



**Improving passenger safety among youth:  
Developing a web-based strategy**

**Final report to NRMA-ACT Road Safety Trust**

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*The Centre for Accident Research & Road Safety - Queensland  
is a joint venture initiative of the Motor Accident Insurance  
Commission and Queensland University of Technology*





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## ACKNOWLEDGEMENTS

The authors would like to acknowledge the funding support provided by the NRMA-ACT Road Safety Trust and the ongoing assistance of Linda Cooke and previously, Eddie Wheeler.

In addition, we would also like to acknowledge:

- The staff and students in the participating ACT and Qld high schools
- The staff of the ACT Government Education and Training Department
- The Qld Department of Education.

The work has been prepared exclusively by the Queensland University of Technology Centre for Accident Research and Road Safety (CARRS-Q) and is not endorsed or guaranteed by the Trust.

## EXECUTIVE SUMMARY

The project sought to develop web-based program material for senior school students to encourage young people to engage in protective and intervening strategies that would promote both passenger and young driver safety. The research involved three stages. Firstly, a literature review was undertaken examining web-based program design for young persons' health promotion and systematically examining the protective strategy and intervening literature. In addition initial focus groups were held (stage 2) to examine the way in which young people currently operationalize and undertake protective and intervening behaviours around the road and how young people respond to, and favour, web material. The construction process of a web-based program was undertaken with scenarios and associated interactive component activities. A final stage of this report overviews the user-centred and participatory design framework used to examine both potential target students' and teachers' perceptions of the web-based material designed for this research.

The research found that web-based programs are well used and can demonstrate effectiveness in health promotion. The literature showed that young people engage with the Internet and particularly respond well to interactive or gaming material. The systematic literature review undertaken of protective strategies found that young adult research in the area typically focuses on college students and intervening in drink driving contexts. Importantly however there were key factors; including confidence to intervene, perceptions of seriousness of the context, the relationship and closeness of friendship and expectations for protective behaviour within friendships that facilitated the reported likelihood of intervening. Such factors were consistent with the senior students' reports in Stage 2 of the research. These students however also acknowledged other contexts in which intervening could occur; eg speeding and using a mobile phone while driving and acknowledged that the emotional state of the potential driver may be a critical factor in determining likelihood of intervening.

The research literature and Stage 2 focus groups provided key information from which to develop program activities. In particular, scenario-based learning was incorporated whereby students were provided with a typical intervening scenario and asked to process and undertake activities that related to the example. In addition, key behaviour change theoretical constructs were incorporated (as they were consistent with the intervening protective strategy literature which is largely atheoretical). The behaviour change theoretical constructs included developing self-efficacy, perceived seriousness of harm, expectations among friends and particularly close friends, of a norm to protect as well as promoting planning strategies to undertake such intervention at earlier time points. In addition, key curriculum factors were considered, for example length of activities, the way in which teachers may be able to facilitate participation in activities and incorporation into curriculum such as Health (eg through the inclusion of first aid skill development).

A participatory and user-centred design approach was undertaken to inform the development of the web-based program. Focus groups conducted with both teachers and students following the

design of the initial framework material revealed that the pictorial elements of the current design were progressing well. The importance of the role of the facilitator to motivate and encourage students to undertake activities was noted. In addition, the participants provided important insights into the potential to improve design (particularly in choice of colour and text) to appeal to the older adolescent target. Perceptions were that the current colour and text would appeal better to early teens. The choice of target behaviours and problem solving approach were favoured.

In sum, the construction of a web-based program has been undertaken and initial findings suggest that the material can be appropriate for the target developmental period; senior school students. The program was developed to promote strategies that target improved passenger and young driver safety. The findings provide a solid foundation to continue to refine the web-based program and bring it to the next stage of developing an evidence base; program evaluation.



# 1. INTRODUCTION

## 1.1 BACKGROUND

The report provides an overview of the research development of a web-based school program that aims to improve passenger safety among late high school aged students. In addition to targeting passenger safety it examines the potential for passengers to influence safe driving behaviours. A brief background to the report is initially provided along with objectives of the research. Following the introduction detail on the three stages (including program design), and discussion of the progress toward the development of an effective web-based passenger safety program for senior students is provided.

### 1.1.1 Injury among young people

Injury is the leading cause of death among young people (Australian Institute of Health and Welfare, AIHW, 2008), and motor vehicle crashes (MVCs) are a leading cause. In Australia during the years 2005-06, 98 per 100,000 young people aged 12 to 17 years were hospitalised for an injury resulting from a MVC (AIHW, 2008).

Young people are significantly overrepresented among those killed or seriously injured in motor vehicle crashes (Department of Infrastructure, Transport, Regional Development and Local Government [DITRDLG], 2009) and the high rate of young adult and adolescent road trauma comprise a substantial proportion of passenger-related injuries and fatalities. The presence of same-age passengers with a young driver increases the likelihood of crashes (Chen, Baker, Braver, & Li, 2000; Lam, Norton, Woodward, Connor, & Ameratunga, 2003) and the risk increases further with the number of same-age peer passengers in the vehicle (DITRDLG, 2009; Williams, Ferguson, & McCartt, 2007).

Passenger injuries and fatalities are therefore a related and significant problem. In the ACT, it's noted that over a five year period (2006-2010), 42.6% of all fatalities were among those under 30 years of age (see ACT Government, 2011). The report also noted that those most likely to die on the road in the ACT are 20 to 24 year olds followed by 15 to 19 year olds in the 2006-2010 data collection period. Among Queensland young people aged 13-14 years, self-report data showed that one in seven report a passenger-related injury in the past 6 months, of which 17% required medical treatment (Chapman, Buckley & Sheehan, 2011).

### 1.1.2 Prevention approaches and passenger safety - Graduated Driver Licensing

The current major and largely effective approach to reducing MVC-related injury among young people is Graduated Driver Licensing (GDL). GDL is a legislative approach to producing behaviour change and reducing harm it involve a three-stage licensing process, which require young novice drivers to progress through stages of supervision and restriction prior to full licensure. A number of restrictions exist under different GDL systems and include, for example in some Australian

states, the number of passengers that a young driver is permitted to carry often limited to restrictions at specific times. In Queensland, for example, young novice drivers may only carry one passenger less than 21 years of age, excepting family members, between 11pm and 5am (Queensland Government Department of Transport and Main Roads, 2011).

GDL systems have been demonstrated to be effective in reducing young driver crashes, with a systematic review of studies during the years 2002 to 2007 revealing a reduced crash risk of approximately 20 to 40% (Shope, 2007). Additionally, evaluation has shown that passenger restrictions, among other program components, have had significant effects on reducing fatality risk for young people (Vanlaar et al., 2009). One recent US study has shown that passenger restrictions have reduced fatal crashes among 16 to 17-year-old drivers by an estimated 9% (Fell et al., 2011). Of note however, the youngest age of driving without supervision is typically less in the US states compared with Australia.

While GDL systems have made significant impacts on reducing the crash risk of young people, complementary strategies may contribute to further reductions within the existing legislative framework. Overall, the potential for peer and passenger-focused strategies has been largely overlooked (Williams, 2006). Young driver and passenger education and behaviour change programs may be combined with GDL to improve the safety of young people on the road (Williams, 2006).

### **1.1.3 Peer protective behaviour**

There has been considerable research which has shown that peer groups become increasingly important throughout adolescence and that peers may act to shape young people's behaviour. While a less considered area of research, peers and particularly friendship groups have been found to have both positive and negative influences on the behaviour (Padilla-Walker & Bean, 2009). Although peer influence has commonly been considered as a risk factor for young peoples' risky driving, more recent research has suggested that peers exert protective effects on other young people through intervening behaviour.

