiners, J. S., Rhee, T. G., Raveis, V. H. & Ahluwalia, J. S. (2014). Mobile phone text messaging intervention for cervical cancer screening: Changes in knowledge and behavior pre-post intervention. *Journal of Medical Internet Research, 16*(8): e196.
- Liang, X., Wang, Q., Yang, X., Cao, J., Chen, J., Mo, X., Huang, J., Wang, L. & Gu, D. (2011). Treatment effect of mobile phone intervention for diabetes on glycaemic control: A meta-analysis. *Diabetic Medicine, 28*, 455-463.
- Lim, M. S., Hocking, J. S., Aitken, C. K., Fairley, C. K., Jordan, L., Lewis, J. A. & Hellard, M. E. (2012). Impact of text and email messaging on the sexual health of young people: a randomised controlled trial. *Journal of Epidemiology and Community Health, 66*(1), 69-74.
- Lotfipour, S., Howard, J., Roumani, S., Hoonpongsimanont, W., Chakravarthy, B., Anderson, C. L., Weiss, J. W., Cisneros, V., & Dykzeul, B. (2013). Increased detection of alcohol consumption

- and at-risk drinking with computerized alcohol screening. *The Journal of Emergency Medicine*, 44(4), 861-866.
- Lovecchio, C. P., Wyatt, T. M., & DeJong, W. (2010). Reductions in drinking and alcohol-related harms reported by first-year college students taking an online alcohol education course: A randomized trial. *Journal of Health Communication*, 15(7), 805-819.
- Martens, M. P., Kilmer, J. R., Beck, N. C., & Zamboanga, B. L. (2010). The efficacy of a targeted personalized drinking feedback intervention among intercollegiate athletes: a randomized controlled trial. *Psychology of Addictive Behaviors*, 24(4), 660.
- Mason, M., Benotsch, E. G., Way, T., Kim, H. & Snipes, D. (2014). Test messaging to increase readiness to change alcohol use in college students. *Journal of Primary Prevention*, 35, 47-52.
- Mateo, G. F., Granado-Font, E., Ferré-Grau, C., & Montaña-Carreras, X. (2015). Mobile phone apps to promote weight loss and increase physical activity: a systematic review and meta-analysis. *Journal of Medical Internet Research*, 17(11).
- McAlaney, J. & McMahan, J. (2007). Normative beliefs, misperceptions, and heavy episodic drinking in a British student sample. *Journal of Studies on Alcohol*, 68(3), 385-392.
- McCambridge, J., Bendtsen, M., Karlsson, N., White, I. R., Nilsen, P. & Bendtsen, P. (2013). Alcohol assessment and feedback by email for university students: Main findings from a randomised controlled trial. *The British Journal of Psychiatry*, 203, 334-340.
- Measham, F. (2006). The new policy mix: Alcohol, harm minimisation and determined drunkenness in contemporary society. *International Journal of Drug Policy*, 17, 258-268.
- Mintel International Group. (2005). *Flavoured alcoholic beverages – UK*. London: Author.
- Moore, S. C., Crompton, K., van Goozen, S., Van Den Bree, M., Bunney, J., & Lydall, E. (2013). A feasibility study of short message service text messaging as a surveillance tool for alcohol consumption and vehicle for interventions in university students. *BMC Public Health*, 13(1), 1011.
- Moreira, M. T., Oskrochi, R., & Foxcroft, D. R. (2012). Personalised normative feedback for preventing alcohol misuse in university students: Solomon three-group randomised controlled trial. *PLoS One*, 7(9), e44120.
- Murphy, J. G., Dennhardt, A. A., Skidmore, J. R., Martens, M. P., & McDevitt-Murphy, M. E. (2010). Computerized versus motivational interviewing alcohol interventions: Impact on discrepancy, motivation, and drinking. *Psychology of Addictive Behaviors*, 24(4), 628-639.



