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Accident history, risk perception and traffic safe behaviour

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ABSTRACT

This study clarifies the associations between accident history, perception of the riskiness of road travel and traffic safety behaviours by taking into account the number and severity of accidents experienced. A sample of 525 road users in Cameroon answered a questionnaire comprising items on perception of risk, safe behaviour and personal accident history. Participants who reported involvement in more than three accidents or involvement in a severe accident perceived road travel as less risky and also reported behaving less safely compared with those involved in fewer, or less severe accidents. The results have practical implications for the prevention of traffic accidents.

Practitioner Summary: The associations between accident history, perceived risk of road travel and safe behaviour were investigated using self-report questionnaire data. Participants involved in more than three accidents, or in severe accidents, perceived road travel as less risky and also reported more unsafe behaviour compared with those involved in fewer, or less severe accidents. Campaigns targeting people with a less serious, less extensive accident history should aim to increase awareness of hazards and the potential severity of their consequences, as well as emphasising how easy it is to take the recommended preventive actions. Campaigns targeting those involved in more frequent accidents, and survivors of serious accidents, should address feelings of invulnerability and helplessness.

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1. Introduction

Personal experience is a powerful, but complex determinant of self-protective behaviours (Weinstein 1989). One might expect that somebody who has been involved in an accident would subsequently show more concern about risk and behave more safely. However, several studies have shown that involvement in automobile crashes is not always associated with subsequent safe behaviour (Peltzer and Renner 2003; Weinstein 1989). It has been noted (Weinstein 1989) that some of these studies have methodological flaws: (1) they assume that prior to crash involvement, victims and non-victims behaved similarly; (2) precautionary behaviour was self-reported; (3) length of time between crash involvement and assessment of precautionary behaviour were not addressed; (4) characteristics of past accidents experienced were not addressed. Many studies that have addressed the three first flaws have reported an association between accident history and traffic safety-related behaviours. However, it remains the case that 'the degree of damage (e.g. dollar cost) or harm (e.g. time in hospital, time lost from work) has usually been ignored or only crudely measured' (Weinstein 1989, 37).

This research addressed these limitations by analysing how the number and severity of accidents an individual has experienced were associated with safe behaviour and perceptions of road travel risks. Road traffic accidents are a major public health concern. Globally, there are 1.25 million deaths per annum and over 90% of deaths occur in developing countries, although they account for only 48% of global car numbers (WHO 2013). Our study was carried out in Cameroon, a developing country with no highways, where the motorcycle-taxi is one form of public transport. Although there is a scarcity of official statistics on traffic accidents because no central agency is in charge of collecting driving data in Cameroon, there are daily reports of fatalities in the newspapers and local authorities are urgently seeking ways of tackling the problem.

In the following sections we outline the psychological theory relating accident history to perception of risk and precautionary behaviour, and review relevant previous research. Following a statement of the research objectives and hypotheses, we present our methodology and results. Finally, we discuss the results in the context of psychological research on accidents and accident prevention.

2. Accident history, perception of risk and safe behaviour: insights from psychology

Weinstein (1989) noted four approaches to explaining the relationship between accident history and adoption of protective behaviours. They are focused on *decision-making*, *cognitive factors*, *fear* and *social influence* and are derived from models of the relationship between perception of risk and the adoption of protective behaviours (Ajzen 1985; Becker and Rosenstock 1987; Dejoy 1996).

The *decision-making* perspective assumes that individuals take protective action if they (a) perceive their vulnerability to the threat, (b) understand the harm that will result if the threat is realised, and (c) are aware of preventive measures and consider them to be effective. Experience is central to the decision-making process because it provides the data on which an individual's perceptions are based.

The *cognitive* perspective assumes that individuals' behaviour reflects their beliefs about the risks and benefits about options open to them. However, the relationship between beliefs and actions depends on how information about hazards is stored, recalled and used (Weinstein 1989). Personal experiences provide more concrete, vivid and convincing information and hence have more influence on decisions and actions than do other sources of information (Kahneman and Tversky 1973; Nisbett and Ross 1980). Personal experience is also likely to be subject to context-dependent recall, which may stimulate appropriate action.