There has been previous research to show that young people do, and are willing to, try and stop friends' engagement in risky alcohol situations (Flanagan et al., 2004) and in drink driving contexts (Boekeloo & Griffin, 2009). The study conducted by Boekeloo and Griffin with 509 college students in the US found that over half of the participants (57%) reported having driven or walked someone who had been drinking home in the previous two months. Recent research by the authors also showed that approximately half (46%) of a sample of 393 young females (17 to 25 years) had a recent experience of intervening with a friend who was going to drive after drinking, and that this was more often considered effective than not (Buckley, Chapman, Sheehan & Davidson, 2012). While a few studies have considered the likelihood of intervening, key factors associated with such behaviour typically included self-confidence, greater perception of risk or danger and positive expectations among friends (see also Davidson, 2010). These factors may represent key potential targets for change in a passenger safety program.

Promoting supportive relationships is aligned with the aims of the Skills for Preventing Injury in Youth (SPIY) program developed by the research team at CARRS-Q (and further designed for

Year 8 students in the ACT in previous research funded by the NRMA ACT Road Safety Trust). The program demonstrated effectiveness in reducing risk-taking after 6 months and encouraging protective friendship behaviour; that is getting 'mates to look out for mates'. This curriculum intervention was designed for Grade 8 students in the ACT and there is considerable potential to build these effective program strategies into an intervention for older adolescents. That is, to reinforce messages of looking out for mates and actively intervening to protect them in injury risk situations at a time most pertinent to promoting passenger safety.

#### **1.1.4 Web-based strategies and the current project**

The Internet represents opportunity for widespread dissemination of health and safety promotion activities as well as greater reach to young people at times convenient to them and provides potential links with existing quality material. The research described in this report involves the development of a web-based module that could be used independently or as a booster program for an early adolescent program (Skills for Preventing Injury in Youth, SPIY). The SPIY program focuses on developing supportive relationships including looking out for mates and first aid skills. The current web-based module encourages peer protective strategies in a passenger role.

The recent growth in access to, and use of, the internet has led to a corresponding interest in web-based intervention programs aimed at health-related behaviour change. Recently, research has shown that web-based programs are a promising means of delivering health behaviour change messages, particularly as young people are increasingly accessing the Internet and mobile technologies.

Previous research by the authors has shown that, among senior students in a low socio-economic area of Queensland, 100% reported Internet access at home or school, and around three-quarters had searched for road safety information (Chapman, Buckley & Sheehan, 2009). Of these 72 young people, 87% said that they would visit an interactive, educational passenger safety website, suggesting the potential for web-based methods of road safety program delivery (Chapman, Buckley & Sheehan, 2009). The findings suggest that the web is an important tool for the delivery of an intervention targeting road safety for young people.

Recent research has shown that web-based programs have been developed and implemented to promote change to reduce in young persons' health risk behaviours including smoking, violence and alcohol use, with some promising results showing success in changing knowledge of and attitudes to risk behaviours, or the behaviour itself (e.g., Escoffery, McCormick & Bateman, 2004; Schinke, Noia & Glassman, 2004; Wall, 2007). The authors of such research note that the programs have advantages over traditional means of health information delivery, including novelty and appeal, flexibility, interactivity, as well as the opportunity for individually tailored information and the facilitation of interaction and social support (Ferney & Marshall, 2006). Web-based strategies also provide a critical medium that has the potential to be incorporated in classroom-delivered safety promotion messages that can then also extend beyond the classroom.

Despite their advantages, however, the evaluations of web-based programs have often been limited by poor participant adherence and engagement both in the research process and uptake of internet material (Leslie et al., 2005). In order to address this issue, user-centred or participatory design methods have been proposed, whereby the target participants are consulted throughout the development process in order to ensure their preferences for website functions, content and design are understood (Corry, Frick & Hansen, 1997). It is essential that the message content is considered alongside the way messages are delivered and framed. To engage interest, strategies must be meaningful, perceived to be relevant and developmentally appropriate (Coatsworth, Szapocznik, Kurtines, & Santisban, 1997; McCord & Tremblay, 1992). A qualitative understanding of the target participants affords insight into how risk and protective factors might interact within a community and gives a voice to the perceptions and perspectives of participants. Thus the process of understanding the targets' perspective is an important step in the design process of a relevant behaviour change program that is culturally, ecologically and face valid. There are currently no strategies available for senior school students that report scientifically approaching passenger behaviour change. It is thus important to develop and trial evidence for web-based strategies that may reduce youth injury and promote safety.

## **1.2 OBJECTIVES**

The aim of this research is to develop a module of a web-based program and to scope the feasibility of the design for an extension of a high school injury prevention curriculum (SPIY) for early adolescents.

The research will be conducted over three stages (see below) and include a review of passenger safety and peer protection, and the development and evaluation of previously developed web-based programs. It will also include the development and feasibility testing of a web-based module. The main goal is to develop and understand web-based strategies that might increase the use of personal and friendship protective strategies among young people. Such peer protection strategies would focus on passenger safety.

The research seeks to:

- Examine the key components and messages in existing strategies published in the literature that provide the foundation for content and process methods suitable for ACT passenger safety. (STAGE 1)
- Develop a stand-alone module of a web-based intervention to address key safety issues in passenger safety. (STAGE 2)
- Evaluate school staff and students' perception of such strategies and their assessment of the potential storyboard content and process strategies. (STAGE 3)

## 2. STAGE 1: LITERATURE REVIEW

A literature review was conducted to identify key issues associated with the proposed web-based strategy content and process components, as well as web-based delivery methods and passenger safety. A synthesis of research can provide evidence for the content and process design of program material. The presence of logic, internal consistency and plausibility increases likely compliance with material (Fagan & Malic, 2003). The aim of this stage was to therefore provide some basic building blocks to start addressing the design of messages and the way in which they are delivered. This review included:

- Peer, friendship and contextual factors related to promoting passenger safety among youth.
- Web-based program delivery with a particular focus on road safety strategies.

### 2.1 LITERATURE REVIEW METHODOLOGY

The literature review was conducted in two phases:

1. A systematic review of the literature relating to young people's protective behaviour in risky driving situations; including strategies they use to protect their friends and contextual and person-related factors associated with intervening behaviour.
2. A review of the literature on web-based programs and effective strategies.

For phase 1 (protective behaviour in risky driving situations), a systematic literature review was conducted using online databases, for articles available as at May, 2012. Key phrases were prepared and searched in combination, within scholarly databases including PsychInfo, ERIC (Education Resources and Information Clearinghouse), CINAHL (Cumulative Index to Nursing and Allied Health Literature), and Criminal Justice Abstracts. Key phrases included Intervent\* OR Protect\* OR Pro Social OR Social Responsibility, AND Driv\* OR Passenger OR Car OR Road OR Transport\* OR DUI.

Articles were selected for inclusion in this review based on five criteria. Each article was required to 1) examine strategies, person- or context-related factors relating to peer protective behaviour, 2) among young people (aged 12 - 24 years), and 3) related to risky driving behaviour (e.g. speeding, drink driving, etc.). Articles were also only included if they were 4) published in English, and 5) published within the past 25 years (i.e. since January 1987).

The key phrases were searched in combination within the four databases. Additionally, cited references in identified articles were examined for inclusion. All references identified through these searches were extracted into an Endnote database. At the conclusion of the search process, 91 peer-reviewed articles, book chapters and books were identified and catalogued. The title and abstract of each of these references was examined for relevance to the search criteria, including a focus on youth, and the full text of 39 of these was obtained for a more

thorough review. Twenty-one articles met all relevant inclusion criteria and are described in the current review.

For phase 2 (web-based programs and effective strategies), relevant research findings were identified by searching electronic databases, conference proceedings and through Internet searches of the websites of recognised key injury prevention organisations.

The findings of both phases of the literature review provided the basis for subsequent stages of the research, including development of the web module (stage 2) and the design of feasibility evaluation prompts (stage 3).

