Safe Drive Stay Alive: exploring effectiveness of a real-world driving intervention for pre-drivers and the utility of the Health Action Process Approach

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What is already known on this subject:

- Preventative interventions for pre-drivers are often ineffective
- Psychological theories can help explain behaviour and are used to evaluate interventions
- Safe Drive Stay Alive has been shown to influence only some psychological determinants of behaviour as measured by the Theory of Planned Behaviour

What this study adds:

- The Health Action Process Approach explains a significant amount of variance in driving intentions tested in a ‘real-world’ setting
- Using theories and determinants in addition to the theory of planned behaviour may expand our understanding of driving behaviour
- Atheoretical preventative interventions that rely on persuasion, information provision and negative consequences may not be effective in a predominantly pre-driving population. Therefore, theory-informed interventions are worthy of further exploration

ABSTRACT

Young drivers are greatly overrepresented in road traffic collisions (RTCs) worldwide. Interventions attempt to change driving-related behaviours to reduce injuries and deaths from RTCs. The current study evaluated the effectiveness of the well-established Fife Safe Drive Stay Alive (SDSA) practice-based intervention on determinants of driving behaviour using the Health Action Process Approach (HAPA) model. Adolescent participants (predominantly pre-drivers) attending the SDSA intervention from schools and colleges in Fife, Scotland, were invited to complete an evaluation at baseline and at 3 months exploring motivational determinants of driving behaviour (e.g. risk perception). Intervention content was examined for behaviour change techniques (BCTs). Eighty-seven participants completed both baseline and follow-up evaluations. The motivational HAPA model variables predicted driving intentions. There was no significant overall effect of the SDSA intervention between baseline and 3 month follow-up. Seven negatively-framed BCTs were utilised in the intervention. The effectiveness of SDSA is questioned, however the study supports the use of the HAPA model in explaining driving intentions and therefore may usefully inform driving interventions.

INTRODUCTION

Road traffic Collisions (RTCs) are the leading cause of death among young drivers, primarily as a result of risky driving.[1] Factors of influence include driving environment, demographics, personality factors, driving ability, and psychological predictors such as beliefs, attitudes, and perceived susceptibility.[2,3] Psychological theory has been used to understand driving behaviour, most frequently the Theory of Planned Behaviour (TPB), which can explain up to 53% of variance in intention to speed and 40% of variance in speeding behaviour.[4]

Interventions to change determinants of driving behaviour include: multi-media campaigns;[5] speed camera interventions;[6] driver training programs.[7] These have all been found to influence driving behaviour or determinants of behaviour, however, they lack long-term follow-ups or effects diminish over time. A minority of interventions, which tend to involve smaller group work and discussion, show sustained results.[8]

Safe Drive Stay Alive (SDSA) is a driving intervention implemented in a range of areas in the UK, including Fife, Scotland, where it has been running yearly since 2002.[9] SDSA is intended to deliver thought provoking messages to young people, who are predominantly pre-drivers, or learning to drive, through a video reconstruction of a driving collision that has happened in the area, interjected with live statements from emergency services, parents, and victims of road collisions about their own experiences of RTCs (for example, graphic descriptions of RTCs, details about the consequences of accidents). Evaluations have found effects on intention, attitude, and perceived behavioural control, however, effects faded several

months later.[10, 11] Despite this, SDSA continues to be delivered in many areas of the UK, possibly due, in part, to a lack of awareness of the evidence, and due to its perceived face validity by organisers, funders, pupils and teachers.

The current study's first aim is to build on previous evaluations of SDSA by exploring the ability of the motivational components within the Health Action Process Approach (HAPA) model to predict driving intentions.[12] This was in order to first examine the utility of the HAPA model in explaining driving intentions in young people before examining the intervention effects on HAPA components. The second aim is, therefore, to explore the effectiveness of the existing SDSA intervention in altering determinants of behaviour in young people using the motivational components and intention within the HAPA model. The HAPA aims to explain both the psychological determinants of behaviour, and the processes that support behaviour change, since it specifies a motivational, volitional and maintenance phases of behaviour change. The psychological determinants in the motivational phase are: risk perception (in this case the risk of accidents), self-efficacy (confidence in avoiding an accident), and outcome expectancies (perceived chance and severity of an accident). Collectively, these predict intentions to undertake a behaviour. The HAPA model goes on to specify that action and coping planning help bridge the gap between intention and behaviour. Self-efficacy remains important at this and the maintenance phase, along with barriers and resources. The TPB focuses on psychological determinants only and compared to the TPB (which explores: attitude; perceived behavioural control, which may be considered as similar to self-efficacy; and social norms), the HAPA shows different determinants of intention. The HAPA was favoured over the TPB

since research in other behaviour areas has found it to be more predictive of behavioural intention than the TPB.[13]

We did not have any input into the development nor running of the intervention and no information on how theory or evidence may or may not have been used in its development was available. To explore and therefore better specify the 'active ingredients' of the content of the intervention, our third aim is to code the intervention for behaviour change techniques (BCTs).Therefore, although detailed information about the intervention was not specified, this process brings more detail to the intervention content.