The *fear* perspective posits that the goal of preventive behaviour is to reduce fear rather than to reduce harm (Averill 1987). It assumes that people who have experienced harm in a given situation will have persistent, vivid and unpleasant associations, which increase the salience of the related threat and hence drive them to behave in a way that is designed to reduce their fear.

The *social influence* perspective is based on the idea that people are motivated to win praise and avoid censure (Janoff-Bulman 1985). Victims of accidents thus act to prevent a recurrence in order to avoid blame and criticism, and to gain sympathy.

Ideas about locus of control (LOC) and cultural factors also provide insight into patterns of associations between experience, perceptions and behaviour. Three dimensions of LOC (Rotter 1966) are recognised: primary control (Skinner 1996), secondary control (Rothbaum, Weisz, and Snyder 1982) and socio-instrumental control (Spector et al. 2004). Primary control involves the individual as agent, acting to effect a change in the social or physical environment (Skinner 1996), whereas secondary control involves the individual accepting the environment and adjusting some aspect of his or her self (Morling and Evered 2006).

Socio-instrumental control refers to active attempts to influence the environment through social means (Spector et al. 2004); socio-instrumental control is assumed to be more commonly used in collectivist cultures. The concept was developed to account for differences in the results of LOC studies between Western and non-Western samples. However, Spector and colleagues found that the level of belief in socio-instrumental control was almost as high in American workers as in Chinese workers, suggesting that such beliefs are common across cultures. The study suggested a predominant external LOC by social means in collectivist societies.

In Cameroon, as misfortunes are generally attributed to factors external to the victim (social others, ancestors, God, relatives), it is common to rely on traditional and religious practices for protection from accidents (Ngueutsa 2012). People exert control over events indirectly, through relatives, ancestors or God (Ngueutsa and Kouabenan 2014; Spector et al. 2004). Cameroonian practice seems to represent a form of external LOC (socio-instrumental control), which has been shown to be positively correlated with involvement in hazardous events (Joseph, Reddy, and Sharma 2013; Ngueutsa and Kouabenan 2014). People who are involved in harmful events may expect that others (society, ancestors, God, etc.) will act to change things. The self-adjustment, the acceptance of events and the expectations of changes from others, seem to be culturally constructed as a way to exert control over events in collectivist societies, but may create a certain passivity, discouraging people from acting personally to reduce accident risk.

There are thus sound theoretical reasons for assuming that accident history is associated with perception of risk and involvement in preventive actions. The research discussed above suggested that the association between accident history and adoption of protective behaviours may be mediated by perception of risk. Involvement in accidents activates various sensations and feelings likely to stimulate risk perception, which can in turn activate a person's actions towards risks and safety.

3. Empirical research on accident history, perceived risk and protective behaviours

Although 'personal experience is widely believed to have a powerful impact on the recognition of risk and the willingness to take precautions' (Weinstein 1989, 31), the evidence is inconsistent. A meta-analysis of seven studies (Weinstein 1989) found that personal history of accident and injury in automobile accidents had no effect on reported or observed seatbelt use (Robertson 1975; Robertson, O'Neill, and Wixom 1972). Similarly, Peltzer and Renner (2003) noted that in South African taxi-drivers, being a victim of a road accident was not related

to subsequent risk-taking. These authors speculated that repeated involvement in accidents may generate a belief that accidents are inevitable and hence that precautions are futile.

Several studies in the domain of traffic safety attempted to overcome the methodological shortcomings mentioned by Weinstein (1989) and found negative correlations between accident history and protective behaviours (Alver, Demirel, and Mutlu 2014; Elliott et al. 2000; Lin et al. 2004; Simon and Corbett 1996; Zhao et al. 2012). These studies suggested that past involvement in accidents (regardless of number or severity) was associated with unsafe reported or observed traffic behaviours and crashes. Accident history was positively associated with rules offending in a UK sample (Simon and Corbett 1996), but the authors did not provide details about accident history. A longitudinal study of American drivers (Elliott et al. 2000) showed that individuals involved in a road traffic offence in one year were twice as likely as others to be involved in a serious road traffic offence during the subsequent year. Being at fault in a crash in one year increased the odds of being at fault in a crash in the next year by nearly 50%.

