Evidence that implementation intentions reduce drivers' speeding behavior: Testing a new intervention to change driver behavior

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Abstract

Implementation intentions have the potential to break unwanted habits and help individuals behave in line with their goal intentions. We tested the effects of implementation intentions in the context of drivers' speeding behavior. A randomized controlled design was used. Speeding behavior, goal intentions and theoretically derived motivational pre-cursors of goal intentions were measured at both baseline and follow-up (one month later) using self-report questionnaires. Immediately following the baseline questionnaire, the experimental (intervention) group (N = 117) specified implementation intentions using a volitional help sheet, which required the participants to link critical situations in which they were tempted to speed with goal-directed responses to resist the temptation. The control group (N = 126) instead received general information about the risks of speeding. In support of the hypotheses, the experimental group reported exceeding the speed limit significantly less often at follow-up than did the control group. This effect was specific to 'inclined abstainers' (i.e., participants who reported speeding more than they intended to at baseline and were therefore motivated to reduce their speeding) and could not be attributed to any changes in goal intentions to speed or any other measured motivational construct. Also in line with the hypotheses, implementation intentions attenuated the past-subsequent speeding behavior relationship and augmented the goal intention – subsequent speeding behavior relationship. The findings imply that implementation intentions are effective at reducing speeding and that they do so by weakening the effect of habit, thereby helping drivers to behave in accordance with their existing goal intentions. The volitional help sheet used in this study is an effective tool for promoting implementation intentions to reduce speeding.

Keywords: Implementation intentions; Speeding; Habit/Past behavior; Goal intentions; Behavior-change; Volitional help sheet

1. Introduction

Exceeding the speed limit is one of the main contributing factors to road traffic crashes (Department for Transport, 2013). While road engineering (e.g., speed humps) and police enforcement (e.g., speed cameras) can reduce driving speeds, their measurable effects are limited to those locations on the road network where they operate (see Champness, Sheehan & Folkman, 2005; Elliott & Broughton, 2005). Educational interventions (e.g., media campaigns) should have a wider influence on driver behavior because they are designed to motivate safe driving (e.g., the avoidance of speeding) rather than control it through non-ubiquitous environmental constraints. However, speeding is habitual and habits interfere with the process of translating motivation into action (e.g., Elliott, Armitage & Baughan, 2003). Indeed, educational interventions have not been shown to reduce speeding (e.g., Stead, Tagg, MacKintosh & Eadie, 2005). The aim of this study was to test a new intervention designed to facilitate the formation of implementation intentions, thereby helping drivers to over-ride speeding habits and convert motivations to avoid speeding into action.

1.1 Motivation, speeding behavior and habit

Motivational models, in particular the theories of reasoned action (Ajzen & Fishbein, 1980) and planned behavior (Ajzen, 1985), have been widely used to predict driver behavior. According to these models, an individual's goal intention (overall motivation to behave) is the key determinant of their behavior. In support of this proposition, and in line with studies of general social behavior (see Armitage & Conner, 2001; McEachan, Conner, Taylor & Lawton, 2011), goal intentions typically account for between 17% and 45% of the variance in drivers' speeding behavior (e.g., Conner et al., 2007; Elliott, 2012; Elliott et al, 2003; Elliott, Armitage & Baughan, 2007; Elliott & Thomson, 2010). These findings are regarded as moderate- to large-sized effects in the social sciences (see Cohen, 1992) and have led

researchers to conclude that interventions targeting goal intentions are needed to reduce speeding. However, there are two potential problems with this conclusion. First, the above cited R^2 values show that over half of the variance in speeding behavior is typically unaccounted for by goal intentions, meaning that there is a goal intention-behavior 'gap'. Research into goal intention-behavior discrepancies (e.g., Orbell & Sheeran, 1998; Sheeran, 2002), shows that this gap is mainly attributable to 'inclined abstainers' (individuals who intend to perform the required behavior but abstain from doing so). Most relevant to this study, Elliott and Armitage (2006) found that 25% of their general population driving sample ($N = 150$) had a goal intention to comply with speed limits but subsequently exceeded the speed limit more frequently than did the average (median) driver. These inclined abstainers accounted for 72% of all drivers who did not behave in line with their goal intentions and over a half of all drivers who did not regularly comply with speed limits. These findings show that changing drivers' goal intentions will not guarantee a corresponding reduction in speeding behavior. Additionally, they show that there are a substantial number of drivers for whom intention change does not represent a useful intervention strategy in the first place. This is because they already have the required goal intention to avoid speeding; they just fail to translate that goal intention into action.

The second reason why interventions targeting goal intentions are, on their own, unlikely to change behavior is that speeding is largely habitual (e.g., Elliott et al., 2003; Elliott & Thomson, 2010). Habit is a concept that originates from behaviourism (e.g., Skinner, 1938). When an individual repeatedly performs a behavior in similar situations, s(he) learns to associate those situations with the performance of the behavior. This association is represented in memory and serves to initiate the behavior automatically (rapidly, with little conscious awareness) when the associated situations are subsequently encountered, thereby weakening the influence of motivational cognitions (e.g., goal

intentions) on behavior (e.g., Elliott et al., 2003; Verplanken, Aarts, van Knippenberg & Moonen, 1998). A challenge therefore, is to develop interventions that are capable of both breaking habits and helping drivers to translate their goal intentions into action. Interventions that promote *implementation intentions* represent an appropriate strategy for achieving these aims.

1.2 Implementation Intentions

Implementation intentions are 'IF-THEN' plans that are designed to facilitate the translation of goal intentions into action (Gollwitzer, 1990). In the 'IF' component of an implementation intention, individuals are required to specify a critical situation in which they will perform an intended behavior (e.g., a driver who intends to refrain from speeding might specify: "If other vehicles are overtaking me…"). This serves to encode a representation of the specified situation to memory. That mental representation is then 'activated' when the specified critical situation is subsequently encountered. The encountered situation then becomes highly salient, reducing the likelihood that an individual will miss a good opportunity to perform the intended behavior (Webb & Sheeran, 2004; Webb & Sheeran, 2008 [study 2]). In the 'THEN' component of an implementation intention, an individual is required to mentally associate the specified critical situation with an appropriate goal-directed behavioral response (e.g., "THEN I will drive in a lower gear to help me drive slower"). This serves to automatically initiate a suitable strategy for ensuring the performance of the intended behavior when the mental representation of the specified critical situation has been activated (Webb & Sheeran, 2004; Webb & Sheeran, 2008 [study 2]). Implementation intentions therefore operate in a similar way to habits. However, with habits, the situation-response associations that serve to automate behavior develop through past behavioral experience, meaning that habits can become counter-intentional (e.g., when goal intentions subsequently change). With implementation intentions, on the other hand, the situation-

response associations develop through conscious thought that takes place with an individual's awareness of their most recent goal intention. The automaticity produced by implementation intentions is therefore strategic and can potentially over-ride the automaticity produced by habits (Holland, Aarts & Langendam, 2006).

1.3 Previous research on implementation intentions

Previous research has shown that implementation intentions are an effective strategy for changing behavior. Most notably, a meta-analysis by Gollwitzer and Sheeran (2006) examined 94 independent studies conducted across a wide variety of social and health contexts and found that implementation intentions produced moderate- to large-sized changes in behavior (d = 0.65). However, just one previous study has tested the effects of implementation intentions on driver behavior. Consistent with Gollwitzer and Sheeran's (2006) meta-analysis, Elliott and Armitage (2006) found that an experimental (intervention) group, in which participants specified implementation intentions, subsequently complied with 30mph speed limits to a greater extent than did a control group (d = .43). Additionally, and also in line with studies of general social behavior (see Webb & Sheeran, 2008 [study 1]), Elliott and Armitage (2006) found that the difference between experimental and control participants' speeding behavior was not attributable to changes in goal intentions, implying that implementation intentions helped drivers to translate existing goal intentions into action. In this research, we aimed to replicate Elliott and Armitage's (2006) findings. Given that the strategic automaticity of implementation intentions has the potential to break unwanted habits and help drivers to behave in line with their goal intentions, we also explicitly tested whether specifying an implementation intention attenuates the relationship between past behavior (i.e., habit) and subsequent behavior, and augments the relationship between goal intentions and subsequent behavior (cf. Holland et al., 2006; Orbell, Hodgkins & Sheeran, 1997; Webb, Sheeran & Luszczynska, 2009).