METHOD

Participants and Recruitment

The target participants for the evaluation were 16-18 year olds from schools and colleges in Fife, Scotland who attended the SDSA intervention in November 2011. All young people ages 16-18 in the county who were engaged in education at the time of the intervention were invited to attend, and classes were stopped for that period to allow for pupils and students to be transported to the venue, as part of their curriculum for that day. This represents around 4398 students, who were invited. Although exact numbers attending the intervention were not recorded by the organising committee, it is understood that the majority attended based on the theatre being near capacity for all performances. The aim for recruitment was at least 84 participants, based on a power calculation (4 variables in regression analyses, alpha of 0.05, power of 0.80), but we had hoped to recruit greater numbers than that. Recruitment was through advertisement in schools and colleges one week

before the intervention and 3 months after (timings for the evaluation were pre-determined by the SDSA Organising Committee). This was done using postcards with a web link to the evaluation and posters, which were distributed in schools and colleges to all young people due to attend the intervention. Follow-up participants were also recruited through email if they had participated at baseline. A prize draw, for driving-related gifts, was offered as an incentive. Pupils from all schools took part in the evaluation. Participants were matched by email address. Ethical approval was granted from the University of St Andrews.

Materials

The questionnaire was conducted online using Survey Monkey and included demographic questions (sex, age, and domicile postcode) and psychological determinants of driving behaviour (self-efficacy, outcome expectancies, risk perception, and intention), assessed using the following scenario based on previous driving research: 'You are driving a car down a country road with a few friends as passengers. It's about 4 o'clock on a fine, dry afternoon. You can't see any other cars. There are some bends in the road. The speed limit is 60 miles per hour.'[14]. This scenario was adapted to fit the video shown in SDSA and was done to make the scenario relatable and to create a perspective for non-drivers. Self-efficacy, outcome expectancies, risk perception, and intention HAPA variables were specifically assessed around speed and slowing down for bends or other changes in the road. For example, *'If I drive below 60 miles per hour, I will be able to respond to risks better so have less chance of an accident.*' with answer choices on a 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). See table 1 for a full list of questions, which preface the descriptive statistics. Intervention content of the DVD of the 2011 SDSA intervention was coded for the BCTs it utilised, using

BCT taxonomy V1.[15] This was rated by two authors. Any discrepancies were discussed and agreed upon.

Analysis

Data were analysed using a combination of parametric and non-parametric tests. Data had skewness, predominantly due to ceiling effects, and z-scores were higher than the acceptable level. The non-normality of data was slightly less pronounced for the larger baseline sample, therefore, multiple regressions proceeded as planned for this element of analysis.

RESULTS

538 (12%) young people completed at least one part of the evaluation. We were able to match responses (using their email address) from 87 participants who completed both the baseline and follow-up evaluation (56% female; mean age = 16.98 years). Of these, the majority had never driven a car (N=75). There were no significant differences on any demographic factors (e.g. sex, driving status) or psychological determinants (e.g. self-efficacy, risk perception) at baseline between the 87 matched participants and the remaining 278 participants who took part in baseline only.

Hierarchical multiple regressions were exploratory in nature and were used to assess the ability of the measures of risk perception, self-efficacy, and outcome expectancies to predict driving intention. This was undertaken on all valid datasets for participants at baseline (combined N=365; N in analyses varies due to missing data). Table 2 shows the results of the regression for intentions to avoid speeding in a 60mph limit; the total variance explained by the motivational variables within the HAPA model was 47%, $F(4,289)=20.57$, $p < 0.001$, with more variance explained by

one of the outcome expectancy variables, followed by risk perception and self-efficacy. For intention to slow down for bends and other changes in the road (Table 3), the total variance explained by the motivational variables within the HAPA model as a whole was 59%, $F(4,299)=38.70$, $p < 0.001$, with the most variance again explained by one of the outcome expectancy variables, along with risk perception. This suggests that the motivational variables within HAPA model have utility in explaining driving intentions in this group.