## **2.2 PEER PROTECTIVE BEHAVIOUR IN RISKY DRIVING SITUATIONS**

Results of the systematic review are summarised in a table in Appendix 1. Each of the articles is summarised in the table according to key study details (i.e., participants, methods and key variables), and results relating to peer protection strategies, and person- and context-related factors associated with these strategies.

The systematic review process resulted in 21 articles describing studies relating to peer protective behaviour in risky driving situations. The majority of the studies included college or university samples (14 studies), however several included young people of high school age. For example, studies conducted by Flanagan et al. (2004) and Smart and Stoduto (1997) involved survey research with students in Grades 5 to 13, and a study conducted by Beck et al. (1987) involved focus groups with students in Grades 11 and 12. The large majority of studies involved survey-based research, however several, including the study by Beck and colleagues (1987), involved qualitative methods to study young peoples' protective behaviour in depth.

Two of the 21 articles examined all three factors of interest to the current review, including protective strategies used by young people in risky driving situations, person-related factors associated with intervening as well as context-related factors associated with intervening. These studies, conducted by Boekeloo et al. (2009) and Shore et al. (1998) were both conducted with university samples and involved survey methodologies. The strategies identified as those used by young people included walking or driving someone who had been drinking home (Boekeloo et al., 2009), and talking and reasoning with the friend to persuade them not to drive (Shore et al., 1998). Both of these studies revealed that the sex of the drinker and the intervener were not related to intervention. Boekeloo et al. (2009) also found that race and age were not associated with intervention efforts. This study did however find that drinkers, and those with greater confidence to intervene, were more likely to report having intervened in friends' drink driving attempts (Boekeloo, 2009). In regards to context-related factors, Boekeloo et al. (2009) found that the likelihood of intervention differed according to the closeness of the relationship, with those reporting closer relationships being more likely to intervene.

The remaining studies focused on either strategies used to intervene or factors associated with intervening behaviour. Strategies to intervene, as raised within other studies, included for

example, offering to drive a person home or get a taxi, suggesting they stay overnight, and taking the keys away (Adebayo, 1988), as well as telling an adult, which was identified in a study involving high school students (Flanagan et al., 2004).

Overall, most studies found that sex was not associated with intervening behaviour, although several studies found that sex was associated with use of different intervention strategies. For example, Flanagan et al. (2004), in their study of high school students, found that girls were more likely than boys to take another person's car keys away. This study also showed that older adolescents were more likely than younger adolescents to tell an adult and also to take the person's car keys away. Additional person-related factors found to be associated with intervening behaviour in other studies included, for example, perceptions and beliefs regarding the degree to which a person needed help, perceived ability to intervene (Newcomb et al., 1991), and an individual's own level of impairment (Mauck et al., 2000).

Several studies also addressed context-related factors associated with intervening in risky driving situations. Rabow et al. (1990) found that the number of people present in the situation and the number of people known by the respondent in the vicinity positively predicted decisions to intervene. This was similar to findings by Newcomb et al. (1991) who showed that the number of people in the situation that were known to the respondent, as well as intervention attempts by another person and talking with others who encouraged intervention were associated with intervention attempts. A further study by Wolfinger et al. (1994) however showed that the number of people in the situation and the number known by the respondent had no impact on interventions. Hernandez et al. (1987) studied the location in which intervention occurred, and found that intervention in drunk driving behaviour was most common when leaving a party or a friend's house, and least common when leaving a bar or restaurant.

### **2.2.1 Summary**

Overall, it is primarily the drink driving context which has been examined in terms of the key road safety behaviour studied in the intervention literature. In addition, college students are frequently the targets of such research. Interventions were mostly likely among close relationships and where greater danger is perceived. Furthermore, taking the keys and talking to the potential drink driver appear to be the most common strategies employed.

## **2.3 WEB-BASED PROGRAMS**

The growth in access to, and use of, the Internet over recent decades has seen a corresponding change in the delivery of health behaviour change interventions. Increasingly health promotion activities and supporting materials are being developed for online access. Strategies that are delivered via the Internet represent an opportunity for efficient widespread dissemination of target health and protective messages. These web-based programs also potentially provide

greater reach to young people at times which can be convenient and at times that are potentially most protective for them.

Young people, perhaps moreso than those of other ages, are increasingly accessing the Internet and mobile technologies. Young people have been variously described as 'Digital Natives' and the 'Net Generation' (Chalk, 2008). The Australian Bureau of Statistics report that in the 12 months prior to April 2009, 96% of 12-14 year old Australians accessed the Internet (ABS, 2011). The use of the Internet and computers in Australian high schools is becoming increasingly common with the implementation of the Federal Government's National Secondary School Computer Fund (Commonwealth Government, 2011). Research conducted by the authors showed that 100% of Grade 12 students in a low socio-economic area of Queensland had access to the Internet at home or school (Chapman et al., 2009). The widespread use of the internet, even among low socio-economic groups, who are often less exposed to safe driving messages, makes web-based programs an ideal medium.

While there is a lack of research to date on young adults' use of the Internet for road safety information, there have been a number of studies examining adolescents' use of the Internet for other health information, particularly in reducing alcohol use or related harms. Others have examined the use Internet to obtain health information related to issues such as sexual health, diet and fitness (for example, Borzekowski & Rickert, 2001). The US study of 412 Grade 10 adolescents was conducted in suburban New York with an in-class paper and pencil survey method, showing that 49% of students had used the Internet for accessing health information on the selected topics. The students reported the health information they accessed online to be of high value in terms of worth, trustworthiness, use and relevance. A more widespread qualitative study of health information-seeking behaviour among adolescents (11-19 year olds) conducted both in the UK and the US, revealed that the internet was the primary source of health information for many of the participants (Gray, Klein, Noyce, Sesselberg & Cantrill, 2005). The adolescents also showed some indication of being sophisticated consumers of such information, reporting varying amounts of perceived credibility of health information as a result of their difficulties in assessing the expertise and trustworthiness of specific sites.

There are however a number of websites that provide road safety information to youth however there is no published assessments of the degree to which young people use such websites or their perceptions of these sites. In addition, the impact on any change in knowledge, attitude, driving behaviour or crash/ injury outcomes have been assessed. Past research conducted by the authors has shown that among 72 Grade 12 students in Queensland, 74% had searched for road safety information online, and 87% indicated that they would visit an interactive, educational passenger safety website, suggesting the potential for web-based methods of road safety program delivery (Chapman, Buckley & Sheehan, 2009).

Although many of the health-related sites designed for young people are aimed at simply providing information, there are an increasing number of research projects that evaluate web and computer based (e.g. CD Rom or DVD) programs describing behaviour change in health behaviours. Web-based programs for preventing or reducing smoking, violence, sexual activity, alcohol use, and mental health issues including depression, anxiety and eating disorders, have



been trialled. Many of these programs have shown success in changing knowledge of, and attitudes to, risk behaviours, with some demonstrating change in the risk behaviour itself. A selection of those programs that are most relevant to the current research, including web-based programs for young peoples' alcohol use and general risk-taking (including those implemented in a school-based context) are discussed in further detail below.

*Alcohol interventions:* A randomised control trial conducted in 16 Australian schools compared a multi-session, curriculum-integrated and computerised harm minimisation program with usual classes on changes in Year 8 students' knowledge, alcohol use, alcohol related harms and alcohol expectancies (Vogl, Teesson, Andrews, Bird, Steadman & Dillon, 2009). Females who used the computerised program showed significant reduced alcohol use, and all intervention students showed increased knowledge and decreased positive social expectations regarding alcohol use.