We also addressed several potential limitations with the evidence-base for implementation intentions. First, as noted above, implementation intentions are designed to change behavior by helping individuals translate their existing goal intentions into action (i.e., implementation intentions represent a useful behavior-change strategy only for individuals who are inclined to perform the required behavior but abstain from doing so). However, researchers have not explicitly sampled inclined abstainers in previous studies. While there are some studies in which participants have been sampled from *sections* of the population that are likely to comprise a large number of inclined abstainers (e.g., Luszczynska, Sobczyk & Abraham, 2007), the majority of studies use samples drawn from general populations of students (e.g., Arden & Armitage, 2012; Bamberg, 2000; Milne, Orbell & Sheeran, 2002) or the wider public (e.g., De Vet, Oenema, Sheeran & Brug, 2009; Elliott & Armitage, 2006). These samples will not have been entirely appropriate for testing implementation intentions because they will have included some participants who already carried out the required behavior (e.g., Elliott & Thomson, 2010; George, 2004) and others who did not possess the required goal intention for implementation intentions to convert into action. Indeed, several studies show that implementation intentions change behavior only for participants with moderate (mean) and high (mean +1SD) levels of goal intention, not for participants with low (mean -1SD) levels of goal intention (e.g., Elliott & Armitage, 2006; Sheeran, Webb, & Gollwitzer, 2005). It is likely, therefore, that researchers have underestimated the effects of implementation intentions in previous studies. In this study we separated inclined abstainers (i.e., participants who are appropriate for intervention with implementation intentions) from other participants. We did this to explicitly demonstrate, in line with theory, that implementation intentions work only for inclined abstainers and to accurately estimate the effect size of implementation intentions on drivers' speeding behavior.

Second, virtually all previous implementation intention studies, including Elliott and Armitage's (2006) study on speeding, have used passive control groups. More specifically, control participants have not been put under any demand to change their behavior whilst experimental participants have been asked to change their behavior and to specify implementation intentions. This is problematic because subsequently observed differences in behavior between experimental and control participants might be attributable to an experimenter demand (e.g., Rosenthal, 1966) rather than implementation intentions. Whilst there are very few studies in which researchers have used active control groups, a small series of non-driving studies (e.g., Armitage, 2008; Armitage & Arden, 2010 and 2012; Conner & Higgins, 2010) have shown that participants who form implementation intentions are more likely to change their behavior compared with control participants who form non-implementation intention plans. In line with these studies, an active control group will be used in the present research to provide a rigorous test of implementation intentions in the context of driving.

Third, in field studies focusing on real-world behaviors (e.g., speeding), researchers typically ask participants to self-generate implementation intentions (i.e., identify their own critical situations and goal-directed responses). However, 20–40% of participants do not adhere to planning instructions when asked to do this (Michie, Dormandy & Marteau, 2004; Rutter, Steadman & Quine, 2006; Skar, Sniehotta, Molloy, Prestwich & Araujo-Soares, 2011). As a result, the quality of participants' implementation intentions can vary substantially (Sniehotta, 2009). For example, Elliott and Armitage (2006) found that some participants identified specific, well defined critical situations (e.g., "IF I feel the need to keep up with traffic") and goal-directed responses (e.g., "THEN I will concentrate more on my speedometer") when specifying their implementation intentions to comply with the speed limit. Other participants, however, specified poorly constructed and overly general

implementation intentions (e.g., IF I am driving, THEN I will try to comply with speed limits) that were unlikely to have been activated in response to specific 'problem situations' (e.g., driving when other traffic is exceeding the speed limit) or provide any useful behavior-change strategy.

A potential solution to this problem is to use experimenter-provided implementation intentions. This approach is common in laboratory studies and involves giving participants an implementation intention that contains a pre-defined critical situation and goal-directed response (e.g., Parks-Stamm, Gollwitzer, & Oettingen, 2007; Sheeran, Webb, & Gollwitzer, 2005 [study 2]; Webb & Sheeran, 2004). However, research shows that there is between-person variation in both exposure to different driving contexts, or critical situations (e.g., Collia, Sharp & Giesbrecht, 2003), and the effectiveness of behavior-change strategies, or goal-directed responses (e.g., Sadler-Smith & Smith, 2004). This means that the same implementation intention is unlikely to be appropriate for all individuals. Given also that many real-world behaviors, such as speeding, are performed across multiple contexts and are highly automated, individuals are likely to require more than one implementation intention (i.e., to enable them to deal with more than one critical situation and to provide back-up strategies in case some fail to engender behavior-change). Indeed, research has shown that making more than one implementation intention increases the likelihood of successful behavior-change in real-world contexts (e.g., Elliott & Armitage, 2006; Wiedemann, Lippke & Schwarzer, 2012). Also, as noted by Gollwitzer and Sheeran (2006), experimenter-provided implementation intentions are usually identified on the basis of researchers' intuition. An approach whereby participants are provided with a range of evidence-based critical situations and theoretically derived goal-directed responses would therefore seem a desirable strategy for helping individuals form effective implementation intentions. In the

present study, we sought to address this issue by developing a volitional help sheet (e.g., Armitage, 2008).

A volitional help sheet is a method for helping individuals link evidence-based critical situations with theoretically derived goal-directed responses, and thereby form effective implementation intentions. The first volitional help sheet was developed by Armitage (2008) as a tool for reducing smoking. Participants were presented with a sheet of paper that comprised a list of critical situations, on the left hand side of the page, and a list of goal-directed responses, on the right. The critical situations were identified from previous research in which the situations associated with smoking had been established (Velicer, DiClemente, Rossi & Prochaska, 1990). The goal-directed responses were behavior-change strategies that mapped onto Prochaska and DiClemente's (1983) processes of change (see section 2.3). Participants selected the critical situations and goal-directed responses that they felt were appropriate for them and formed implementation intentions to reduce smoking by drawing lines that linked their chosen critical situations and goal-directed responses. One month later, these participants reported smoking significantly fewer cigarettes and being less nicotine dependent than did control participants. While similar results have been obtained in a small number of studies on physical activity (Armitage & Arden, 2010) and binge drinking (Arden & Armitage, 2012), there are no studies of driver behavior in which volitional help sheets have been used to help participants develop implementation intentions.

1.4 Hypotheses

In line with the above review, we hypothesised that: (1) a group of experimental participants, who used a volitional help sheet to form implementation intentions to avoid speeding, would subsequently report exceeding the speed limit less frequently than would a group of active control participants; (2) this difference would be specific to inclined abstainers; (3) past behavior would be a weaker predictor of subsequently reported speeding

for the experimental participants than it would for the control participants; and (4) goal intentions to speed would be stronger predictors of subsequently reported speeding for the experimental participants than they would for the control participants.

2. Method

2.1 Participants

Participants were recruited from: (a) a university in Glasgow (a large city in the West of Scotland), using advertisements placed on notice boards and virtual learning environments and by making announcements in lectures; (b) other UK universities, using a national postgraduate mailing list; (c) several local businesses in Glasgow (e.g., supermarkets, post offices, cafes, gift shops and travel agents), using leaflets handed out to staff and customers; and (d) UK online driving discussion forums, using messages asking for volunteers. A total of 300 drivers volunteered to take part in the study and 243 of them completed it (81% completion rate). All participants were aged 17 years old or over and held a full UK driving license. The mean age of the sample was 35.58 years old (SD = 14.20; range = 17 to 71 years) and 46.9% was male (n = 114). The mean weekly mileage was 134.11 (SD = 154.28; range = 4 to 1200 miles) and the mean number of years that participants were licensed to drive was 15.41 (SD = 13.25; range = 0.5 to 47 years).