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Wilcoxon Signed Ranks tests examining the effect of the intervention on driving intentions, risk perception, outcome expectancies and self-efficacy between baseline and follow-up were all non-significant (N=87; Table 1; aim two).

<Insert Table 3 around here>

Behaviour Change Techniques Taxonomy

A total of seven techniques were identified in the intervention video through coding the visual and audio messages given (aim three). These were *'future punishment'*, *'persuasive source'*, *'salience of consequences'*, *'information about social and environmental consequences'*, *'information about health consequences'*, *'information about emotional consequences,'* and *'information about others'.*

DISCUSSION

The hierarchical regression analyses showed that the motivational HAPA variables explained more of the variance in intention to slow down for bends and changes in the road (59%) than speeding (47%). It was also found that one of the outcome expectancy variables was the strongest consistent predictor, followed by risk perception, then self-efficacy. This shows that the motivational determinants within the HAPA model can successfully predict driving intentions. However, there are other factors that the HAPA model does not specifically account for such as attitude and social cues, suggesting that interventions for different risky driving behaviours may need to target additional determinants to effect change.

Overall, there was no significant effect of the SDSA intervention on psychological determinants of driving behaviour from the motivational phase of the HAPA model at 3-month follow-up. The findings are in line with previous research, including a previous SDSA evaluation, which found little or no effect of driving interventions in this predominantly pre-driving intervention.[5,11] Given that driving attitudes become riskier with driver training and experience, for a driving intervention to impact upon road traffic collisions, the intervention would need to be effective beyond 3 months.[16] Possible explanations include that shock tactics are ineffective since people try to avoid upsetting messages. Therefore, although the BCTs providing information about consequences can be linked to the risk perception and outcome expectancies constructs within the HAPA, the way the messages were delivered may have rendered them ineffective. Positively-framed messages and those using humour can have greater impact long-term, especially for males, who dissociate

themselves from fear appeals.[5,17] The SDSA intervention may benefit from using less threatening messages, and possibly the use of humour.

The seven BCTs used in the intervention were all negatively framed, and provide more specificity to the intervention content than has previously been reported. It may be that using fewer negative consequences and framing parts of the intervention in a more positive way may have greater long-term effects.[17] Social norms marketing (which uses commercial marketing techniques to influence and change perceived social norms, for example towards perceiving that people do not speed) has been suggested as a useful tool in driving interventions and has successfully changed related behaviours.[18] Further, behavioural techniques and strategies may be needed within an intervention, as suggested by the volitional phase of the HAPA. For example, implementation intentions has been found to be effective in increasing compliance with speed limits.[19]

Despite the strength of this being a 'real-world' evaluation, it meant that a control group was not possible, which was a limitation. Consequently, it is not possible to deduce that the results found (albeit non-significant) would not differ in a population not receiving the intervention. This is particularly pertinent, given that driver attitudes can become more risky with experience – especially when learning – around many driving behaviours.[16, 20] Therefore, there is a possibility that this intervention helped prevent attitudes become more risky, compared to controls. The study was also limited in that predominantly pre-drivers were targeted and therefore, driving behaviour was unable to be measured. In addition, due to the low numbers of matched participants, it is difficult to draw conclusions from the sample, which may

have a self-selection bias, however, power was achieved for the sample. This also ties into problems of reach, with a low proportion of intervention participants taking part in the evaluation – another possible source of bias. Since the current study did not collect data immediately post-intervention it is unknown whether there was an initial effect that wore off by the follow-up. Never-the-less, for a driving intervention to impact upon road traffic accidents, especially one that targets young people predominantly without any driving experience, the intervention would need to be effective in the long-term. Therefore, the lack of effect at 3-months is of importance. Further research utilising the motivational variables, within the HAPA, as well as the HAPA model on the whole may be warranted. It may also be timely to re-appraise SDSA and explore the use of theory as well as the evidence base and BCTs in modifying the intervention to increase effectiveness. Future research exploring the effectiveness of driving interventions in this population should aim to include longer term follow-ups to assess the impact on behaviour.

CONCLUSIONS

The motivational variables within the HAPA model has been found to be highly successful in predicting driving intentions and may offer an additional tool in developing and evaluating interventions. Overall the current study was unable to find any main effects of the SDSA intervention. Therefore, interventions may in particular need to consider additional input to improve outcomes of interventions delivered in 'real-world' settings; evidence-based BCTs offer a way to inform these interventions.

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Table 1. Hierarchical regression summary for intention to avoid going above 60mph at baseline (N=289).