Among programs for college students, AlcoholEdu provides an example of an interactive, 5-chapter, web-based program. An evaluation of this program by Wall (2007) suggested that this program was particularly effective in reducing alcohol use among first year students. Chiauuzzi et al. (2005) also report on the effectiveness of the interactive alcohol component of the My Student Body website, which promotes healthy behaviours among college students across the US. The results of this study showed that the site was effective among women and persistent binge drinkers, when compared to users of a text based alcohol education website. Similarly a college student alcohol prevention program by Bingham et al., M-PASS, was found to be effective in reducing females' binge drinking behaviour. ). A UK study which used personalised feedback and information on social norms, found a reduction in the units of alcohol consumed per occasion (Bewick, Trusler, Mulhern, Barkham & Hill, 2008). For these alcohol interventions, students reported positive perceptions of the site, indicating that they would visit the website again. A review of 17 computer-based college drinking intervention programs found that these programs are on the whole effective and are cost effective to develop and administer (Elliott, Carey & Bolles, 2008).

*General risk taking intervention:* A more broadly focused and computer based program to reduce risky behaviour is the BARN (Body Awareness Resource Network) System. The program targeted adolescent health promotion and behaviour change across a number of risk behaviours including alcohol and other drug use, smoking, and sexual activity. The program was made available to adolescents in grades 6-12 in schools in the US (Bosworth et al., 1994) with students able to choose to use the program during their free time. The design of BARN incorporated games and simulations aimed to attract teens. An evaluation study showed that BARN was widely used by both middle and high school students, and that it was attractive to students who had already experimented with risk behaviours. Overall, the study found that among students that used BARN they were also more likely to abstain from risk behaviours than were students who were nonusers.

Overall, evaluation of web-based health behaviour changed programs for youth have revealed varying albeit generally positive results. The conclusions reached from these studies indicate that web-based programs show promise for reducing adolescents' risk of harm and that

research is needed into understanding their effectiveness as it relates to change in more diverse health risk behaviours. Web-based programs show particular promise in allowing for consistent delivery, wide accessibility, personalised tailoring, and because adolescents are more likely to disclose information on risky behaviour and other sensitive issues online. Adolescents are also receptive to the Internet, and interactive elements such as multi-media information and games are appealing and attractive at this developmental period (Elliott, Carey & Bolles, 2008). Programs have potential to be self directed and paced at a level suitable to the classroom or individual adolescent. A web-based program can more accurately consider an individual's priorities and interests (Elliott et al., 2008). Therefore web-based programs can be engaging and effective for adolescents, especially when the topic is one in which they see relevance and application to their own circumstances and social relationships.

Despite their many advantages, however, web-based programs have to date been limited by poor participant adherence and engagement (Leslie et al., 2005). Evaluations of multi-session web-based programs across many groups are also often faced with high levels of attrition (Cunningham & Mierlo, 2009). Rates of attrition are reported as much lower in studies involving school-based samples (where participation is required as part of a classroom activity) or in those involving incentives. While the use of incentives is beneficial for evaluation research, this approach is much less likely to be sustainable when moving beyond a research trial.

Researchers and program designers therefore need to consider ways in which to encourage sustained participation throughout multi-session programs targeting change in health risk behaviours. Some approaches have included, for example providing emailed prompts to remind participants about future sessions and setting a defined deadline for completion and are most relevant for non-school based interventions. School students' compliance can be aided by teacher involvement and school assessment. In addition, the design of the program plays an important part in user engagement. Therefore, user-centred or participatory design methods have been proposed, whereby the target users are consulted throughout the design process to ensure that their preferences for website functions, content, and design are understood and implemented (Corry, Frick & Hansen, 1997).

In particular, the appeal of the web program (in terms of, for example, its interactivity) may work to encourage users to return to the program. Several evaluations (e.g. 28) have shown that interactive games are the most frequently accessed components of interventions designed for young people. Results of a study conducted by the researchers with Grade 12 students also show that young adults use the Internet primarily for social networking (e.g. emailing, instant messaging) or interactive activities (e.g. watching videos and playing games) (Chapman et al., 2009). Harnessing the power of the Internet to deliver health messages in an interactive and engaging manner is thus an important design consideration for web-based programs targeting adolescents.

The process of designing a web-based intervention to improve young adult passenger safety is therefore important to consider. Repeatedly, the literature reveals several design aspects of web-based programs that have impacted on program effectiveness. Nearly all evaluations indicate that the provision of immediate, personalised feedback is an essential component to

ensure program effectiveness. Many programs do this based on responses provided throughout navigation of the webpage. The capacity of web-based programs to provide automatic, tailored feedback to each participant at key intervals throughout the program is one reason for the increasing popularity of such programs in health promotion research. Additional design features relating to the preferences of the target users do however need to be understood through the developmental research process.

## **2.4 LITERATURE REVIEW SUMMARY**

This literature provided an understanding of key issues associated with web-based program delivery and content as it relates to young adult road safety, and has established findings that may be built upon in the design of the program and its key messages. For example, the systematic literature review firstly provided an understanding of important issues relating to content of the web-based program. It identified a number of strategies that young people use to protect their friends in risky driving situations, many of which related to potential drink driving of their friends. These strategies, which may be built into web program content through the design of scenarios and response options, include active measures such as driving a friend home and taking away car keys, as well as more persuasive measures such as talking to a friend and suggesting they stay overnight.

The systematic literature review also identified key person and context-related factors that are associated with intervening behaviour among young people. These are particularly pertinent as they may be key factors to target and strengthen within a web-based program. The findings of the systematic review showed that potential factors to target include confidence to speak up and intervene in risky driving scenarios, as well as perceptions of risk and the need for people to help in these situations. Additionally, a review of context-related factors suggested that young people should be encouraged to talk to their friends about intervening in friends' risk, as this was found to increase the likelihood of protective behaviour.

A review of web-based programs is also able to provide directions for design and processes relating to a passenger safety program. This review suggested the importance of a participatory design process, whereby young people are consulted throughout the design stage to ensure their preferences regarding content and design are integrated into the finalised program. This review also identified a number of previously evaluated programs that have shown effectiveness in changing other health related behaviours and associated attitudes and knowledge (e.g., alcohol use). Several advantages to web-based programs were identified, for example, the potential for interactivity and personalised feedback, which may increase user engagement. The information gained from this literature review is able to be incorporated into the design process for the current web-based passenger safety program.

## **3. STAGE 2: DEVELOPMENT OF A WEB-BASED MODULE**

### **3.1 METHODOLOGY**

#### **3.1.1 Participatory design process (initial focus groups)**

As identified through the literature review, the process of developing the web-based program drew on a user-centred or participatory design method, whereby the target participants are consulted throughout the design process in order to ensure their preferences for website functions, content and design are understood (Corry, Frick & Hansen, 1997). As part of this method and prior to developing program materials, focus groups were conducted with senior school students. Focus groups were conducted to provide an initial understanding of adolescents' perceptions of web-based programs and road safety issues, with the aim of using this data in the design of the current program.

#### **3.1.2 Participants**

Approximately 30 Year 11 students from one class at a Queensland state high school participated in this stage of the research. Approximately 50% were male.

#### **3.1.3 Procedure**

Approval to conduct this stage of the research was initially obtained from the school principal as per the Queensland Department of Education and Training and the university (QUT) research protocol. Information and permission sheets were sent home to parents prior to the students' participation in the research. All participants were also given their own information sheets and signed consent forms prior to the discussions.

The focus groups were held during school class time. The participating students were split into three equal groups, and three researchers facilitated the discussions over one class period (approximately 45 minutes). Participants were asked questions relating to content and design issues of a web-based passenger safety program for young people their age. Discussions were audio recorded with participants' consent, and later transcribed.

#### **3.1.4 Materials**

Based on Stage 1 findings, key strategies and examples of previously-evaluated websites were used in the development of prompts, in order to understand how the design can be grounded in relevant situations, issues, concerns and resources. This included both the content of the strategies and the process (i.e., the method by which it is to be implemented).

Example questions from the focus groups included:

- Do you think a web-based road safety program would be useful for your safety, your friend's safety, the sort of people you know and don't know safety? What areas of road safety should be addressed?
- What are ways that you intervene before your friend start on the road?
- What key components would be needed for a web-based safety program?