2.2 Design & Procedure

Ethical approval for conducting this study was awarded by the ethical committee within the university's School of Psychological Sciences and Health. A randomised-controlled design was used. Participants were randomly allocated to either an experimental condition (N = 117) or an active control condition (N = 126). All participants were told that the project was a general purpose investigation into drivers' attitudes towards speeding. At baseline all participants completed a questionnaire that measured basic demography (age, gender, weekly mileage, and number of years licensed to drive) and contained standard items

that are commonly used in the social sciences to measure goal intentions and behavior (see Fishbein & Ajzen, 2010). The key motivational pre-cursors of goal intentions that are specified in the theory of planned behavior (i.e., attitudes, subjective norms and perceived behavioral control; Ajzen, 1991) were also measured because they have been shown to possess predictive validity across numerous contexts (Armitage & Conner, 2001), including driving (Conner et al, 2007; Elliott et al, 2003 and 2007; Elliott, Thomson, Robertson, Stephenson & Wicks, 2013). Where possible, participants completed a paper-and-pencil copy of the questionnaire in a laboratory within the School of Psychological Sciences and Health. Participants who were not local to Glasgow completed an online version of the questionnaire[1]. The paper-and-pencil and online questionnaires contained identical items to measure behavior, goal intention, attitude, subjective norm and perceived behavioral control. At the end of the baseline questionnaire, the experimental participants received a volitional help sheet designed to promote implementation intentions to avoid speeding (see appendix 1). Active control participants received, instead, information taken from the UK Department for Transport's THINK! campaign about the risks of speeding and government advice on how to drive safely.

After approximately one month, all participants completed a follow-up questionnaire. The follow-up questionnaire included identical items to the baseline questionnaire to measure speeding behavior, goal intentions and the motivational pre-cursors of goal intentions. The follow-up questionnaires were administered using the same mode of participation that was used at baseline (i.e., participants who completed a paper-and-pencil questionnaire at baseline also completed a paper-and-pencil questionnaire at follow-up and participants who completed an online questionnaire at baseline also completed an online questionnaire at follow-up). All

[1] Note that the analyses presented in the main text were run on the participants who completed the paper-and-pencil questionnaire and the participants who completed the online questionnaire, separately. The findings were the same for both sets of participants and therefore all participants were analyzed together.

baseline and follow-up questionnaires were successfully matched using self-generated unique codes. More specifically, each participant was asked for their initials and the first letter of their mother's maiden name on both questionnaires (e.g., Elliott, 2012; Elliott et al., 2013).

2.3 The volitional help sheet

In line with research in other domains (e.g., Armitage, 2008; Armitage & Arden, 2010; Arden & Armitage, 2012), the volitional help sheet used in this study comprised a list of 20 critical situations and a list of 20 goal-directed responses from which participants were asked to specify implementation intentions (see appendix 1). The 20 critical situations were identified from the literature on driver behavior (e.g., Beilinson, 1994; Harrison, Fitzgerald, Pronk, & Fildes, 1998; Stradling, 2005; Walker, Murdoch, Bryant, Barnes & Johnson, 2009). They were situations in which drivers are known to speed frequently or report difficulties complying with speed limits. Each critical situation was presented as an 'if' statement (see table 1). The 20 goal-directed responses were theoretically derived behavior-change strategies from Prochaska and DiClemente's (1983) transtheoretical model. This model specifies 10 processes that people use to change their behavior (see Prochaska, Velicer, DiClemente & Fava, 1988): (1) consciousness raising (acquiring information about the problem behavior); (2) self-reevaluation (assessing how you think and feel about yourself with respect to the problem behavior); (3) self-liberation (choosing and making a commitment to change the problem behavior and believing in one's ability to do so); (4) counter-conditioning (substituting the problem behavior with alternatives); (5) stimulus control (avoiding the stimuli that elicits the problem behavior); (6) reinforcement management (rewarding oneself for changing the problem behavior); (7) helping relationships (seeking social support for changing the problem behavior); (8) dramatic relief (experiencing and expressing emotions about the consequences of the problem behavior); (9) environmental reevaluation (assessing how the problem behavior affects the physical

environment); and (10) social liberation (acknowledging societal support for changing the problem behavior). The volitional help sheet included two goal-directed responses for each process of change. Each goal-directed response was presented as a 'then' statement (see table 1). The specific wording of these statements was informed by previously published research, which has identified standard items to measure each process of change in relation to health behaviors: smoking cessation (e.g., Armitage, 2008; Prochaska et al. 1988); increasing fruit and vegetable intake (Oliveira, Anderson, Auld & Kendall, 2005); exercise (Armitage & Arden, 2010); and binge drinking (Arden & Armitage, 2012). The most appropriate items from these previous studies were selected and adapted to suit the present target behavior.

Insert table 1 about here

The experimental participants' task was to choose up to four critical situations from the volitional help sheet and to link each one with an appropriate goal-directed response. The participants were told to choose the critical situations in which they thought they would be most tempted to speed over the next month. They were also told that they could link each of their chosen situations with the same goal-directed response or a different one. Those who completed the paper-and-pencil questionnaires made these links by drawing a line between their chosen critical situations and goal-directed responses. The participants who completed the online questionnaires were asked to select pairs of critical situations and goal-directed responses from drop-down menus.

All participants were therefore asked to specify up to four implementation intentions. Previous research has shown that specifying more than one implementation intention is more effective at changing complex behaviors, such as speeding, than is specifying just one implementation intention (Elliott & Armitage, 2006). It has also been demonstrated in other behavioral domains that a larger number of implementation intentions leads to a larger change in behavior. More specifically, Wiedemann et al. (2012) found that only participants

who formed four or five implementation intentions significantly increased their fruit and vegetable intake. However, as noted by Webb (2006), there is a risk that specifying too many implementation intentions could weaken each individual association between the critical situations and goal-directed responses and could interfere with efficient encoding and retrieval of the plans. In other words, the effects of each implementation intention could be diluted with each additional plan. Therefore, the maximum number of implementation intentions that participants specified in this study was four.

Table 1 shows the percentage of participants selecting each critical situation and goal-directed response. The most commonly selected critical situations were: 'If I am tempted to speed when I am late or in a hurry to get somewhere' (59.8%), and 'If I am tempted to speed in order to keep up with surrounding traffic' (38.5%). The least commonly selected were: 'If I am tempted to speed when I feel the urge to show off or assert myself' (1.7%) and 'If I am tempted to speed when I feel like the car 'wants' to go faster' (1.7%). The goal-directed responses most frequently chosen were: 'Then I will remind myself that I am not saving much time by speeding' (42.7%) and 'Then I will remind myself that drivers caught for speeding (e.g., by the police or safety cameras) face sanctions' (41.9%). The goal-directed responses selected least frequently were 'Then I will seek advice from people in my life about how to avoid speeding in such situations in the future' (0.9%) and 'Then I will drive in a lower gear to help me drive slower' (2.6%).

2.4 Measures

2.4.1 Speeding behavior and goal intention to speed. Speeding behavior was measured at both baseline and follow-up by asking participants: "Over the last month, how often have you found yourself driving faster than the speed limit…?" Participants completed this item with regards to each of the 20 critical situations specified on the volitional help sheet, separately (see table 1) using a 9 point scale from 'never' (scored 1) to 'all the time'

(scored 9). The mean of the 20 behavior items produced a final measure of speeding behavior that possessed high internal reliability for both the experimental condition (α = .91 at baseline; .93 at follow-up) and the control condition (α = .94 at baseline; .94 at follow-up).