A 20-month prospective study (Lin et al. 2004) among students in Taiwan found that at baseline, participants who had experienced a motorcycle crash reported higher risk-taking than did those who had not. During the study period, positive changes in risk-taking scores were found to be significantly associated with the lack of a motorcycle crash prior to the study. Lin et al. (2004) concluded that surviving multiple crashes encouraged students to take more risks.

Arnau-Sabatès et al. (2013) reported that pre-drivers who had been injured in a traffic accident in Catalonia (Spain) were less road safety-conscious than were pre-drivers who had not. Similarly, a cohort study of young novice drivers in Australia (Ivers et al. 2009) showed that injured pre-drivers reported less awareness of road safety than did pre-drivers who had not been injured. Moreover, a 50% increase in incidents of police-reported crashes was associated with poor hazard awareness reported by participants two years previously.

In summary, previous accident involvement tends to be associated with unsafe driving behaviour and crashes in both Western and non-Western cultures. In most of these studies, however, accident history was one socio-demographic variable among many, and the nature of the accident was not taken into consideration. There is one study (Kouabenan 2002) in which having been involved in road accidents was associated with the perception that road travel is risky, and with protective behaviours.

Research in the health and other sectors, some of which has taken into account the severity of an adverse event,

has shown associations between event history and adoption of protective behaviours. Burling et al. (1984) reported that people who suffered myocardial infarction were more likely to reduce or quit smoking if the infarction was severe. Kouabenan et al. (2007) showed that nurses who had contracted *Staphylococcus aureus* during nursing were more afraid of other contagious diseases in the hospital environment, and were more likely to use anti-infection measures than were those who had not. By contrast, Gonçalves et al. (2008) found that in a Spanish industrial company, experience of many accidents at work was associated with safe and unsafe behaviour. They speculated that the results would be more concise if they addressed the past accidents' severity. Somewhat similar findings were reported in a study of Ghanaian workers (Gyekye 2006): frequent involvement in industrial accidents was associated with a negative perception of safety measures and neglect of such measures.

These studies suggested that it would be interesting to try to understand how the number and severity of past accidents is related to perceptions of risk and adoption of protective behaviour. It may also be important to distinguish witnesses from individuals who are directly involved.

4. This study

The aim of this study was to analyse how the number and severity of traffic accidents experienced would be associated with an individual's perception of risk and adoption of safe behaviour. We hypothesised that:

- (1) Perceived level of risk would be positively associated with safe behaviour (H1). Involvement in multiple accidents can lead to habituation to danger, thereby reducing fear of danger and encouraging neglect of protective measures. We therefore predicted that:
- (2) People who had been involved in several accidents would perceive road travel as less risky and would behave less safely, compared with those who had been involved in fewer accidents (H2).
- (3) People who had been involved in one or more serious accidents (resulting in serious injury or death) would perceive road travel as less risky and would behave less safely compared with those involved in less serious accidents (H3).

This was based on the hypothesis that survivors of accidents that result in death or serious injury to another person may believe themselves to be invulnerable, or protected by supernatural forces, and may therefore ignore the risks of dangerous situations and fail to see the importance of taking precautions.

- (4) In the case of witnessed accidents, severity would be positively associated with: (a) risk perception and (b) reported adoption of safety behaviour (H4).

This was based on the assumption that more severe accidents provide witnesses with a more vivid and convincing demonstration of the potential consequences of risky behaviour, and hence increase awareness of risks and likelihood of adopting protective behaviour.

5. Method

5.1. Sample

A convenience sample of 525 road users from Cameroon participated voluntarily and without compensation. The road traffic background of participants varied: licensed drivers ($N = 136$), student drivers ($N = 25$), pedestrians¹ ($N = 142$), traffic agents (police; road-safety patrolmen; road engineers) ($N = 102$), agents in the transportation sector (insurance agents; heads of travel agencies; managers of vehicle inspection centres; instructors and managers of driving schools) ($N = 95$); 25 participants did not report this information. The sample comprised 379 men, 132 women and 14 individuals who did not report their gender. The mean age of participants was 32 years ($SD = 9$; range: 16-76). Two hundred and eighty participants reported having been involved in at least one accident, 383 reported having witnessed at least one accident, and 209 participants had both witnessed and been involved in an accident. Table 1 gives a detailed description of the sample, including missing data.