- Mustanski, B., Garofalo, R., Monahan, C., Gratzner, B. & Andrews, R. (2013). Feasibility, acceptability, and preliminary efficacy of an online HIV prevention program for diverse young men who have sex with men: The Keep It Up! intervention. *AIDS and Behaviour*, *17*, 2999-3012.
- Naimi, T. S., & Cole, T. B. (2014). Electronic alcohol screening and brief interventions: Expectations and reality. *JAMA*, *311*(12), 1207-1209.
- Neighbors, C., Lewis, M. A., Atkins, D. C., Jensen, M. M., Walter, T., Fossos, N., Lee, C. M., & Larimer, M. E. (2010). Efficacy of web-based personalized normative feedback: a two-year randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *78*(6), 898-911.
- NHS Choices (2013). Alcohol misuse. <http://www.nhs.uk/conditions/Alcohol-misuse/Pages/Introduction.aspx> (accessed 11.08.2015).
- NHS Information Centre (2009). *Adult Psychiatric Morbidity in England, 2007*. London: NHS Information Centre.
- NICE (2010a). Alcohol-use disorders: Prevention. <https://www.nice.org.uk/guidance/ph24/chapter/8-glossary#hazardous-drinking> (accessed 27.05.2016).
- NICE (2010b). Alcohol-use disorders: Preventing harmful drinking. <http://www.nice.org.uk/guidance/PH24/chapter/1-Recommendations> (accessed 11.08.2015).
- Northcote, J. & Livingston, M. (2011). Accuracy of self-reported drinking. *Alcohol and Alcoholism*, *46*(6), 709-713.
- Nundy, S., Dick, J. J., Solomon, M. C. & Peek, M. E. (2013). Developing a behavioral model for mobile phone-based diabetes interventions. *Patient Education and Counseling*, *90*(1), 125-132.
- Nyhan, B. & Reifler, J. (2015). Does correcting myths about the flu vaccine work? An experimental evaluation of the effects of corrective information. *Vaccine*, *33*(3), 459-464.
- Office of Public Sector Information. (2003). Licensing Act 2003. [http://www.legislation.gov.uk/ukpga/2003/17/pdfs/ukpga\\_20030017\\_en.pdf](http://www.legislation.gov.uk/ukpga/2003/17/pdfs/ukpga_20030017_en.pdf) (accessed 23.03.2015).
- Palfai, T. P., Zisserson, R. & Saitz, R. (2011). Using personalized feedback to reduce alcohol use among hazardous drinking college students: The moderating effect of alcohol-related negative consequences. *Addictive Behaviors*, *36*, 539-542.

- Palfai, T. P., Winter, M., Lu, J., Rosenbloom, D. & Saitz, R. (2014). Personalized feedback as a universal prevention approach for college drinking: A randomized trial of an e-mail linked universal web-based alcohol intervention. *Journal of Primary Prevention, 35*, 75-84.
- Paschall, M. J., Antin, T., Ringwalt, C. L., & Saltz, R. F. (2011a). Effects of AlcoholEdu for College on alcohol-related problems among freshmen: A randomized multicampus trial. *Journal of Studies on Alcohol and Drugs, 72*(4), 642-650.
- Paschall, M. J., Antin, T., Ringwalt, C. L., & Saltz, R. F. (2011b). Evaluation of an Internet-based alcohol misuse prevention course for college freshmen: findings of a randomized multi-campus trial. *American Journal of Preventive Medicine, 41*(3), 300-308.
- Patrick, K., Raab, F., Adams, M. A., Dillon, L., Zabinski, M., Rock, C. L. & Norman, G. J. (2009). A text message-based intervention for weight loss: randomized controlled trial. *Journal of Medical Internet Research, 11*(1).
- Patton, R., Deluca, P., Kaner, E., Newbury-Birch, D., Phillips, T. & Drummond, C. (2014). Alcohol screening and brief intervention for adolescents: The how, what and where of reducing alcohol consumption and related harm among young people. *Alcohol and Alcoholism, 49*(2), 207-212.
- Postel, M. G., de Haan, H. A., Ter Huurne, E. D., Becker, E. S., & de Jong, C. A. (2010). Effectiveness of a web-based intervention for problem drinkers and reasons for dropout: randomized controlled trial. *Journal of Medical Internet Research, 12*(4).
- Proudfoot, J., Parker, G., Hadzi Pavlovic, D., Manicavasagar, V., Adler, E. & Whitton, A. (2010). Community attitudes to the appropriation of mobile phones for monitoring and managing depression, anxiety, and stress. *Journal of Medical Internet Research, 12*(5): e64.
- Rabinovich, L., Brutscher, P. B., de Vries, H., Tiessen, J., Clift, J. & Reding, A. (2009). *The affordability of alcoholic beverages in the European Union: Understanding the link between alcohol affordability, consumption and harms*. Cambridge: Rand Europe.
- Rehm, J., Zatonski, W., Taylor, B. & Anderson, P. (2011). Epidemiology and alcohol policy in Europe. *Addiction, 106*(S1), 11-19.
- Reid, A. E. & Aiken, L. S. (2013). Correcting injunctive norm misperceptions motivates behavior change: A randomized controlled sun protection intervention. *Health Psychology, 32*(5), 551.
- Reid, A. E., Carey, K. B., Merrill, J. E., & Carey, M. P. (2015). Social network influences on initiation and maintenance of reduced drinking among college students. *Journal of Consulting and Clinical Psychology, 83*(1), 36-44.