Goal intention was measured using five items: "I plan to drive faster than the speed limit over the next month" (1 = *strongly disagree* to 9 = *strongly agree*); "How likely or unlikely is it that you will drive faster than the speed limit over the next month?" (1 = *extremely unlikely* to 9 = *extremely likely*); "I intend to drive faster than the speed limit over the next month" (1 = *definitely no* to 9 = *definitely yes*); "I would like to drive faster than the speed limit over the next month" (1 = *strongly disagree* to 9 = *strongly agree*); and "I want to drive faster than the speed limit over the next month" (1 = *strongly disagree* to 9 = *strongly agree*). The mean of these five items was taken to produce a final measure of goal intention to speed (experimental condition: α = .91 at both baseline and follow-up; control condition: α = .90 at baseline and α = .91 at follow-up).

On the basis of the final measures of speeding behavior and goal intention, participants were classified as being either suitable for intervention (i.e., inclined abstainers; *n* = 110 [*n* = 56 experimental participants; *n* = 54 controls]) or unsuitable for intervention (i.e., all other participants; *n* = 133: [*n* = 61 experimental participants; *n* = 72 controls]). More specifically, participants were coded as suitable for intervention (scored 1) if their baseline behavior score was greater than their baseline goal intention score. In other words, these participants reported speeding more than they intended to at baseline meaning that there was scope to reduce their speeding behavior to their specified levels of goal intention. All other participants were coded as unsuitable for intervention (scored 0). In other words, their baseline behavior score was less than or equal to their baseline goal intention score, meaning that they reported speeding less often than they intended to or as much as they intended to at the outset of the study and therefore there was no scope to reduce their speeding.

2.4.2 The motivational pre-cursors of goal intention. Attitudes towards speeding were measured with five items. Participants were presented with the stem: "For me, driving faster than the speed limit over the next month would be…". They completed this stem using five semantic differential scales: *extremely bad* (scored 1) to *extremely good* (scored 9); *extremely negative* (scored 1) to *extremely positive* (scored 9)*; extremely dull* (scored 1) to *extremely fun* (scored 9)*; extremely unpleasant* (scored 1) to *extremely pleasant* (scored 9); and *extremely foolish* (scored 1) to *extremely wise* (scored 9). The mean of these five attitude items served as a reliable final measure of attitude for both the experimental condition (α = .90 at baseline; .91 at follow-up) and the control condition (α = .90 at baseline; .87 at follow-up).

Subjective norm was measured with two items: "How often will the people who are important to you drive faster than the speed limit over the next month?" (1 = *never* to 9 = *very often*) and "Of the people you know, how many do you think will drive faster than the speed limit over the next month?" (1 = *none of them* to 9 = *all of them*). The mean of the two subjective norm items was used as the final measure of subjective norm (experimental condition: $r = .54$, $p < .001$ at baseline and $r = .67$, $p < .001$ at follow-up; control condition: $r = .49$; $p < .001$ at baseline and $r = .51$; $p < .001$ at follow-up).

Perceived behavioral control was measured with seven items: "For me, avoiding driving faster than the speed limit over the next month would be…" (1 = *extremely difficult* to 9 = *extremely easy"*); "How confident are you that you will be able to avoid driving faster than the speed limit over the next month?" (1 = *not at all confident* to 9 = *extremely confident*); "How much will factors outside your control influence whether or not you drive faster than the speed limit over the next month" (1 = *not at all* to 9 = *a lot*); "How much personal control do you feel that you have over whether or not you will drive faster than the speed limit over the next month?" (1 = *no control at all* to 9 = *complete control*); "I believe

that I have the ability to avoid driving faster than the speed limit over the next month" (1 = *strongly disagree* to 9 = *strongly agree*); "Whether or not I drive faster than the speed limit over the next month is under my control" (1 = *strongly disagree* to 9 = *strongly agree*); and "To what extent do you see yourself as being capable of avoiding driving faster than the speed limit over the next month?" (1 = *not at all capable* to 9 = *very capable*). The mean of these seven items served as the final measure of perceived behavioral control for both the experimental condition ($\alpha = .75$ at baseline and $\alpha = .84$ at follow-up) and the control condition ($\alpha = .73$ at baseline and $\alpha = .84$ at follow-up).

3. Results

3.1 Tests of attrition and randomization

A series of ANOVAs was conducted to test whether there were any baseline differences between participants who dropped out of the study at follow-up ($n = 57$) and those who completed it ($n = 243$). The dependent variables in these analyses were the baseline measures of behavior, goal intention and the motivational precursors of goal intention. The independent variables in each analysis were attrition (0 = dropped out of the study at follow-up; 1 = completed the study) and suitability for intervention (0 = unsuitable for intervention; 1 = suitable for intervention). These analyses revealed no significant main effects of attrition or interactions between attrition and suitability for intervention (see table 2). Therefore, there were no baseline differences between those who dropped out of the study at follow-up and those who completed it on any of the measures, and that was the case for both the participants who were suitable for intervention and the participants who were unsuitable for intervention. The following analyses were therefore conducted on the final sample only.

Insert table 2 about here

Another series of ANOVAs was conducted to test whether participants had been successfully randomized to the conditions. The dependent variables were the baseline measures of behavior, goal intention and the motivational precursors of goal intention. The independent variables were condition (0 = control; 1 = experimental) and suitability for intervention (0 = unsuitable for intervention; 1 = suitable for intervention). These ANOVAs revealed no significant main effects of condition or interactions between condition and suitability for intervention (see table 3). This means that there were no detectable differences between the experimental and control conditions at baseline, and that was the case both for the participants who were deemed suitable for the intervention and for those deemed unsuitable for the intervention. Randomization to the experimental and control conditions was therefore deemed to have been successful.

Insert table 3 about here

3.2 Descriptive Statistics

The means and standard deviations for all measures are shown in table 4 for the suitable and unsuitable for intervention participants, separately. Participants were not, in general, highly motivated to exceed the speed limit. The sample means on the baseline and follow-up measures of both goal intention and attitude were around or just below the scale mid-points. This indicates that participants, on average, did not report strong intentions to speed or particularly positive attitudes towards speeding. The means on the measures of subjective norm were just above the scale mid-points at both baseline and follow-up, indicating that participants perceived only moderate amounts of social pressure to exceed the speed limit. The baseline and follow-up means for perceived behavioral control were towards the top of the scale, indicating that participants reported that they could easily avoid driving faster than the speed limit. The mean score on the measure of speeding behavior shows that participants, on average, reported moderate levels of speeding. However, within the suitable

for intervention sub-sample, the mean on reported speeding behavior was lower at follow-up for the experimental condition (M = 3.24) than it was for the control condition (M = 4.00), in line with hypothesis 1. On the other hand, within the unsuitable for intervention sub-sample, there was very little difference between the conditions in reported speeding behavior (M = 3.74 for the experimental condition; M = 3.66 for the control condition).

Insert table 4 about here

3.3 Effects of implementation intentions on reported speeding behavior

A two-way ANCOVA was conducted to simultaneously test hypothesis 1 (that experimental participants, who form implementation intentions, will subsequently report exceeding the speed limit less frequently than will active control participants) and hypothesis 2 (that the difference in reported speeding behavior between experimental and control participants will be specific to inclined abstainers). The dependent variable in the analysis was the follow-up measure of speeding behavior. The independent variables were condition (0 = control; 1 = experimental) and suitability for intervention (0 = unsuitable; 1 = suitable). The covariate was the baseline measure of speeding behavior.