5.2. Instrument

Data were collected using a questionnaire designed by the authors. It contained scales measuring perceived

risk of road travel and reported safe behaviour, as well as questions on accident history (involvement i.e. direct involvement or witness; number, severity). Accident severity was measured with questions about (a) severity of injury/ies and (b) number of casualties. The scales measuring perceived risk and safe behaviour were specifically designed for this study based on interviews with eight Cameroonians (drivers and non-drivers) and a literature review.

The perceived risk scale consisted of 39 items describing dangerous traffic situations (situations were derived from interview data and reflected the reality of road travel in Cameroon). Respondents were asked to estimate the degree of risk associated with each situation using a four-point scale ranging from 1 (*not at all risky*) to 4 (*very risky*). Example items: 'Following a car which goes through a red light'; 'Answering the phone while driving'; 'Walking in the road whilst chatting with friends'.

The safe behaviour scale consisted of 29 items derived from Kouabenan's traffic risk taking questionnaire (2002), and adapted to the Cameroonian context. Respondents used a four-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), to describe their approach to the dangerous situation described in each item. Fourteen items described safe responses e.g. 'When I'm driving through an area where there are children, I reduce my speed significantly', and the remaining 15 described unsafe responses, e.g. 'If I'm in a motorcycle-taxi and the driver keeps taking risks, I grit my teeth and pray that we reach my destination safe and sound'. The items were pre-tested on a sample of postgraduate students and workers recruited on a university campus in France ($N = 23$; 13 men, 10 women; 14 drivers, 9 non-drivers); nationalities represented were Cameroonian, other African, French and South American. This sample was presented with the 29 items and asked whether the reaction described in the item was safe or unsafe. As expected, irrespective of nationality, gender and

Table 1. Reported details of accident involvement and accident witnessing.

	Accident involvement ($N = 525$)			Accident witnessing ($N = 525$)		
	Yes ($n = 280$)	No ($n = 223$)	Missing ($n = 22$)	Yes ($n = 383$)	No ($n = 119$)	Missing ($n = 23$)
	Number of accidents involved			Number of accidents witnessed		
One	108	/	/	/	/	/
Two	79	/	/	/	/	/
Three	37	/	/	/	/	/
More than Three	51	/	/	/	/	/
Missing	5	/	/	/	/	/
	Worst injury severity experienced			Worst injury severity witnessed		
No Injuries	92	/	/	34	/	/
Minor injury/ies	114	/	/	124	/	/
Severe injury/ies	74	/	/	213	/	/
Missing	/	/	/	12	/	/
	Number of deaths encountered			Number of deaths witnessed		
No deaths	185	/	/	156	/	/
One death	25	/	/	50	/	/
More than one death	47	/	/	150	/	/
Missing	23	/	/	27	/	/

status (driver or non-drivers), about 90% of this sample perceived the items as intended.

Participants were asked about their accident history as an involved party and as a witness. First, they were asked whether they had been involved in a road accident and if so, how many (*one; two; three; more than three*). Next, they were asked to indicate the severity of injuries (*no injury/ies; minor injury/ies; severe injuries*), and the number of fatalities (*no deaths; one death; more than one death*) resulting from the accidents in which they had been involved. After this they were asked the same questions in relation to accidents they had witnessed.

5.3. Procedure

Data were collected in Yaoundé, Cameroon. Participants were recruited in workplaces and on the street. Participation was voluntary and the refusal rate was very low (about 5%). First, an interviewer described the aim of the study, emphasising the importance of potential participants' contributions. Participants were informed that there were no right or wrong answers to the questions and assured that their responses would be processed anonymously and would only be used for research purposes. After they had consented to participate, they completed the questionnaire during a face-to-face interview with the researcher or his trained assistants; this took about 30 min. After the questionnaire had been completed, participants were thanked and invited to contact the main researcher by email to obtain the full results of the study.

The study was carried out in accordance with the American Psychological Association's code of conduct for the ethical treatment of human participants. In Cameroon and in France, institutional approval is not needed for simple questionnaire studies.