## 3.2 FOCUS GROUP RESULTS

The focus group findings were clustered into two main themes; (1) issues of program content, that is the material that is covered in the program and (2) issues of program design, that is the way in which such material and messages are delivered. Findings related to these two themes are described below.

### 3.2.1 Program content

The results of the Stage 2 focus groups provided information from which program content could be developed, particularly as it related to strategies for intervening in risky driving situations as well as factors that might encourage or influence their intervening behaviour.

#### *Intervening behaviours*

Participants discussed a number of ways in which they could intervene in friends' risky driving, which could be incorporated into program content that is relevant for adolescents. Many participants indicated that they could tell their friends to stop:

- *'telling them to slow down', tell them 'others in danger'*
- *'tell them not to do it while you're in the car'*
- *'let them know what could happen if they continue'*
- *'yeah, just telling, being the big man, ah, know what's right and what's wrong'*
- *'if they're doing over the speed limit say you don't want to get arrested as well as them'*

Additional comments included other means of active intervention, for example:

- *'I would drive for them'*
- *'take their keys'*

### *Factors influencing intervention*

Discussions also included comments relating to factors that influence their decisions to intervene in friends' risky driving. These comments could also be incorporated into program content, for example, in scenarios illustrating ways in which such factors may be overcome. Participants indicated, for example, that they are more likely to intervene in close friends' risk behaviour:

- *'if they're your friends'*

The drivers' emotional state also played a part in decisions to intervene:

- *'hurt the driver's feelings or something like'*
- *'they might be angry at you for doing it...try not to fight with each other'*
- *'cos the emotions in the car might not be that good'*
- *'if you're fighting they'll just speed up'*
- *'sort of assess the driver and see how they're feeling as well'*

Additional comments relating to factors that affect intervening behaviour related to *'peer pressure'*, as well as distractions in the car (*'with constant noise and stuff you can't concentrate properly'*).

### *Preferred content*

Participants were also asked directly about what content they would like to see in a web-based program for young people's passenger safety. Responses included:

- *'real life stories'*
- *'information about what sort of car you would be driving ... like the right tyres ... and it could be easier to crash or like kill someone'*
- *'information about how the passenger could get home, some other ways to possibly get home, instead of going with the driver'*
- *'first aid skills can be useful for all sorts of things'*

### **3.2.2 Program design**

Additional results of the Stage 2 focus groups provided information informing the design, including the features, activities and overall 'look' of the website.

## *Processes*

Participants had a number of suggestions regarding potential design features of a web-based program that would make it more appealing to young people of their age. Many comments related to the need for interactive features on the site, including games, quizzes and options for discussion:

- *'like a quiz', 'like a game', 'brain games'*
- *'like a wall, kind of like a Facebook wall'*
- *"cos they don't have to talk face-to-face"*

Other comments related to having a section for professional postings, as well as the option for discussions among friends. Privacy was also mentioned, however (*'I would like it to be, it's your choice'*). Additionally, iPhone applications were considered a possible means of delivery (*'people with iPhones would actually use those and well I've got a touch and stuff like that'*).

## *Perceptions of other site designs*

Participants were shown printouts of web-based program pages and asked to comment on their designs. Participants in particular discussed whether the pages were interesting enough for them, for example:

- *'you don't want it to look boring'*
- *'If there's a whole lot of writing just going to like not go on'*

Other comments focussed on the text versus the pictures, and the ratio of each on the page:

- *'writing generally crowded the pictures'*
- *'Speech bubbles... it's pretty inventive ... it's like its talking to you but it's not talking to you'*
- *'not too much writing, too much to read'*

Some of the example sites were considered inappropriate for their age, either because they looked too young, or they reminded them too much of schoolwork:

- *'looks like an episode of Sesame Street or something'*
- *'reminds me of school...Ah it's got a blackboard'*

### **3.3 IMPLICATIONS FOR PROGRAM DESIGN**

The design of the program built on the findings from stage 1 (literature review), including information from previous research about key strategies, friends' protective behaviour and understanding the target behaviours for change, and from the focus groups conducted in stage 2. Focus group findings revealed key areas of program content and processes that could be used to inform program development. In terms of content, talking to friends appeared the most commonly cited approach to intervening and this was most often affected by closeness in the friendship, seriousness of risk and confidence to intervene. Participants also reported on the importance of pictures and interactivity in design.



## 4. PROGRAM DESIGN

Using the results of the focus groups and of the literature review, storyboards were written, and framework content and design, including key activities, were developed. This included the development of scenarios based on those identified by young people in the Queensland focus groups as being relevant to people their age. Activities were also designed to correspond to these scenarios. The program design was based on addressing change in the key constructs associated with passenger intervening behaviour including targeting improved confidence to intervene, perceptions of danger and friends' perceptions of the importance of speaking up or acting up. Screenshots of the program are provided in a separate Appendix. They provide detail of the program activities and way in which the program is designed.

Scenarios and related and independent activities were designed to be interactive and to encourage an understanding of cognitions and behaviour. A web developer translated storyboards into web-based format, and incorporated design elements (e.g. colour, font, illustrations) to be visually appealing and engaging for young people. Each of the scenarios and activities was designed to be accessible from a homepage, which outlined the aim of the website and provided the developers' contact details.

The development of the website was a collaborative process; whereby frequent consultations were held between the researchers and the web developer to ensure appropriate design of program material. Based on these consultations, further activities were designed as opportunities and ideas were formulated. Additionally, frequent testing of the web material was undertaken to ensure appropriate functionality, and changes were made throughout the process to ensure usability of the finalised program. The following section and the attached Appendix provide further information on the web-based program.

### 4.1 SCENARIOS

Three scenarios were developed based on students' indications of risky driving situations, upon which activities were based. The text for these scenarios was based on the following:

1. Character driving a group of friends to a party after a fight with his girlfriend. Driver was emotional, texting his girlfriend and driving too fast. A crash ensued.
2. Character driving a group of friends on back roads late at night; speeding down hills. Lost control on a steep hill. A crash ensued.
3. Character assigned as designated driver but had a few drinks. Insisted on still driving, and was changing music on his iPod. A crash ensued.

## 4.2 SCENARIO-BASED ACTIVITIES

Activities were developed, based on key components of sites as indicated in the earlier research, which related to the three scenarios. These activities included:

- Identifying factors that contributed to the crash
- Assessing benefits and costs relating to protective strategies (driver and passenger); and identifying own strategies for each scenario
- Choosing the best protective prevention method, and identifying reasons for choice.

## 4.3 ADDITIONAL ACTIVITIES

Several activities were also designed to be independent of the scenario-based exercises. These included:

- Identifying safety levels within risky passenger situations and self-assessing confidence to intervene
- Identifying verbal and active intervention strategies within a drink driving situation
- Learning first aid techniques for dealing with MVC-related injuries, and considering prevention strategies to avoid injury (it is anticipated that the first aid content will be to be further developed in consultation with St John Ambulance).

## 5. STAGE 3: FEASIBILITY EVALUATION

According to Nation et al. (2003), the relevance of a program to participants (and those that help facilitate a program) is a primary concern in producing positive outcomes in reducing harm. Additionally, and as was identified through the literature review, a participatory design method is particularly important to ensure users' preferences for content and design are incorporated into the final program (Corry, Frick & Hansen, 1997). Stage 3 was undertaken as part of the participatory design process. Literature reviewed (stage 1) and focus groups, conducted prior to development of materials, provided an initial understanding of key issues for content and design. Following the development of framework materials, stage 3 was conducted to ensure that the program is being developed appropriately for the target audience and target behaviour change.

### 5.1 METHODOLOGY

#### 5.1.1 Participants

One high school in the Australian Capital Territory was recruited for this stage. Parental consent to participate was obtained for N=30 senior students (aged 16 to 17 years) from one class. Additionally, N=8 school staff were recruited at that same school. These staff members were from different teaching departments throughout the school, and were approached by the Pastoral Care Coordinator to participate.