In support of hypothesis 1, the ANCOVA revealed a significant main effect of condition, F (1, 241) = 9.07, $p < .01$, MSE = 0.77, d = 0.39, with the estimated marginal means showing that the experimental participants reported exceeding the speed limit less frequently (M = 3.32; SE = 0.11) than did the control participants (M = 3.92; SE = 0.11). Suitability for intervention was not statistically significant, F (1, 240) = 3.78, *ns*, MSE = 0.77, d = 0.25. In line with hypothesis 2, however, there was a significant interaction between condition and suitability for intervention, F (1, 239) = 5.11, $p < .05$, MSE = 0.77, d = 0.30. This interaction was decomposed by running separate ANCOVAs on the suitable and unsuitable for intervention sub-samples (see top row of table 4). As expected, the analysis of the suitable for intervention sub-sample showed that the experimental participants reported

exceeding the speed limit less often than did the control participants. The analysis of the unsuitable for intervention sub-sample showed that there was no difference in the measure of speeding behavior between the experimental and control participants.

To ensure that the difference in reported speeding behavior between the experimental and control participants was not attributable to any post-intervention differences in goal intentions or the other motivational constructs measured in this study, another series of ANCOVAs was conducted. These ANCOVAs were conducted on the suitable for intervention sub-sample only (i.e., the sub-sample for which there was a difference between experimental and control participants' speeding behavior). The dependent variables in these analyses were the follow-up measures of goal intention and the motivational pre-cursors of goal intention. The covariates were their baseline counterparts. The independent variable in each analysis was condition. These analyses revealed no significant effects of condition on goal intention, attitude, subjective norm or perceived control (see table 4). Therefore, the effects of implementation intentions on reported speeding behavior could not be attributed to any changes in motivation to speed[2].

A supplementary analysis was conducted to gauge whether the effects of implementation intentions on reported speeding behavior were specific to the critical situations that participants specified in the IF component of their plans or whether the effects might potentially generalize to situations that participants did not specify. Whilst this was not an original aim of the study, the data did permit a test of the baseline to follow-up changes in reported speeding behavior in the situations that the experimental participants specified in their implementation intentions relative to those situations they did not specify (note that these changes could not be tested against the data from the control participants because the

[2] Note that there were no differences between the conditions in the follow-up measures of motivation for the unsuitable for intervention sub-sample either.

control participants did not specify implementation intentions; we return to this issue in section 4). First, baseline and follow-up measures of speeding behavior in specified critical situations were derived for each experimental participant by taking the mean of the speeding behavior items that corresponded to those critical situations they selected on the volitional help sheet. Next, baseline and follow-up measures of speeding behavior in unspecified critical situations were derived by taking the mean of the remaining items. A repeated measures ANOVA was then conducted. Baseline versus follow-up speeding behavior in specified critical situations was the first repeated measure. Baseline versus follow-up speeding behavior in unspecified critical situations was the second repeated measure. Both main effects were statistically significant: F (1, 55) = 36.56, $p < .001$ for baseline versus follow-up speeding behavior in the specified critical situations; and F (1, 55) = 149.58, $p < .001$ for baseline versus follow-up speeding behavior in the unspecified situations. As figure 1 shows, reported speeding behavior reduced significantly in both specified and unspecified situations. However, there was also a significant interaction between the two repeated measures, F (1, 55) = 13.08, $p = .001$. This showed that experimental participants reported reducing their speeding behavior to a greater extent in the specified situations than in the unspecified situations (also see figure 1).

Insert Fig.1. about here

3.4 Moderating effects of implementation intentions

A moderated linear regression and follow-up simple slopes analyses (Aiken & West, 1991) were conducted to test whether past speeding behavior was a weaker predictor of subsequently reported speeding behavior for the experimental participants than it was for the control participants (hypothesis 3). We also tested, in the same analyses, whether goal intentions were stronger predictors of subsequently reported speeding behavior for the experimental participants than they were for the control participants (hypothesis 4). The

dependent variable in the regression was the follow-up measure of speeding behavior. The independent variables were the baseline measures of speeding behavior and goal intention, condition (0 = control; 1 = experimental), and the two-way interactions between the baseline measures of speeding behavior and goal intention, on the one hand, and condition, on the other. Following the standard procedure for testing interaction effects outlined by Aiken and West (1991), the continuous independent variables (i.e., baseline speeding behavior and goal intention) were mean-centred before the interactions were computed in order to reduce the possible effects of multicollinearity.

As shown in table 5, the regression model accounted for 74% of the variance. The standardized beta weights showed that the independent predictors of the follow-up measure of speeding behavior were the baseline measure of speeding behavior, condition and the two interactions. The simple slopes analyses (Aiken & West, 1991) decomposing the baseline behavior X condition interaction (figure 2) showed that the baseline measure of speeding behavior significantly predicted the follow-up measure in both conditions. However, in support of hypothesis 3, it was a weaker predictor in the experimental condition ($\beta = .40$, $p < .01$) than in the control condition ($\beta = .91$, $p < .001$). In support of hypothesis 4, the simple slopes analyses decomposing the baseline goal intention X condition interaction (figure 3) showed that baseline goal intentions were significant predictors of subsequently reported speeding behavior for the experimental group ($\beta = .50$, $p < .001$) but not the control group ($\beta = -.08$, *ns*).

Insert table 5 about here

Insert figure 2 about here

Insert figure 3 about here

4. Discussion

This study was conducted to investigate the effects of implementation intentions on drivers' speeding behavior. It was hypothesized that participants randomized to an experimental condition and asked to form implementation intentions, would report exceeding the speed limit less frequently at follow-up than would participants randomized to an active control condition (hypothesis 1). It was also hypothesized that this difference in subsequently reported speeding behavior would be specific to inclined abstainers (hypothesis 2). Finally, it was hypothesized that past behavior would be a weaker predictor of subsequently reported speeding for the experimental participants than it would for the control participants (hypothesis 3) and that goal intentions would be stronger predictors of subsequently reported speeding for the experimental participants (hypothesis 4). The observed effects of implementation intentions on drivers' reported speeding behavior, the moderation of the past–subsequent behavior and goal intention–subsequent behavior relationships, and the implications of the findings for behavior-change interventions are discussed in the following sections.

4.1 The effects of implementation intentions on reported speeding behavior

In support of hypothesis 1, the results showed that the experimental participants reported exceeding the speed limit significantly less often at follow-up than did the control participants, despite the two conditions reporting equivalent baseline levels of speeding behavior and motivation to speed (i.e., goal intentions, attitudes, subjective norm and perceived control). The difference between the experimental and control participants in their subsequently reported speeding behavior yielded an effect size estimate of $d = 0.39$. According to conventionally accepted criteria in the social sciences (e.g., Cohen, 1992) this is approaching a moderate-sized change in behavior. The findings are therefore consistent with studies of non-driving behaviors in which implementation intentions have also been found to be an effective behavior-change technique (Gollwitzer & Sheeran, 2006; $d = 0.65$). The

findings are also consistent with Elliott and Armitage (2006; $d = 0.43$), which is, to date, the only other study to have tested the effects of implementation intentions in the context of driving.

The findings also extend previous research on implementation intentions. First, in support of hypothesis 2, we provided the first explicit demonstration that implementation intentions represent a useful behavior-change strategy for inclined abstainers only. In line with theory (e.g., Gollwitzer, 1990), we found an interaction between condition (experimental versus control) and suitability for intervention (inclined abstainers versus all other participants) in the follow-up measure of speeding behavior. Decomposition of the interaction showed that the inclined abstainers in the experimental condition reported speeding significantly less often at follow-up than did the inclined abstainers in the control condition, with the difference between the conditions representing a large-sized reduction in speeding ($d = 0.76$). For the other participants, however, there was no difference between the conditions at follow-up. These findings imply that the effects of implementation intentions have been underestimated in previous studies, in which researchers have sampled participants from general populations of students or the wider public and have not, therefore, focused exclusively on inclined abstainers (e.g., Elliott & Armitage, 2006; Gollwitzer & Sheeran, 2006). Researchers should sample only inclined abstainers in future tests of implementation intentions, unless a two-level approach is being used in which researchers aim to first motivate desirable behavior (e.g., avoidance of speeding) in participants who do not declare as inclined abstainers before using implementation intentions to help convert these participants' newly developed goal intentions into action (e.g., Milne et al., 2002).