6. Results

6.1. Descriptive statistics and scale reliability

Descriptive statistics were calculated and Cronbach's alpha was used as a measure of scale internal reliability. Items on the safe behaviour scale, which described unsafe reactions were reverse scored. Factor analysis revealed two correlated factors. We decided to use the overall scale which had good reliability ($\alpha = 0.84$) because unsafe responses were reverse scored. Average scores were used in the analyses; high scores indicated reported safe behaviour.

Factor analysis of the perceived risk scale revealed six correlated factors. The overall scale, which had excellent reliability ($\alpha = 0.92$), was used for the analyses because items describing similar situations were located in different factors. A participant's total score was derived by averaging the scores of the 39 items; high scores indicated that

Table 2. Scale descriptives and internal reliabilities ($N = 525$).

Scales	Factors and overall scales (Items N)	α	Mean (SD)
Perception of risk	Corruption practices and traffic laws violations (10)	0.88	3.40 (0.45)
	Drivers' reckless behaviours (10)	0.83	3.30 (0.42)
	Pedestrians' reckless behaviours (5)	0.68	3.10 (0.50)
	Drivers' impatience (6)	0.73	3.01 (0.50)
	Drivers' anger and traffic violations (5)	0.67	2.82 (0.57)
	Priority refusal by drivers (3)	0.64	3.10 (0.56)
	Overall scale (39)	0.92	3.18 (0.40)
Safe behaviour	Unsafe responses (15)	0.84	2.77 (0.55)
	Safe responses (14)	0.82	3.05 (0.49)
	Overall scale (29)	0.84	2.91 (0.35)

road travel was perceived as risky. All missing values data were listwise deleted throughout the analysis because our sample was large. Descriptive statistics of the scales, description of factors and their reliability indexes are presented in Table 2.

6.2. Relationship between perception of risk and safe behaviour

Perception of risk was positively correlated with safe behaviour ($r = 0.33$, $p < 0.01$). A simple linear regression model with perceived risk score as an independent variable and safe behaviour score as the dependent variable revealed a positive association between perception of risk and reported safe behaviour, $B = 0.38$; $SE = 0.04$; $t(519) = 8.12$; $p < 0.001$; $R^2 = 0.11$. This supported H1: people who perceived road travel as riskier reported behaving more safely on the roads. Factorial ANOVA with perceived risk as an independent variable and the three socio-demographic variables (gender; age; status i.e. driver, pedestrian, traffic agent, agent in the transportation sector) as moderators revealed no moderation effects.

6.3. Direct involvement in accidents, perception of risk and safe behaviour

Associations between accidents in which the respondent was directly involved and perception of risk and use of safe behaviour were examined using Student's t -test or ANOVA with Tukey *post hoc* tests. First we assessed the effects of history of direct involvement (yes; no), number of accidents (one; two; three; more than three), and accident severity (no injuries; minor injury/ies; serious injury/ies; no deaths; one death; more than one death) on perception of risk and safe behaviour. To identify possible mediation effects of risk perception between accident involvement (and accident witnessing) and reported safe behaviour, hierarchical regressions were run.

Table 3. Perception of risk and reported safe behaviour according to accident involvement.

Accident history	Perception of risk				Reported safe behaviour		
	<i>N</i>	<i>M</i>	<i>F</i> or <i>t</i>	<i>p</i>	<i>M</i>	<i>F</i> or <i>t</i>	<i>p</i>
<i>Involved in accident</i>							
Yes	280	3.14			2.90		
No	223	3.21	5.33	0.021	2.91	0.12	0.720
<i>Number of accidents experienced</i>							
One	108	3.18 ^b			2.97 ^d		
Two	79	3.25 ^b	10.15	<.001	2.94 ^d	3.80	0.011
Three	37	3.18 ^b			2.91		
More than three	51	2.92 ^a			2.74 ^c		
<i>Injury severity experienced</i>							
No injuries	92	3.20 ^f			2.91		
Minor injury/ies	114	3.15	3.19	0.042	2.95 ^h	3.18	0.043
Severe injury/ies	74	3.06 ^e			2.80 ^g		
<i>Number of deaths experienced</i>							
No deaths	185	3.16 ^l			2.94 ⁱ		
One death	25	3.27 ^l	8.83	<.001	2.81	6.63	0.002
More than one death	47	2.94 ^k			2.70 ^j		

(a) Significantly lower than (b); (c) significantly lower than (d); (e) significantly lower than (f); (g) significantly lower than (h); (i) significantly lower than (j); (k) significantly lower than (l).