Variables	B	SE B	β
I plan to avoid going above 60 miles per hour.			
Step 1. Self-efficacy			
How confident do you feel that if you wanted to, you could avoid speeding?	0.17	0.06	0.15**
Risk Perception			
I could be at risk of having an accident on this road because of driving more than 60 miles per hour.	0.15	0.05	0.17**
Outcome expectancies			
If I drive below 60 miles per hour I will be able to respond to risks better so have less chance of an accident.	0.49	0.08	0.40***
If I drive below 60 miles per hour any accident will be less serious.	-0.05	0.06	-0.06

*Note: R^2 =.47 Adjusted R^2=.22, F(4, 289)=20.57, (p=0.000). *p<0.05, **p<0.01, ***p<0.001*

Table 2. Hierarchical regression summary for intention to slow down for bends and other changes in the road at baseline (N-299).

Variables **I plan to slow down for bends and other changes in the road.**	B	SE B	β
Step 1. Self-efficacy			
How confident do you feel that you could slow down in time for corners and other changes in the road?	0.02	0.04	0.03
Risk Perception			
I could be at risk of having an accident on this road because of not slowing down enough for bends or other changes in the road.	0.09	0.03	0.17**
Outcome expectancies			
If I slow down for bends and other changes in the road I will be able to respond to risks better so have less chance of an accident.	0.51	0.06	0.57***
If I slow down for bends and other changes in the road any accident will be less serious.	-0.06	0.04	-0.09

*Note: R^2 =.59 Adjusted R^2=.34, F(4, 299)=38.70, (p=0.000). *p<0.05, **p<0.01, ***p<0.001*

Table 3. showing the descriptive statistics for intention and determinants of intention at baseline and follow up and statistical test values for the difference between these scores from baseline to follow-up (N=87).

Items	Baseline		3 month Follow-up		
	Mean	SD	Mean	SD	*p* value
Intentions					
I plan to avoid going above 60 miles per hour.	4.09	(1.08)	4.05	(1.14)	.80
I plan to slow down for bends and other changes in the road.	4.51	(0.77)	4.48	(0.89)	.98
Risk Perception					
I could be at risk of having an accident on this road because of driving more than 60 miles per hour.	3.74	(1.38)	3.83	(1.42)	.35
I could be at risk of having an accident on this road because of not slowing down enough for bends or other changes in the road.	3.98	(1.37)	4.06	(1.26)	.45
Outcome expectancies					
If I drive below 60 miles per hour I will be able to respond to risks better so have less chance of an accident.	4.33	(0.95)	4.36	(0.93)	.80
If I drive below 60 miles per hour any accident will be less serious.	3.63	(1.30)	3.64	(1.31)	.77
If I slow down for bends and other changes in the road I will be able to respond to risks better so have less chance of an accident.	4.28	(0.86)	4.29	(0.94)	.70
If I slow down for bends and other changes in the road any accident will be less serious.	3.69	(1.23)	3.64	(1.23)	.82
Self-efficacy					
How confident do you feel that if you wanted to, you could avoid speeding?	4.21	(0.88)	4.37	(1.02)	.07
How confident do you feel that you could slow down in time for corners and other changes in the road?	4.02	(0.90)	4.11	(1.03)	.32

Table 4 showing the behaviour change techniques (BCTs) used in SDSA

BCT	Definition	Examples
59. Future Punishment	Inform that future punishment or removal of reward will be a consequence of performance of an **unwanted** behaviour (may include fear arousal) (includes ***'Threat'***).	Presentation of what would happen if they do not drive safely. "They can and will happen to you unless...".
72. Persuasive Source	Present verbal or visual communication from a **credible source** in favour of or against the behaviour.	Testimonies by Police, Fire Brigade, against the behaviour.
78. Information about social and environmental consequences	Provide information about social and environmental consequences of performing the behaviour.	Damage to cars, life in a wheelchair, loss of friends or family.
79. Information about health consequences	Provide information about health consequences of performing the behaviour.	Depiction of death and injury.
80. Information about emotional consequences	Provide information about emotional consequences of performing the behaviour.	Emotional impact of families of victims and guilt of driver.
81. Salience of consequences	Use methods to emphasise (make more memorable) the consequences of changing the behaviour (goes beyond informing about consequences).	Vivid reconstruction on screen.
84. Information about others' approval	Provide information about what other people think about the behaviour. Information clarifies whether others will like, approve or disapprove of what the person is doing or will do.	The Driver says "Faster doesn't mean better".