- Reinsma, K., Bolima, N., Fonteh, F., Okwen, P., Siapco, G., Yota, D. & Montgomery, S. (2015). Bobbi Be Best: the development and evaluation of an audio program and discussion guide to promote exclusive breastfeeding in Cameroon, Central Africa. *Global Health Promotion*, 1757975914556786.
- Ridout, B. & Campbell, A. (2014). Using Facebook to deliver a social norm intervention to reduce problem drinking at university. *Drug and Alcohol Review*, DOI: 10.1111/dar.12141
- Rodgers, A., Corbett, T., Bramley, D., Riddell, T., Wills, M., Lin, R. B. & Jones, M. (2005). Do you smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging. *Tobacco Control*, 14(4), 255-261.
- Rodriguez, L. M., Neighbors, C., Rinker, D. V., Lewis, M. A., Lazorwitz, B., Gonzales, R. G., & Larimer, M. E. (2015). Remote versus in-lab computer-delivered personalized normative feedback interventions for college student drinking. *Journal of Consulting and Clinical Psychology*, 83(3), 455-463.
- Schuckit, M. A., Kalmijn, J. A., Smith, T. L., Saunders, G., & Fromme, K. (2012). Structuring a college alcohol prevention program on the low level of response to alcohol model: a pilot study. *Alcoholism: Clinical and Experimental Research*, 36(7), 1244-1252.
- Schuckit, M. A., Smith, T. L., Kalmijn, J., Skidmore, J., Clausen, P., Shafir, A., Saunders, G., Bystritsky, H., & Fromme, K. (2015). The Impact of Focusing a Program to Prevent Heavier Drinking on a Pre-existing Phenotype, the Low Level of Response to Alcohol. *Alcoholism: Clinical and Experimental Research*, 39(2), 308-316.
- Schulz, D. N., Kremers, S. P., & de Vries, H. (2012). Are the stages of change relevant for the development and implementation of a web-based tailored alcohol intervention? A cross-sectional study. *BMC Public Health*, 12(1), 360.
- Schulz, D. N., Candel, M. J., Kremers, S. P., Reinwand, D. A., Jander, A., & de Vries, H. (2013). Effects of a Web-based tailored intervention to reduce alcohol consumption in adults: randomized controlled trial. *Journal of Medical Internet Research*, 15(9), 53-68.
- Shaw, R. J., Bosworth, H. B., Silva, S. S., Lipkus, I. M., Davis, L. L., Ronald, S. S. & Johnson, C. M. (2013). Mobile health messages help sustain recent weight loss. *The American Journal of Medicine*, 126(11), 1002-1009.
- SIGN (2014). Guideline 74: The management of harmful drinking and alcohol dependence in primary care. <http://www.sign.ac.uk/guidelines/fulltext/74/section1.html> (accessed 11.08.2015).