The second way in which this research represents an important contribution to the literature is that it adds to the currently small number of (non-driving) studies in which implementation intentions have been tested using an active control condition (e.g., Armitage,

2008; Armitage & Arden, 2010 and 2012; Conner & Higgins, 2010). Specifically, a demand was placed on the control participants in this study by giving standard (Government) road safety educational information that is designed to change behavior. This study therefore provides a more rigorous test of implementation intentions than most previous studies, in which researchers have used passive control conditions (e.g., Armitage, 2004; Elliott & Armitage, 2006; Sheeran & Orbell, 2000). We can therefore be confident that the effects observed in this study are not attributable to a demand effect.

The third way in which this study represents an important contribution to the literature is that it gives rise to the first volitional help sheet (e.g., Armitage, 2008) for changing driver behavior. Consistent with volitional help sheets that have been developed for other social behaviors (e.g., Armitage & Arden, 2010 and 2012; Arden & Armitage, 2012), the present volitional help sheet provided an effective tool for promoting well-specified implementation intentions that explicitly link evidence-based critical situations (in this case, situations in which drivers are known to regularly speed) with theoretically derived goal-directed responses (strategies for changing behavior based on Prochaska et al.'s (1988) processes of behavior-change). It therefore helps overcome the problems that are associated with asking participants to self-generate implementation intentions, such as non-compliance with planning instructions (e.g., Michie et al., 2004; Rutter et al., 2006; Skar et al., 2011) and the specification of trivial or overly general critical situations and goal-directed responses that are unlikely to change behavior (e.g., Elliott & Armitage, 2006). Also, given the volitional help sheet contained 20 critical situations and 20 goal-directed responses from which the participants could specify their implementation intentions, it helps address the problems associated with traditional experimenter-provided implementation intentions (e.g., Parks-Stamm et al., 2007; Sheeran, et al., 2005 [study 2]; Webb & Sheeran, 2004), which not only tend to be based on researchers' intuition but are also unable to account for between-person

variation in exposure to different critical situations in real-world settings and between-person sensitivity to different behavior-change techniques. More generally, the volitional help sheet developed in this research represents an effective intervention for reducing drivers' speeding behavior (discussed further in section 4.3).

Finally, the present study provided an initial test of the relative effects of implementation intentions on behavior in specified and unspecified critical situations. More specifically, supplementary analyses showed that the experimental participants reported reduced levels of speeding behavior over the study period in both the situations they specified in their implementation intentions and the situations they did not specify. However, speeding reduced to a significantly greater extent in the specified situations. These supplementary findings are consistent with the idea that implementation intentions initiate effective behavior-change strategies (goal-directed responses) when specified critical situations are encountered (Gollwitzer, 1990). However, they are also consistent with the possibility that the behavior-change effects of implementation intentions might generalize to other (unspecified) situations. This would have clear benefits from an intervention perspective because it would mean that implementation intentions are capable of producing wide-spread reductions in speeding, across large sections of the road network. It should be noted, however, that the present study was not designed to address this particular issue, and the supplementary findings are from a baseline to follow-up comparison of the experimental condition only (because control participants in this study did not specify implementation intentions). The findings are nonetheless encouraging and further research is needed to provide an appropriate controlled test of whether the behavior-change effects produced by implementation intentions can generalize from specified to unspecified critical situations.

4.2 The moderation effects of implementation intentions

In addition to testing whether implementation intentions reduced drivers speeding behavior, we also tested whether they moderated the past speeding behavior - subsequent speeding behavior and the goal intention - subsequent speeding behavior relationships. In support of hypothesis 3, the baseline measure of speeding behavior (i.e., past behavior) was a weaker predictor of follow-up (i.e., subsequently reported) speeding behavior for the participants in the experimental condition than it was for the participants in the control condition. In support of hypothesis 4, goal intentions as measured at baseline were stronger predictors of subsequently reported speeding behavior for the participants in the experimental condition than they were for the participants in the control condition. These findings are consistent with previous research showing that implementation intentions moderate the effects of both past behavior (e.g., Holland et al., 2006; Orbell et al., 1997; Webb, et al., 2009) and goal intentions (e.g., Elliott & Armitage, 2006) on subsequent behavior. Given that past behavior is a valid proxy for habit (e.g., Verplanken & Orbell, 2003), these findings support the idea that the strategic automaticity produced by implementation intentions can weaken the effects of habit on speeding behavior, allowing drivers to behave in accordance with their goal intentions.

4.3 Implications of the findings for interventions

The findings of this research also have important implications for road safety interventions. More specifically, the findings imply that road safety interventions, such as media campaigns (e.g., Stead et al., 2005) or driver rehabilitation courses (e.g., McKenna, 2003) should encourage drivers to form implementation intentions. The volitional help sheet that was designed in this study also constitutes an easy to administer and cost effective intervention for achieving this aim (i.e., no need for a road safety professional to deliver it). While implementation intentions were found to reduce speeding for inclined abstainers only, it should be noted that inclined abstainers (operationalized as people who, at baseline,

reported speeding more than they intended to) comprised 45.3% of the overall sample. Given that there are over 36 million driving license holders in Great Britain alone (National Travel Survey, 2013), the present volitional help sheet, and implementation intentions more generally, have the potential to bring about wide-spread reductions in speeding. Given also that the volitional help sheet used in this study was found to reduce speeding regardless of whether it was completed as a paper and pencil based task or an online task (see footnote 1), it suggests that there are multiple delivery mechanisms (e.g., postal and web delivery) that can be used to obtain maximum "reach". Future research might usefully test which critical situations and goal-directed responses on the volitional help sheet are the most effective for changing behavior with a view to refining this promising safety intervention.

4.4 Methodological considerations

While the present study provides strong support for the efficacy of implementation intentions in the context of driving, the findings need to be interpreted in light of several methodological considerations. First, self-reported measures of speeding behavior were used. Self-reported behavior measures are potentially vulnerable to a range of cognitive biases, such as the primacy and recency effect (Fulcher, 2003), and self-presentational biases, such as social desirability (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). These biases can serve to inflate or deflate participants' estimates of how often they have engaged in a behavior (e.g., speeding) over a study period (e.g., Corbett, 2001). Furthermore, self-reported behavior measures are potentially vulnerable to demand effects in intervention studies (e.g., participants can report changing their behavior simply because they have received an intervention). However, whilst it would be useful to replicate this study using more objective behavior measures obtained from either driving simulators (e.g., Elliott et al., 2007) or instrumented vehicles (e.g., Lai & Carsten, 2010), we remain confident in the validity of the results for several reasons. First, self-reported measures of speeding behavior have previously

been shown to correlate with objective measures of speeding in both driving simulator studies (e.g., Elliott et al., 2007) and on-road studies (e.g., Aberg, Larsen, Glad & Beilinson, 1997). Second, meta-analytic research shows that there is no difference between the size of the behavior-change that is produced by implementation intentions when researchers use self-reported behavior measures and the size of the behavior-change that is produced by implementation intentions when they use objective behavior measures (Gollwitzer & Sheeran, 2006). Third, as discussed earlier in this section, we used an active control group in this study and still found that implementation intentions had a substantial effect on driver behavior. Finally, the behavior-change observed in this study was not accompanied by a change in any of the other self-report measures (i.e., goal intention, attitude, subjective norm and perceived behavioral control). If the behavior-change observed in this study were attributable to a general demand effect, we would have expected changes in all or some of the other self-reported measures to have been observed.