6.3.1. Accident involvement

We used *t*-tests to determine whether perception of risk and safe behaviour differed between participants who had and had not been directly involved in an accident. Participants who had been involved in an accident perceived road travel as less risky ($M = 3.14$) compared with those who had not ($M = 3.21$; $t = 5.33$; $df = 475$; $p = 0.021$; $R^2 = 0.01$), but both groups reported similar use of safe behaviour (involved: $M = 2.90$; not involved: $M = 2.91$) (see Table 3).

6.3.2. Accident history

Separate ANOVAs with number of accidents (1; 2; 3; >3) in which participants had been directly involved as an independent variable, and perception of risk or safe behaviour as the dependent variable, revealed that accident history was associated with risk perception, $F(3, 271) = 10.15$; $p < 0.001$; partial $\eta^2 = 0.10$, and reported safe behaviour, $F(3, 270) = 3.80$; $p = 0.011$; partial $\eta^2 = 0.04$ (see Table 3). *Post hoc* tests indicated that participants who reported involvement in more than three accidents perceived road travel as less risky than did those who reported involvement in one (HSD = 0.26, $p < 0.001$), two (HSD = 0.32, $p < 0.001$) or three (HSD = 0.25, $p = 0.003$) accidents. Similarly, participants who had been involved in more than three accidents reported behaving less safely than did those who had been involved in only one (HSD = 0.23, $p = 0.006$), or two (HSD = 0.20, $p = 0.037$) accidents.

The Baron and Kenny (1986) analysis revealed a partial mediation effect of risk perception between number of accidents involved (1; 2; 3; >3) and reported safe behaviour. (1) Risk perception was regressed on number of accidents involved, and showed a negative and significant association, $B = -0.07$; $SE = 0.01$; $t(276) = 3.94$; $p < 0.001$;

$R^2 = 0.05$. (2) Reported safe behaviour was regressed on number of accidents involved, and showed a negative association, $B = -0.06$; $SE = 0.02$; $t(276) = 3.10$; $p = 0.002$; $R^2 = .003$. (3) Reported safe behaviour was regressed on both number of accidents involved and on risk perception. Risk perception was positively associated with reported safe behaviour, $B = 0.31$; $SE = 0.06$; $t(276) = 4.63$; $p < 0.001$; $R^2 = 0.07$, and number of accidents involved became nearly associated with reported safe behaviour, $B = -0.04$; $SE = 0.02$; $t(275) = 2.04$; $p = 0.042$.

Older participants had been involved in more accidents, $F(3, 259) = 6.35$; $p < 0.001$; partial $\eta^2 = 0.15$, but age was not associated with risk perception, nor with reported safe behaviour. Participants who reported that they had been involved in more than three accidents were older ($M = 36.65$ years) than were those who had only been involved in one ($M = 30.47$ years; HSD = 6.18; $p < 0.001$) or two ($M = 30.64$ years; HSD = 6.01; $p = 0.002$) accidents. There was no age by length of accident history interaction with respect to either perception of risk or reported safe behaviour. There were no effects of gender or status on length of accident history, perception of risk or reported safe behaviour.

H2 was supported: participants who reported involvement in more than three accidents perceived road travel as less risky and reported behaving less safely on the road compared with those with a lower accident history (≤ 3 accidents).

6.3.3. Accident history severity

A one-way ANOVA indicated that perception of risk varied according to the severity of the accidents in which the participant had been involved (see Table 3). Participants involved in accidents that did not result in any injury/ies

perceived road travel as more risky compared with those who had been involved in accidents that resulted in serious injury/ies (HSD = 0.14, $p = 0.033$). Perception of risk also varied according to the number of deaths that had occurred as a result of accidents in which the participant had been involved (see Table 3). More specifically, participants involved in accidents in which there was more than one death perceived road travel as less risky compared with those who reported having been involved in accidents that resulted in one death (HSD = 0.32, $p = 0.001$), or in no deaths (HSD = 0.21, $p = 0.001$).