- Sinadinovic, K., Wennberg, P., Johansson, M., & Berman, A. H. (2014). Targeting individuals with problematic alcohol use via web-based cognitive-behavioral self-help modules, personalized screening feedback or assessment only: a randomized controlled trial. *European Addiction Research*, 20(6), 305-318.
- Smith, L. A. & Foxcroft, D. R. (2007). The effect of Alcohol Advertising and Marketing on Drinking Behaviour in Young People: A Systematic Review. [http://www.aerc.org.uk/documents/pdf/finalReports/051\\_Effect\\_of\\_alcohol\\_advertising.pdf](http://www.aerc.org.uk/documents/pdf/finalReports/051_Effect_of_alcohol_advertising.pdf) (accessed 12.06.2015).
- Song, E., Smiler, A. P., Wagoner, K. G. & Wolfson, M. (2012). Everyone says it's OK: Adolescents' perceptions of peer, parent, and community alcohol norms, alcohol consumption, and alcohol-related consequences. *Substance Use & Misuse*, 47, 86-98.
- Steinberg, L. (2004). Risk-taking in adolescence: What changes, and why? *Annals of the New York Academy of Sciences*, 1021, 51-58.
- Steinberg, L. (2007). Risk taking in adolescence new perspectives from brain and behavioral science. *Current Directions in Psychological Science*, 16(2), 55-59.
- Strecher, V. (2007). Internet methods for delivering behavioral and health-related interventions (eHealth). *Annual Review of Clinical Psychology*, 3, 53-76.
- Strohman, A. S., Braje, S. E., Alhassoon, O. M., Shuttleworth, S., Van Slyke, J., & Gandy, S. (2015). Randomized controlled trial of computerized alcohol intervention for college students: role of class level. *The American Journal of Drug and Alcohol Abuse*, 1-10.
- Suffoletto, B., Callaway, C., Kristan, J., Kraemer, K. & Clark, D. B. (2012). Text-message-based drinking assessments and brief interventions for young adults discharged from the emergency department. *Alcoholism: Clinical and Experimental Research*, 36(3), 552-560.
- Suffoletto, B., Kristan, J., Chung, T., Jeong, K., Fabio, A., Monti, P., & Clark, D. B. (2015). An Interactive Text Message Intervention to Reduce Binge Drinking in Young Adults: A Randomized Controlled Trial with 9-Month Outcomes. *PLoS one*, 10(11), e0142877.
- Tensil, M. D., Jonas, B., & Strüber, E. (2013). Two fully automated web-based interventions for risky alcohol use: randomized controlled trial. *Journal of Medical Internet Research*, 15(6).
- The Information Centre. (2010). *Statistics on alcohol: England 2010*. Leeds: The Information Centre.
- Trucco, E. M., Colder, C. R., Bowker, J. C. & Wiczorek, W. (2011). Interpersonal goals and susceptibility to peer influence: Risk factors for intentions to initiate substance use during early adolescents. *The Journal of Early Adolescents*, 31, 526-547.

- Ubhi, H. K., Michie, S., Kotz, D., Wong, W. C., & West, R. (2015). A mobile app to aid smoking cessation: preliminary evaluation of SmokeFree28. *Journal of Medical Internet Research*, *17*(1).
- Voogt, C. V., Kuntsche, E., Kleinjan, M., Poelen, E. A. P., Lemmers, L. A. C. J. & Engels, R. C. M. E. (2013a). Using ecological momentary assessment in testing the effectiveness of an alcohol intervention: A two-arm parallel group randomized controlled trial. *PLoS ONE*, *8*(11), e78436.
- Voogt, C. V., Poelen, E. A. P., Kleinjan, M., Lemmers, L. A. C. J. & Engels, R. C. M. E. (2013b). The effectiveness of the 'What Do You Drink' web-based brief alcohol intervention in reducing heavy drinking among students: A two-arm parallel group randomized controlled trial. *Alcohol and Alcoholism*, *48*(3), 312-321.
- Voogt, C. V., Kuntsche, E., Kleinjan, M. & Engels, R. C. M. E. (2014a). The effect of the 'What Do You Drink' web-based brief alcohol intervention on self-efficacy to better understand changes in alcohol use over time: Randomized controlled trial using ecological momentary assessment. *Drugs and Alcohol Dependence*, *138*, 89-97.
- Voogt, C., Luntsche, E., Kleinjan, M., Poelen, E. & Engels, R. (2014b). Using ecological momentary assessment to test the effectiveness of a web-based brief alcohol intervention over time among heavy-drinking students: Randomized controlled trial. *Journal of Medical Internet Research*, *16*(1), e5.
- Voogt, C. V., Poelen, E. A., Kleinjan, M., Lemmers, L. A., & Engels, R. C. (2014c). The development of a Web-based brief alcohol intervention in reducing heavy drinking among college students: An Intervention Mapping approach. *Health Promotion International*, *29*(4), 669-679.
- Wagener, T. L., Leffingwell, T. R., Mignogna, J., Mignogna, M. R., Weaver, C. C., Cooney, N. J., & Claborn, K. R. (2012). Randomized trial comparing computer-delivered and face-to-face personalized feedback interventions for high-risk drinking among college students. *Journal of Substance Abuse Treatment*, *43*(2), 260-267.
- Weaver, C. C., Leffingwell, T. R., Lombardi, N. J., Claborn, K. R., Miller, M. E., & Martens, M. P. (2014). A computer-based feedback only intervention with and without a moderation skills component. *Journal of Substance Abuse Treatment*, *46*(1), 22-28.
- White, A., Kavanagh, D., Stallman, H., Klein, B., Kay-Lambkin, F., Proudfoot, J., Drennan, J., Connor, J., Baker, A., Hines, E. & Young, R. (2010). Online alcohol interventions: A systematic review. *Journal of Medical Internet Research*, *12*(5), e62.