#### 5.1.2 Materials

A detailed focus group protocol was developed for both the student and teacher discussions. Students were asked questions relating to the situations in which passengers may feel unsafe and potential strategies for intervening in their peers' risky driving. The groups of students were also shown the storyboards and framework web-based material and were asked to comment on design and content issues. Teachers were also shown the material and asked about their perceptions of program design and content. Teachers were asked questions relating to the feasibility within the school context. Example questions for the student and teacher focus groups are shown in Table 1.

Table 1. Example focus group questions

Topic ( <i>Group asked</i> )	Example questions
Passenger safety and intervention ( <i>Students</i> )	What situations might make a passenger feel unsafe?  What things can passengers do in this situation?
Web-based program design ( <i>Students &amp; Teachers</i> )	What is your first impression? Prompt on: Design/Layout, Colour, Fonts  What do you like about it? What do you dislike about it?
Web-based program content ( <i>Students &amp; Teachers</i> )	( <i>After presenting risky driving scenarios in web program</i> ) How realistic are these stories?  What sorts of things would you like to see as activities?
Web-based program feasibility ( <i>Teachers</i> )	What, technically, is feasible to incorporate into classroom web-based programs?  How would you facilitate interaction and discussion with a classroom web-based program?

### 5.1.3 Procedure

Approval to conduct this stage of the research was initially obtained from the school principal as per the ACT Department of Education and Training and the university (QUT) research protocol. Parental consent was obtained prior to the students' participation by sending an information sheet and consent form home about the focus groups. Students were only able to participate with written parental consent. Teachers and students were also provided with information sheets and consent forms prior to the focus groups, and gave their own written consent before participating.

All of the focus groups were held during school time. Two facilitators conducted two groups with students over approximately 45 minutes, during one class period. A single teacher focus group was conducted over lunch, and teachers were provided sandwiches to thank them for their participation. Each of the focus groups was audio recorded with the participants' permission, and later transcribed.

## 5.2 RESULTS

The results of the ACT focus groups provided further information on young adults' perceptions of road safety, including the situations in which they feel unsafe and the strategies they use to intervene in unsafe driving behaviour. Much of the results of this stage however focused on perceptions of the framework material and preferences for program design. Teachers also commented on the feasibility of delivering the web-based module in their classes.

### 5.1.1 Passenger safety and intervention

Results relating to passenger safety and intervention came from the student focus groups. Responses to these issues related to two themes: risky driving situations in which young people feel unsafe, and strategies for intervention.

#### *Situations in which students feel unsafe*

Students mentioned both general and specific situations in which they would feel unsafe in a car. Generally, students mentioned the risky behaviour of the driver, for example *'if they were being irresponsible or stupid while driving'*, *'just being dangerous in general'*, and *'if they're not cautious on the road'*.

With regard to specific behaviours, students primarily mentioned *'drink driving'* as a situation in which they would feel unsafe, as well as when the driver is *'not bothering about seatbelts or speed'*.

#### *Intervention strategies*

Overall, students indicated that they would intervene in the risky driving behaviour of their friends, and that they think about protecting their peers. They suggested that they try to act responsibly toward their friends (*'you want to do the right thing'*, and *'you want to make sure your friends are okay'*.) In regards to protecting their friends, one student said, *'you plan to keep an eye out for people'*, although as another followed on, *'but you're not like being their mother the whole time'*. Students described the protection of their friends as an instinctive process, although they do sometimes think and plan for this before an event. For example, one student said that looking out for their friends would be a *'bit of instinct'* and another said *'you would probably plan'*. Another student suggested that *'it would be a bit of both'*.

Students discussed intervention strategies in the context of drink driving friends, as well as a driver who has had a fight with his girlfriend and is texting her on a mobile phone as he drives. Regarding the friend who is texting while driving, students initially discussed an active intervention, such as *'rip the phone off him, throw it out the window'*, however this was then discussed by the group as potentially having more negative consequences (*'that would make him more angry'*). One student suggested that they would *'just like politely...like tell him about it and ask him to stop and not make him angry'*. The group of students also suggested strategies prior to getting in the car, such as *'ask him how he is'*, *'wait and calm them down, and then drive'*, and *'offer to drive instead'*, however they also indicated that this depends on their

capacity as a passenger, for example, *'depends on your state of mind, if you've been drinking'*, and *'you have to be fine as well, if you're a passenger'*. One student indicated that passengers also hold a position of responsibility in the car, suggesting that *'you could get in, but you have to act as like a second eye on the road as well, so like point out things that he might not see'*. In the context of a drink driving friend, students also indicated their responsibility as potential passengers (*'it is our responsibility; you have to be grown up about it'*). Many of the responses relating to the drink driving situations related to actions prior to getting into the car, such as *'do something at the party, before you get in the car'*.

Students were also asked about their confidence regarding attempts to intervene in friends' risky driving. The students were unanimous that they would intervene with a good friend (*'if it's a good friend, yeah'*), however had mixed responses regarding acquaintances or strangers. Some said that they would not actively intervene (*'I wouldn't think so, not if I didn't know them'*), but would avoid the situation, for example, by seeking another means of transport (*'walk'*). Others, though, suggested that they *'would still say, even if I didn't know them that well'*, because *'they're putting you in danger'*.

### **5.2.2 Program design and content**

Three major themes emerged from both students and teachers within the topic of program design and content, relating to 'visual appeal', 'interactivity' and basing the site on 'real life situations and solutions'. Recommendations for program design and content as raised by the student and teacher participants are summarised in Table 2, and presented in more detail in the following sections.

Table 2. Recommendations for design and content of a passenger safety website for young people

Theme	Recommendation
Visual appeal	Include pictures and animation, and not too much text
	Colours that ‘work together’
	Have the right ‘look’ for the target age group
Interactivity	Incorporation of feedback mechanisms
	Games and quizzes
	Videos and opportunities for practice in class
Real life situations and solutions	Base on scenarios that are realistic for target group
	Ideas and strategies for real life risky situations
	Accounts of peers

### *Visual appeal*

Students and teachers agreed that the website should incorporate pictures and animation and not rely heavily on text. For students, too much text makes a site ‘*boring*’ and ‘*plain*’, and would make them want to navigate away from the page. The students indicated that a web-based program would ‘*need pictures*’, although did indicate that the pictures included in the framework material were ‘*cool*’ – the site just needed more of them. Specifically, the students suggested that the site ‘*needs something that catches the eye first, and then bring it in to the information*’.

Teachers also suggested that ‘*boys like animation*’, and that ‘*cartoony stuff is definitely something that they relate to...it’s the drill-in point for them, so they don’t go, oh here we go, it’s another bit of education*’. Some teachers also indicated that pictures and graphics are a ‘*visual language*’ students are ‘*comfortable and familiar with*’. Several of the teachers also suggested that the initial, framework version of the web-based program looked ‘*very much like a test*’, and that this ‘*would probably turn kids off pretty quickly*’, indicating that a ‘*more graphic interface*’ was needed.

Students were the only group to comment on the colours used on the site, and suggested that it needed to make use of ‘*colours that work together more*’. They commented that the colours used within the framework material looked ‘*weird together*’. The students also mentioned that

the program *'kind of looks like it's for children'* and that it needed to be made to *'look a bit older, like for older people'*. The colours and graphics were suggested as means of making the program *'look'* like it was targeted toward their age group.

### *Interactivity*

Both the students and teachers indicated that the web-based program should incorporate interactive activities. Teachers indicated that feedback mechanisms within interactive website activities were *'critical'* for maintaining students interest; *'where they see a feedback mechanism is where they will want to engage and then continue'*. This individualised feedback was suggested by teachers as being incorporated into interactive game activities, with one teacher suggesting *'avatars'*; for example, *'an avatar who they'd have to safely navigate through various scenarios and see if they survive'*. They saw this as potentially transferring to their own decisions within risky situations; for example, *'that might give them a sense of reason for why you make those decisions....what if that's actually me at the party having to make these choices'*.