A second methodological feature of this study that needs considering is the time delay between baseline and follow-up. Specifically, the one-month gap might be considered quite short. However, research has shown that behavior-change that has persisted for 3-4 weeks, tends to continue after this time (Armitage, 2005). Also, non-driving research has shown that the effects of implementation intentions can last years (e.g., Conner & Higgins, 2010) and that their effects actually increase over time (e.g., Sheeran & Orbell, 1999). Overall, we are confident that the present finding will persist for longer than a month, although further research, with a longer follow-up, would still be worthwhile.

4.5 Conclusions

To summarize, this research provides evidence that specifying implementation intentions reduces drivers' speeding behavior. It also shows that the effects of implementation intentions are specific to inclined abstainers, in line with theory (Orbell &

Sheeran, 1998; Sheeran, 2002). Implementation intentions were also found to moderate the relationships between past behavior and goal intentions, on the one hand, and subsequently reported speeding behavior, on the other, implying that implementation intentions weaken the effects of habit, thereby allowing goal intentions to be converted into action. Additionally, this study provides some limited evidence that implementation intentions reduce drivers' speeding behavior in unspecified situations as well as specified situations, although further research is required to provide a more rigorous test of this possible generalization effect. Overall, the findings suggest that future interventions would benefit from encouraging drivers to specify implementation intentions. The volitional help sheet developed in this study provides a useful tool for helping drivers link evidence-based critical situations with theoretically derived goal-directed responses, and therefore form effective implementation intentions to reduce speeding.

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Table 1: Critical situations and goal-directed responses specified by participants

Critical Situations/Goal Directed Responses	%
Critical Situations ('If I am tempted to speed…')	
…when I am late or in a hurry to get somewhere (e.g. work/university/an appointment/to meet friends)	59.8
… in order to keep up with surrounding traffic	38.5
… when I am on a long journey	37.6
… when under pressure from another driver following close behind me	34.2
… when driving on quiet roads with little or no traffic	34.2
… after I have been 'stuck' behind a slow moving vehicle	25.6
… in order to get through traffic lights that have started to turn against me	23.9
… when driving on roads which I think should have higher speed limits	22.2
… when driving on familiar roads	22.2
… when I feel like there is little chance of being caught for speeding	15.4
… after I have been 'stuck' in stationary traffic	14.5
… when another driver is putting on the pressure to drive faster by flashing their headlights/sounding their horn	12.8
… when being overtaken by other traffic/another vehicle	11.1
… when I am feeling stressed	11.1
… when I am listening to certain types of music in the car	9.4
… when driving past a school	4.3

Table 1 (continued): Critical situations and goal-directed responses specified by participants

Critical Situations/Goal Directed Responses	%
… when driving down a road with parked cars	3.4
… when passengers are encouraging me to drive faster (overtly or otherwise)	2.6
… when I feel the urge to show-off or assert myself	1.7
… when I feel like the car 'wants' to go faster	1.7
Goal-Directed Responses ('Then I will…)	*%*
… remind myself that I am not saving much time by speeding (CR)	42.7
… remind myself that drivers caught for speeding (e.g. by the police or safety cameras) face sanctions (SocLib)	41.9
… think about the emotional pain I would suffer if my speeding caused a death or injury to someone (DR)	34.2
… make a concerted effort to ignore the urge/pressure to speed (CC)	33.3
… rather than speed, I will try to relax and drive in a more careful/considerate/responsible manner (CC)	29.9
… remember how upsetting it is to see/hear about road traffic crashes caused by speeding motorists, and the distress caused to the victims and their families (DR)	29.9
… tell myself that I have the ability to comply with speed limits if I want to (SL)	23.1
… try to avoid putting myself in that situation again in the future (SC)	18.8
… remind myself that speeding increases my fuel consumption, which is bad for the environment and costs me money (ER)	13.7
… remember that I have made a commitment to avoid speeding (SL)	12.8
… tell myself that although it might be an easy and enjoyable thing to do, speeding is a harmful and dangerous habit (CR)	12.0
… remember that speeding contradicts the view I have of myself as a considerate person (SR)	11.1

Table 1 (continued): Critical situations and goal-directed responses specified by participants

… tell myself that society is becoming less accepting and tolerant of speeding (SocLib)	6.8
… tell myself how skillful a driver I am to be able to control my vehicle within the speed limit (RM)	6.8
… remember that there are people in my life who are supportive of me complying with speed limits (HR)	6.0
…think about how disappointed I would be in myself if I drove faster than the speed limit (SR)	4.3
… remember to tell myself that I am a good driver if I do not speed (RM)	4.3
… remind myself that speeding increases my vehicle emissions, which pollute the environment (ER)	3.4
… drive in a lower gear to help me drive slower (SC)	2.6
… seek advice from people in my life (e.g. more experienced or calm drivers) about how to avoid speeding in such situations in the future (HR)	0.9

Notes. Acronyms in parentheses indicate the processes of change (Prochaska & DiClemente, 1983) that the goal-directed responses were designed to tap: CR = Consciousness Raising; ER = Environmental Reevaluation; DR = Dramatic Relief; SocLib = Social Liberation; SR= Self Reevaluation; SL = Self Liberation; HR = Helping Relationships; CC = Counter Conditioning; RM = Reinforcement Management; SC = Stimulus Control

Table 2: ANOVAs testing the effects of attrition and suitability for intervention on the baseline measures of behavior, goal intention and the motivational pre-cursors of goal intention

Dependent Variable	*F*	*MSE*	*d*
Attrition (0 = Dropped out at follow-up; 1 = Completed both baseline and follow-up)			
Behavior	0.22	2.37	-0.07
Goal Intention	0.03	3.81	-0.03
Attitude	0.04	2.57	-0.03
Subjective Norm	2.17	2.86	0.23
Perceived Control	0.96	1.73	0.15
Suitability for Intervention (0 = Unsuitable for intervention; 1 = Suitable for intervention)			
Behavior	7.23*	2.37	-0.12
Goal Intention	59.50**	3.81	1.27
Attitude	27.90**	2.57	0.80
Subjective Norm	3.10	2.86	0.30
Perceived Control	0.09	1.73	-0.21
Attrition x Suitability for Intervention			
Behavior	3.63	2.37	-0.30
Goal Intention	0.18	3.81	-0.07
Attitude	0.04	2.57	0.03
Subjective Norm	0.02	2.86	0.23
Perceived Control	2.48	1.73	0.24

*$p < .01$ **$p < .001$ All *df*s = 1

Table 3: ANOVAs testing the effects of condition and suitability for intervention on the baseline measures of behavior, goal intention and the motivational pre-cursors of goal intention

Dependent Variable	*F*	*MSE*	*d*
Condition (0 = Control; 1 = Experimental)			
Behavior	0.00	2.34	0.01
Goal Intention	0.21	3.42	0.06
Attitude	0.19	2.38	-0.06
Subjective Norm	0.36	2.91	0.08
Perceived Control	0.51	1.69	0.09
Suitability for Intervention (0 = Unsuitable for intervention; 1 = Suitable for intervention)			
Behavior	0.83	2.34	-0.12
Goal Intention	106.02**	3.42	1.34
Attitude	40.79**	2.38	0.83
Subjective Norm	5.15*	2.91	0.29
Perceived Control	2.59	1.69	-0.21
Condition x Suitability for Intervention			
Behavior	1.07	2.34	-0.13
Goal Intention	0.43	3.42	-0.08
Attitude	1.80	2.38	-0.17
Subjective Norm	1.17	2.91	-0.14
Perceived Control	0.40	1.69	0.08

*$p < .05$ **$p < .001$ All *df*s = 1

Table 4: Means (SDs) and ANCOVAs testing the differences between participants who were suitable and unsuitable for intervention on the measures of speeding behavior, goal intention and the motivational pre-cursors of goal intention