- Whittaker, R., McRobbie, H., Bullen, C., Borlan, R., Rodgers, A. & Gu, Y. (2012). Mobile phone-based interventions for smoking cessation. *Cochrane Database of Systematic Reviews*, (11).
- WHO (2016). Lexicon of alcohol and drug terms published by the World Health Organization. [http://www.who.int/substance\\_abuse/terminology/who\\_lexicon/en/](http://www.who.int/substance_abuse/terminology/who_lexicon/en/) (accessed 29.06.2016).
- Williams, E. D., Bird, D., Forbes, A. W., Russell, A., Ash, S., Friedman, R., Scuffham, P. A. & Oldenburg, B. (2012). Randomised controlled trial of an automated, interactive telephone intervention (TLC Diabetes) to improve type 2 diabetes management: baseline findings and six-month outcomes. *BMC Public Health*, 12: 602.
- Winters, K. C., Toomey, T., Nelson, T. F., Erickson, D., Lenk, K., & Miazga, M. (2011). Screening for alcohol problems among 4-year colleges and universities. *Journal of American College Health*, 59(5), 350-357.
- Wodarski, J. S., MacMaster, S., & Miller, N. K. (2012). The use of computer technology to reduce and prevent college drinking. *Social Work in Public Health*, 27(3), 270-282.
- Wyatt, T. M., DeJong, W., & Dixon, E. (2013). Population-level administration of AlcoholEdu for college: an ARIMA time-series analysis. *Journal of Health Communication*, 18(8), 898-912.