Students also mentioned that they would like interactive activities, like *'a car game'* or *'quizzes'*. A pair of students talked about a quiz that had recently been conducted in class, where the teacher *'had a projector, she put up questions. And we had like teams and all that, and we had to get points, and the team that got the most points won'*. Other students agreed with the idea of quizzes; *'yeah I reckon quizzes would be best, where the teacher and the whole class can work through it'*, and *'maybe quizzes of varying difficulty'*.

The students also mentioned that they would like videos that demonstrated practical skills (*'yeah maybe like videos or something, on like what you should do'*), and that videos would enable them to learn at their own pace (*'so you can pause and start again', 'step by step'*). One student did however suggest that practice would need to take place within the class context as well (*'online it's a bit difficult, you can't like practice it'*). The students also did acknowledge that videos might not be possible in all cases, and that an alternative may be *'those cartoon things from before'*.

Of note, both students and teachers indicated that a web-based program needed a *'combination of activities that took place both online and within the actual classroom context.'* For example, one teacher suggested that *'I wouldn't just make it game, game, game...there's a balance between reading, feedback, interactivity, you know, breakout teacher-based things. It's the combination of all those things that will touch on different levels of people's learning'*.

### *Real life situations and solutions*

The participating students indicated that each of the scenarios included within the framework materials was realistic for their age group (*'it could be anyone; especially when people have drunk alcohol'*). The teachers agreed that the web program should include *'scenario-based stuff'*, and also suggested that it should give examples of solutions or strategies that young people can use in risky driving situations (for example, *'a script, a set of fall-back scripts that they can use'*). The students also saw example strategies as useful, and suggested that the web-based program should include *'a page for what to do if...'*, and *'solutions for if you're in bad circumstances'*.



Several students also indicated that examples are useful; however that the program should also enable students to generate their own strategies that are individually relevant.

A further suggestion arising from the teacher group was the inclusion of real life accounts from young people or peers. One teacher indicated that when they taught sex education in class, *'when they really started engaging was actually a website that had accounts of peers from their own group'*. The teachers saw real life scenarios and accounts as being a *'hook in'*, that would engage students. For example, one teacher suggested that *'a lot of...distracted students engage in things that are, hey this isn't school, this is life, and they suddenly focus'*.

### **5.2.3 Program feasibility**

Results relating to program feasibility came primarily from the teacher focus groups. The teachers indicated that web-based programs are able to be run in classes, particularly in lab rooms where computers are available, and suggested that potential difficulties, such as for example, audio-based web activities are able to be overcome. For example, in a discussion of narrated online content on individual computers, teachers suggested that *'it's probably just more like classroom management and setup; you can arrange those things to suit. Turn it down, put some headphones on, work in a group, so not just have one each...So you wouldn't necessarily compete with 27 different sound things happening at once'*. Students also reported that they sometimes used computers for a variety of classes and often that teachers projected content onto a central screen so that all students could follow along.

The teachers did however indicate that students would require a large degree of direction in their use of the web-based program in class, and that without the teacher's presence and direction, they would not complete the program activities. For example, one teacher who had previously taught an online curriculum indicated that *'kids don't drill into that unless the teacher is the catalyst to it, and you've got to be the animated person at the front drawing things, showing them some things on the website, and they will read it, but they won't read it to the level you'd think they would...you'd think that's their world, because there's this perception where adults and school boards and principals go, that's the future of education, and you talk to the students and they go, I wouldn't do it if you weren't showing me how to do it'*. This was similarly acknowledged by students, *"you've got to have the teacher talking to you about stuff, letting you know what to do."* The teachers suggested that a program must incorporate interaction with teachers as the *'motivating factor'* that would encourage their completion of the web-based content.

## 6. KEY FINDINGS AND FUTURE RESEARCH

This research provides an evidence base for the development of a web-based passenger safety program for young people. There were a number of key findings arising from this research. It appears that a web-based program may be a feasible method of intervention for the prevention of young adult passenger related injuries, and that young people see this as an appealing means of approach. The comments made by the young people in this research provide real-life scenarios that can be built upon in program content.

In terms of the design of a web-based program, several features have been shown to be particularly important. These include:

- Provision of immediate, personalised feedback
- Interactive activities and games
- An approach that moves beyond simple information provision.

It is clear that the goals of the proposed program (to increase the use of personal and peer-protective strategies in a passenger context) require an interactive, multi-session approach that moves beyond text-based information provision. A comprehensive evaluation would also be required of the resulting interactive web program.

Web-based behaviour change programs are becoming increasingly used within public health practice however a key factor to enhancing acceptability appears to be engagement and responsiveness to material (Leslie et al., 2005). A user-centred or participatory approach to program design can enhance the usability and appeal of intervention programs (Ferney & Marshall, 2006). This research presented in this report has described the participatory design process undertaken to develop a web-based road and passenger safety program for senior school students.

The findings provide information for the kind of scenario in which strategies for intervention may be implemented and can thus be processed in the program design and content. For example, the driving and passenger-related situations described as unsafe by student participants may be used to further develop the real life scenarios on which the program activities are based. The scenarios, which are consistent with the literature on factors likely to contribute to young driver crashes, include drink driving and speeding as unsafe. Such feedback is critical in the design phase of the program, prior to any widespread implementation throughout schools.

The strategies described by the students also suggest material for the intervening behaviour which can be implemented in risky driving situations (such as the drink driving or speeding contexts). These strategies can also be used to further inform the program content. For example, students indicated that, at times, they plan to look out for their friends, while at other times this is more instinctive and immediate. Having a plan to watch out for friends is likely to

be a key strategy that could therefore be further encouraged through web-based program content. The suggestions that the students had for intervening in their friends' risky driving behaviour can also be used as example strategies for future participants in program activities. Important factors related to intervening evidenced from the literature and focus groups suggests that students vary in their confidence to intervene and that this is likely to be particularly limited with drivers (and fellow passengers) who are not close friends. Confidence to intervene with different groups of risky drivers is therefore an important factor to target through the web-based program.

Both the student and teacher participants provided insight into preferred program design and content. Both groups of participants indicated that visual appeal and interactivity are particularly important in terms of engagement and continued use of a program. Students noted the need for pictures and limited text, and teachers agreed with this perception, indicating that text needs to be used supplementary to graphics in an online curriculum. It was noted that text can be found in textbooks and that the web can be used to supplement traditional learning mechanisms. Teachers also mentioned that individualised feedback is particularly important, and students provided ideas of how this may be implemented through a web-based program; for example through interactive class quizzes with group prizes, which is likely to be a key strategy.

Students indicated that aspects of the framework of the initially proposed web-based materials were appealing, particularly the pictures that had been drawn to illustrate the different scenarios. They did however suggest that much of the rest of the program design was at that stage too basic and more appropriate for earlier teens. It was suggested that the colours in particular that were used throughout the pages gave the impression of being for a younger audience. Such feedback is particularly important in the design phase of the web-based program, and can be used to tailor the website to appeal to the age group and developmental period it is intended for.

Interestingly, both teachers and students suggested the need for varied content, and to integrate web-based material with interactive classroom activities. Most students mentioned this in terms of the ability to 'practice' skills, while teachers recommended this as a means of sustaining engagement and motivating students for continued participation in the online content (similarly, some students noted attention would be achieved with varied content and engagement with teachers). Importantly for the design of the web-based program, activities should incorporate classroom interactivity and teacher-student engagement.

Grounding the web-based activities in real life scenarios was considered important, and students indicated that the scenarios developed for the initial program were realistic for their age group. Thus the scenario descriptions were found to be consistently appropriate across all stages of the research. Teachers and students also gave additional recommendations for enhancing the 'real life' elements of the program content, for example, by including activities for developing strategies for dealing with risky situations. This approach could potentially be achieved by incorporating peer accounts of risky situations, having material provided and

allowing students to then develop their own outcomes and solutions. Such suggestions may be incorporated into future iterations of the web-based program.