Variable	Time	Suitable for intervention					Unsuitable for intervention				
		M (*SD*)		ANCOVA			*M* (*SD*)		ANCOVA		
		Cont (*N* = 54)	Exp (*N* = 56)	*F* (1, 107)	*MSE*	*d*	Cont (*N* = 72)	Exp (*N* = 61)	*F* (1, 130)	*MSE*	*d*
Behavior	Baseline	4.08 (1.57)	3.87 (1.51)	15.89*	0.63	-0.76	3.69 (1.69)	3.89 (1.28)	0.30	0.89	-0.09
	Follow-up	4.00 (1.48)	3.24 (1.34)				3.66 (1.69)	3.74 (1.38)			
Goal Intention	Baseline	2.96 (1.45)	2.69 (1.47)	0.01	0.91	-0.02	5.26 (2.30)	5.30 (1.87)			
	Follow-up	3.07 (1.48)	2.84 (1.54)				4.59 (2.41)	4.90 (2.19)	-	-	-
Attitude	Baseline	3.53 (1.54)	3.35 (1.52)	3.81	0.90	-0.38	4.53 (1.58)	4.89 (1.51)			
	Follow-up	3.51 (1.31)	3.03 (1.49)				4.32 (1.68)	4.71 (1.83)	-	-	-
Subjective Norm	Baseline	5.87 (1.90)	5.50 (2.09)	1.70	1.33	0.25	6.13 (1.52)	6.24 (1.30)			
	Follow-up	5.71 (1.58)	5.75 (1.95)				5.93 (1.66)	6.07 (1.61)	-	-	-
Perceived Control	Baseline	6.96 (1.19)	6.94 (1.28)	2.27	0.95	0.29	6.79 (1.36)	6.56 (1.34)			
	Follow-up	6.71 (1.37)	6.98 (1.25)				6.84 (1.65)	6.81 (1.41)	-	-	-

Note. ANCOVAs were not conducted on the measures of motivation to speed for the unsuitable for intervention group because there was no significant difference on the measure of behavior. Cont = Control condition. Exp = Experimental condition. * $p < .001$

Table 5: Moderated linear regression predicting follow-up behavior from baseline goal intention, baseline behavior, condition, condition X baseline goal intention and condition X baseline behavior

Variable	R^2	F	β
Baseline Goal Intention	.74	60.01	-.08
Baseline Behavior			.90**
Condition (0 = Control; 1 = Experimental)			-.19**
Condition X Goal Intention			.38*
Condition X Baseline Behavior			-.36*

*$p < .01$ ** $p < .001$

Figure 1. Speeding behavior at baseline and follow-up in specified versus unspecified situations (experimental participants only)

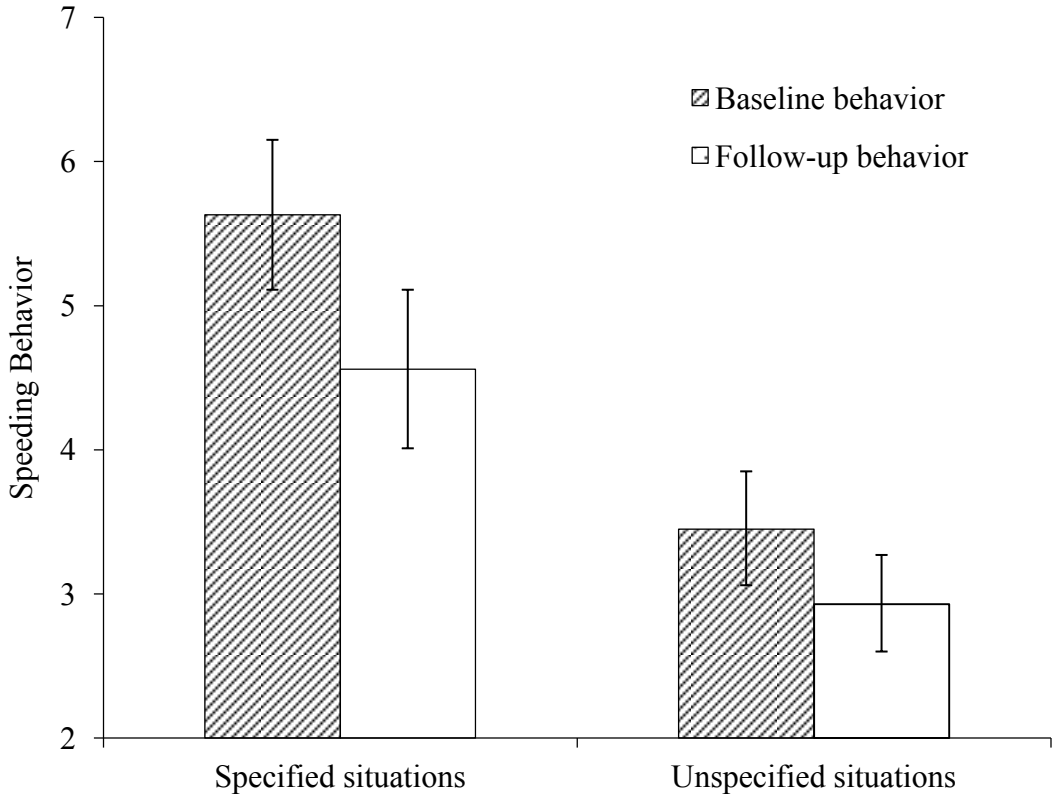

Figure 2. Simple slopes for the relationship between baseline behavior and follow-up behavior (for experimental and control participants, separately).

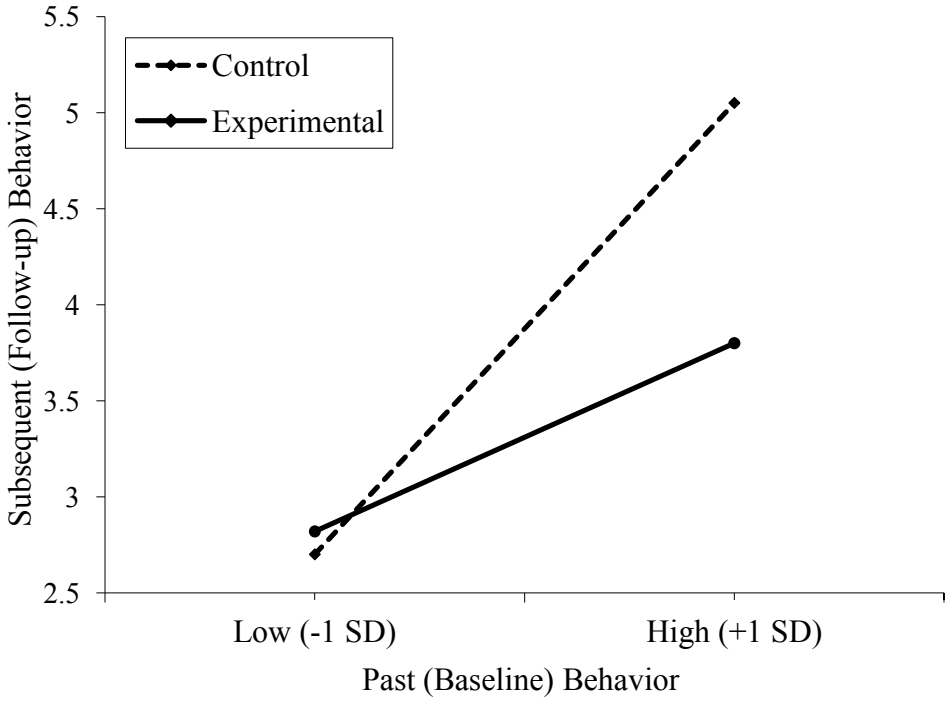

Figure 3. Simple slopes for the relationship between baseline goal intention and follow-up behavior (for experimental and control participants, separately).