Figure 1: Study identification and analysis flow diagram

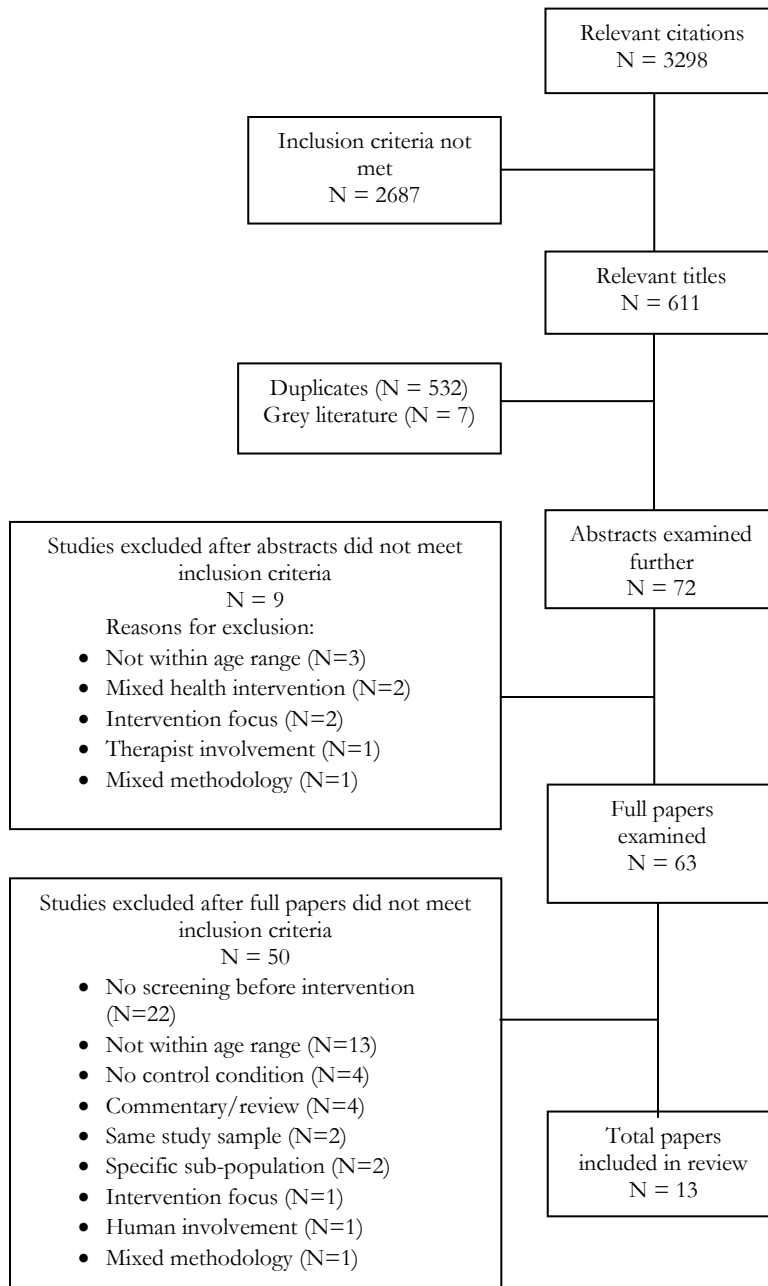


Table 1: Study characteristics

Author and location	Participant demographics	Intervention content and groups	Outcome measures and follow-up	Reported results	Summary of findings
Cunningham <i>et al.</i> , 2012 USA	N = 425 52.5% male M(SD)=22.6(3.9)	Two conditions: 1. Web-based assessment, personalized feedback (5 minutes) 2. No intervention	AUDIT-C Measured at baseline and 6 weeks.	No significant differences between condition and intervention ( $p > .05$ ).	"...web-based feedback...most effective among specific subgroup of students...who view their drinking as problematic and/or who are considering changing their drinking."
Gajecki <i>et al.</i> , 2014 Sweden	N = 1929 48.3% male M(SD)=24.7(4.8)	Three conditions: 1. Promillekoll mobile phone app 2. PartyPlanner mobile phone app 3. Control: No intervention	AUDIT; Daily Drinking Questionnaire (DDQ). Measured at baseline and 7 weeks.	No significant time-by-group interactions for outcome measures in PartyPlanner group. Promillekoll app users showed a significant increase in drinking frequency compared to control ( $p = .001$ ).	"...participation...did not seem to affect drinking in any of the three study groups. However...Promillekoll app... associated with a negative effect in the form of an increased number of drinking occasions over one week." "eBAC in the app form is not effective for reducing alcohol consumption among university students."
Hester, Delaney & Campbell, 2012 USA	<u>Experiment 1</u> N = 144	<u>Experiment 1</u> Two conditions: 1. Web-based intervention (35 minutes) 2. Assessment only	<u>Experiment 1</u> AUDIT; BDP (Brief Drinker's Profile); CSAP (College Students Alcohol Problems). Measured at baseline, 1 and 12 months.	<u>Experiment 1</u> Reductions in drinking and alcohol-related problems in the intervention group tended to be greater than that in the control group.	<u>Experiment 1</u> "...modest support...that...experimental group would show lower levels of drinking and alcohol-related problems relative to the control group at follow-ups."
	<u>Experiment 2</u> N = 82	<u>Experiment 2</u> Two conditions: 1. Web-based intervention (35 minutes) 2. Delayed assessment	<u>Experiment 2</u> AUDIT; BDP (Brief Drinker's Profile); CSAP (College Students Alcohol Problems). Measured at baseline and 1 month.	<u>Experiment 2</u> Control group showed no improvement from baseline to 1-month on Drinks per Week or on Peak BAC in a typical week.	<u>Experiment 2</u> "...experimental group show lower levels of drinking relative to the control group at follow-up."
Kypri <i>et al.</i> , 2014 New Zealand	N = 3422 42% male Intervention M(SD)=20.2(1.8) Control M(SD)=20.1(1.7)	Two conditions: 1. Web-based assessment and personalized feedback (10 minutes) 2. Screening only	AUDIT-C; AREAS (Academic Role Expectations and Alcohol Scale); Drinking Frequency; Number of Drinks per Occasion; Weekly Volume of Drinks, Binge Drinking and Heavy Drinking Indicators. Measured at baseline and 5 months.	Intervention produced reduction in amount consumed per drinking occasion ( $p = .005$ ), but not in frequency of drinking, overall volume consumed, or related academic problems.	"...web-based alcohol screening and brief intervention program resulted in... a small reduction in the amount consumed in a typical drinking occasion but not in other alcohol consumption and problem measure."