The findings from this research provide a number of suggestions that can assist in the development of the web-based road and passenger safety program; however future program design needs to take into account the sustainability, cost-effectiveness and potential efficacy of the suggested elements (Ferney & Marshall, 2006). For example, several students suggested that they would like videos to be included; however videos are costly to produce and may 'age' quickly, requiring frequent updates. Additional program elements therefore need to be carefully assessed in terms of their addition to program efficacy in relation to their sustainability and cost-effectiveness, prior to inclusion in program content.

A web-based program for senior high school students therefore appears to be a feasible means of delivery for road and passenger safety messages within the school context. Importantly a key step in program design was achieved; the development and construction of activities and web-based material. The current research reveals the importance of a participatory, evidence-based approach to web-based program design, in order to ensure future acceptance and use of the program by target participants. The findings of this research have important implications for the further development of the web-based passenger safety program and to the road safety education of senior high school students.

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## APPENDIX A: SYSTEMATIC LITERATURE REVIEW RESULTS

Research Examining Protective Strategies					
Reference	Participants	Method & key variables	Results relating to risky driving behaviour		
			Protective strategies	Person-related factors	Context-related factors
Boekeloo et al. (2009)	N=509 (40% male) college students	Web- or paper-based survey. Examined intentions and confidence to intervene in others' drinking	57.3% reported having driven or walked someone who had been drinking home in the previous two months	Drinkers, and those with greater intervention confidence, were more likely to report intervening. Sex, study condition, race and age were not significant	Likelihood of intervening differed by relationship, with likelihood increasing from stranger, to wing-mate, to roommate, to friend
Shore et al. (1998)	N=201 (51% female) college students (Mean age 22.2 years)	Paper-based survey. Examined threat to competence in the prevention of drunk driving	Mentioning police presence was rated as most likely to persuade friend to not drive drunk, followed by stating they'd had too much, stating that they would get them killed, stating that they're really drunk, and finally stating that they're smashed	Sex was not associated with effectiveness ratings of intervention statements	Among men and drinkers, perceived threat level of the intervention statement was significantly and inversely related to effectiveness ratings of intervention statements
Collins et al. (1992)	N=195 (44% male) college students (Median age 20 years)	Paper-based surveys. Examined informal peer sanctions in potential drunk driving situations	Most often reported strategy was assuming role of driver (25%), followed by actively preventing person from driving (8%), telling person not to drive (7%) and arranging for someone else to drive (5%). 46% reported multiple strategies	No detail	No detail
Shore et al. (2000)	N=100 (40% male) college students (Mean age 24.3 years)	Paper-based survey. Examined interactions in drunk driving prevention situations	Most common intervention method was offering suggestions of how to get home (37%), followed by asking permission to drive (36%), simply stating that the person is drunk (11%), actively taking over without questioning (10%) and demanding they not drive (6%).	No detail	No detail

Research Examining Person-related Factors Related to Protective Strategies				
Reference	Participants	Method & key variables	Results relating to risky driving behaviour	
			Protective strategies	Person-related factors
Adebayo (1988)	N=482 (51% male). 17% 18-24, 36% 25-34, 16% 35-44, 19% 45-59, 12% aged 60+	Face-to-face interviews. Examined prevention of impaired driving	Among 18-24 year olds; willing to intervene by: Offering to drive person home/ get taxi (92%), suggesting they stay overnight (84%), trying to persuade not to drive (79%), and trying to take keys away (60%)	Age, sex, and marital status of respondents were not significant in determining protective strategies
Flanagan et al. (2004)	N=2697 (54% female) 5 <sup>th</sup> – 12 <sup>th</sup> grade students	Survey with vignettes. Examined strategies adolescents endorsed for protection of friends using alcohol and other drugs	For vignette regarding friend's drinking and potential driving, adolescents most likely to endorse strategies for own protection (i.e. finding another ride) followed by talking to friend, taking their keys, and then telling an adult. Those aged 16+ more likely to endorse taking keys than talking to friend	Age – older adolescents less likely than younger adolescents to tell an adult and more likely to take away keys. Sex – girls more likely than boys to take away keys
Turrisi et al. (1993)	N=260 (59% female) 16-18 year old students	Interviews with surveys. Examined intervention in drunk driving	For males, modal response was to take keys away, followed by get a friend to drive, try to arrange for them to stay overnight, and try to reason with them. For females, modal responses were to take keys away and ask a friend for a ride, followed by try to arrange to stay over, and try to reason with them	Significant sex differences in frequencies of reporting different strategies
Mauck et al. (2000)	N=119 (60% female) college students (Mean age 22.32 years)	Paper-based survey. Examined psychosocial predictors of interventions to prevent drunk driving	No detail – drink driving context	Comparative impairment, moral/social obligation and number of people consulted significantly predicted intervention effort. Sex, age and affinity toward driver were not significant
Monto et al. (1992)	N=303 (62% female) college students (Mean age 21 years)	Paper-based survey. Examined decisions to intervene to prevent peer from drunk driving	No detail – drink driving context	Race, sex, age were not significant in predicting likelihood of intervention
Smart et al. (1997)	N=1184 students in Grades 7, 9, 11 and 13	Paper-based survey. Examined interventions in friends' alcohol, tobacco, illegal drug use and drunk driving	No detail – drink driving context	Only 6.5% of students reported often intervening in friends' drunk driving. Factors predicting intervention in friends' substance use included older age, using cannabis less often, having more friends who use substances, having more school drug education, more disapproval of substance use

Research Examining Context-related Factors Related to Protective Strategies				
Reference	Participants	Method & key variables	Results relating to risky driving behaviour	
			Protective strategies	Context-related factors
Beck et al. (1987)	Four focus groups held with 11 <sup>th</sup> and 12 <sup>th</sup> grade students. 5-6 students/ group	Focus groups. Examined in-depth perceptions of alcohol use and interventions	Strategies for stopping others driving drunk included taking away keys or suggesting someone else drive. Other students indicated informal participation in designated driver programs with friends	Most participants indicated they would not intervene if didn't know the potential drunk driver
Hernandez et al. (1987)	N=97 (55% male) college students (77% aged 18-19 years)	Paper-based survey. Examined type and frequency of interventions used to prevent drunk driving	Most common intervention – being told not to drive. Least common – having car keys taken away	Interventions most common when leaving a party or friend's home rather than bar or restaurant
Hernandez et al. (1999)	N=192 (59% female) college students (Mean age 19 years)	Paper-based survey. Examined psychological reactions to drunk driving situations and types of interventions	Telling person not to drive was most frequently attempted assertive intervention. Asking person not to drive was most frequently attempted passive intervention	Psychological reactions to drunk driving situations predicted interventions – Anxiety positively predicted both assertive and passive interventions; excitement and chivalrousness positively predicted passive interventions; sense of vulnerability negatively predicted assertive interventions
Gustin et al. (2008)	N=277 (75% female) college students (Mean age 20.5 years)	Web-based surveys manipulating number of drinks, consumption time and distance needed to drive. Examined perceived risk and intervention in drunk driving situations	No detail – drink driving context	Distance to drive negatively associated with intervention likelihood. Perceived risk factors including impairment, likelihood of arrest and accident also associated with intervention likelihood
Thomas et al. (1995)	N=489 (61% female) college students (Median age 19 years)	Paper-based survey. Examined factors contributing to decisions to intervene in alcohol-related situations	No detail – drink driving context	Decisions to intervene in drunk driving motivated by concern for immediate harm (53%), safety of others (31%) and concern for own safety (23%). Decisions for non-intervention included not knowing person well (24%), being too drunk to help (24%), impact on self-image (16%), being unsure of drunkenness (13%), anticipated conflict (13%) and lack of personal responsibility (12%).