Mason <i>et al.</i> , 2014 USA	N = 18 44% male M(SD)=19.2(1.3)	Four days. Two conditions: 1. Text messages (4-6) daily plus booster texts. 2. No intervention	AUDIT; 12-item Brief Symptom Inventory; Substance Use; 12-item Drinking Expectancy Questionnaire; SOCRATES (Stages of Change Readiness and Treatment Eagerness Scale). Measured at baseline and 1 month.	Both groups reported drinking less at 1 month. Intervention increased readiness to change and intentions to reduce alcohol use, whereas control group decreased in readiness and intentions to reduce alcohol use.	“...ability to reach populations of interest at an extremely low cost has implications for...public health...” “...MI-based intervention activated participants’ motivation for change...subsequently... reevaluating their drinking behaviour.”
Palfai, Zisserson & Saitz, 2011 USA	N = 119 30% male M(SD) = 18.6 (1.45)	Two conditions: 1. Web-based personalized feedback 2. Control: guidelines for sleep and consumption of fruit and vegetables	AUDIT; Daily Drinking Questionnaire-Modified (DDQM); Young Adult Alcohol Problems Screening Test-36 (YAAPST-36); Drinking Motives Questionnaire; Alcohol Outcome Expectancies Scale; Readiness to Change Questionnaire; Alcohol Use Discrepancy. Measured at baseline and 1 month.	Students with high levels of alcohol-related consequences exhibited significantly less drinking when exposed to intervention ( $p < .05$ ).	“...providing web-based personalized feedback about alcohol use and consequences...particularly effective strategy for reducing alcohol use among hazardous drinking students who have experienced high levels of alcohol-related negative consequences.”
Palfai <i>et al.</i> , 2014 USA	N = 695 33% male M(SD) = 18.21 (46)	Two conditions: 1. Web-based personalized feedback (15 minutes) 2. Control: general health feedback	AUDIT; Frequency of Heavy Episodic Drinking; Typical Quantity per Week; Young Adult Alcohol Consequences Questionnaire (YAACQ). Measured at baseline and 5 months.	No significant effect of intervention on past-month heavy drinking episodes and 5 month follow-up on number of negative consequences reported.	“Although...no significant overall effects of the intervention...analyses among the non-drinking sample provided suggestive evidence...that this intervention may prevent the uptake of alcohol among students who do not drink.”
Ridout & Campbell., 2014 Australia	N = 95 22% male M(SD) = 19.05 (1.78)	Two conditions: 1. Social networking site (SNS) - feedback 2. No intervention	AUDIT; GF (Graduated Frequency Measure); Social Norms. Measured at baseline, 1 and 3 months.	Intervention reduced monthly drinking quantity and frequency ( $p < 0.01$ ) at follow-ups. Intervention improved accuracy significantly more than the control on three of the four social norms ( $p < .05$ ; $p < .001$ ; $p < .01$ ).	“...correcting misperceptions regarding...prevalence and social approval of binge drinking using SNS is an inexpensive and effective strategy...potentially bring widespread benefit to university populations.”
Suffoletto <i>et al.</i> , 2012 USA	N = 45 36% male M(SD) = 21 (1.8)	Twelve weeks. Automated text messages Three conditions: 1. Assessment of alcohol consumption 2. Feedback and goal setting 3. Final survey reminder	AUDIT-C; Drinks Per Drinking Day (DPDD); Heavy Drinking Days (HDD); Rutgers Alcohol Problem Index (RAPI). Measured at baseline and 3 months.	Group 1 had HDD 69% of the time, compared with 58% in Group 2. Setting a goal >50% of the time they were prompted, had average of 2.7 weeks with HDD, vs. 5.4 weeks with HDD in those who set goals $\leq 50\%$ of the time.	“Exposure to TM-based feedback was associated with a decrease in the number of HDDs and DPDD.” “...intervention has the ability to provide TM-based feedback and support at a large scale with minimal cost.”
Suffoletto <i>et al.</i> , 2015	N = 765 SA+F (N=384)	Twelve weeks. Two-way text message	AUDIT-C; Self-reported Binge Drinking Days; Binge Drinking	Significant intervention by time interaction at 3-, 6- and 9-months,	“...automated and interactive text-message intervention can produce sustained reductions in

USA	34.6% male $M(SD)=22(2.0)$  SA (N=196) 36.2% male $M(SD)=22(2.0)$  Control (N=185) 33% male $M(SD)=21.8(2.1)$	sessions. Three conditions: 1. SMS assessment + Feedback intervention (SA+F) 2. SMS assessment 3. No SMS assessment	Prevalence over past 30 days; Drinks per Drinking Day; Alcohol-related Injury Prevalence over past 3 months. Measured at baseline, 3, 6 and 9 months.	with SA+F participants reporting less drinking across all measured alcohol consumption outcomes when compared to control participants. No significant reductions in alcohol-related outcomes when comparing SA participants to control.	alcohol consumption in a diverse sample of young adults.” “...SMS messages can provide a “cue to action” when self-regulation processes are most vulnerable.”
Voogt <i>et al.</i> , 2013b The Netherlands	N = 907, 60.2% male $M(SD) = 20.8$ (1.7)	Two conditions: 1. Web-based intervention (20 minutes). 2. No intervention	AUDIT; Heavy Drinking; Frequency of Binge Drinking; Dutch version of the Alcohol Weekly Recall; Readiness to Change. Measured at baseline, 1 and 6 months.	No significant differences between conditions in heavy drinking, frequency of binge drinking, weekly alcohol consumption ( $p > .05$ ).	“...intervention...not effective in reducing heavy drinking, frequency of binge and weekly alcohol consumption among heavy drinking students at 1- and 6-month post-intervention. However...effective in lowering drinking levels for subgroups of heavy drinking students in the short term.”
Voogt <i>et al.</i> , 2014a The Netherlands	N = 907 60.3% male $M(SD) = 20.8$ (1.7)	Two conditions: 1. Web-based intervention (20 minutes) 2. No intervention	AUDIT; Dutch version of Alcohol Weekly Recall; Binge Drinking Frequency; Drinking Refusal Self-Efficacy Questionnaire Revised Adolescents Version (DRSEQ-RA) Measured at baseline and 6 months.	Participants gradually reduced their consumption over time.	“...experimental condition experienced a higher social pressure DRSE compared to...control condition...that sustained at six-months follow-up.”
Voogt <i>et al.</i> , 2014b The Netherlands	N = 907 60.3% male $M(SD) = 20.8$ (1.7)	Two conditions: 1. Web-based intervention (20 minutes). 2. No intervention	AUDIT; Dutch version of the Alcohol Weekly Recall; Frequency of Binge Drinking Measured at baseline, 1, 3 and 6 months.	Participants reduced consumption of alcohol and frequency of binge drinking throughout 6 months ( $p < .001$ ).	“...intervention...effective in preventing an increase in weekly alcohol consumption and frequency of binge drinking...among heavy-drinking students that was sustained at 3 and 6 months post intervention.”

Table 2: Quality Rating Summary for Included Studies

	Adequate sequence allocation	Allocation concealment	Blinding	Incomplete outcome data addressed	Free of selective reporting	Free of other bias
<b>Table Key</b>						
Low Risk of Bias	☺					
High Risk of Bias	☹					
Unclear	☹					
Cunningham <i>et al.</i> , 2012	☹	☹	☹	☺	☺	☹
Gajecki <i>et al.</i> , 2014	☺	☺	☹	☺	☺	☹
Hester, Delaney & Campbell, 2012	☹	☹	☹	☹	☺	☹
Kypri <i>et al.</i> , 2014	☺	☺	☺	☺	☺	☹
Mason <i>et al.</i> , 2014	☹	☹	☹	☺	☺	☹
Palfai, Zisseron & Saitz, 2011	☹	☹	☹	☹	☹	☹
Palfai <i>et al.</i> , 2014	☺	☺	☹	☹	☺	☹
Ridout & Campbell, 2014	☹	☹	☹	☺	☺	☹
Suffoletto <i>et al.</i> , 2012	☺	☺	☹	☹	☺	☹
Suffoletto <i>et al.</i> , 2015	☺	☺	☺	☺	☺	☹
Voogt <i>et al.</i> , 2013b	☺	☺	☹	☺	☺	☹

Voogt <i>et al.</i> , 2014a	😊	😊	😐	😊	😊	😞
Voogt <i>et al.</i> , 2014b	😊	😊	😊	😊	😊	😞