Reported safe behaviour also varied according to accident history severity (see Table 3). Participants involved in accidents resulting in serious injuries reported behaving less safely compared with those involved in accidents that resulted in minor injuries (HSD = 0.15, $p = 0.035$). Similarly, participants who had been involved in accidents resulting in more than one death reported behaving less safely compared with those who had been involved in accidents where there were no deaths (HSD = 0.24, $p = 0.001$). These results supported H3: participants who had been involved in severe accidents (resulting in serious injuries or deaths) perceived road travel as less risky and reported behaving less safely on the road compared with those involved in less severe accidents (resulting in minor injuries and no deaths).

Another Baron and Kenny (1986) analysis revealed a partial mediation effect of risk perception between number of deaths (0; 1; >1) and reported safe behaviour. (1) Risk perception was regressed on number of deaths, and showed a negative and significant association, $B = -0.09$; $SE = 0.02$; $t(277) = 3.08$; $p = 0.002$; $R^2 = 0.03$. (2) Reported safe behaviour was regressed on number of deaths, and showed a negative association, $B = -0.11$; $SE = 0.03$; $t(277) = 3.64$; $p < 0.001$; $R^2 = 0.05$. (3) Reported safe behaviour was regressed on both number of deaths and on risk perception. Risk perception was positively associated with reported safe behaviour, $B = 0.28$; $SE = 0.06$; $t(277) = 4.28$; $p < 0.001$. Number of deaths' effect on reported safe behaviour was reduced, but remained significant, $B = -0.09$; $SE = 0.03$; $t(275) = 2.86$; $p = 0.005$.

Older participants' accident histories included more severe accidents, $F(2, 243) = 6.24$; $p = 0.002$; partial $\eta^2 = 0.16$. Participants involved in accidents resulting in more than one death were older ($M = 35.81$ years) than were those involved in accidents that did not result in death ($M = 30.93$ years; HSD = 4.88; $p = 0.004$). The association found between participant age and accident involvement was likely to be an exposure effect. Indeed, the older someone is, the more likely they are to have experienced one, more or severe accidents. There was no age by accident severity interaction with respect to perception of risk or reported safe behaviour.

6.4. Accidents witnessed, risk perception and reported safe behaviour

6.4.1. Accidents witnessed

A t -test revealed that perception of risk and reported safe behaviour were similar in those who had and had not witnessed at least one accident. Two (witness; non-witness) \times 2 (involved; not involved) factorial ANOVAs with perception of risk and safe behaviour as dependent variables yielded no significant results. Risk perception and reported safe behaviour did not differ significantly between participants who had both witnessed at least one accident and been involved in, at least one accident, and those who had only been witnesses to, or only been involved in one accident.

6.4.2. Severity of accidents witnessed

As some levels of severity had numbers that were too small for *post hoc* comparisons, we combined the sub-groups-witness-no injury ($n = 34$) and witness-minor injury ($n = 124$) to yield a new sub-group-witness-none or minor injuries ($n = 158$). T -tests indicated that perception of risk and reported safe behaviour were similar in this group and the witness-severe injuries group ($n = 213$). We also combined the sub-groups witness-no death ($n = 156$) and witness-one death ($n = 50$) to yield a new sub-group-witness-none or one death ($n = 206$). T -tests indicated that perception of risk and reported safe behaviour were similar in this new sub-group and the witness-more than one death group ($n = 150$). Hierarchical regression analyses yielded no significant results. These results did not support H4: witnesses of severe accidents did not perceive road travel as riskier than did witnesses of less severe accidents and their reported behaviour on the roads was not safer.

7. Discussion

The aim of this study was to analyse associations between accident history and perceptions of risk, and reported safe behaviour. Several of our hypotheses were supported. We replicated previous research showing that people who perceived road travel as risky reported behaving more safely (Gigerenzer 2004; Ivers et al. 2009; Kuttschreuter 2006; McCool et al. 2009). Our results supported models positing that perceived risk is a driver of protective behaviour (Ajzen 1985; Becker and Rosenstock 1987; Dejoy 1996).

This study also sheds light on the relationships between accident history and perception of risk, and reported safe behaviour. We found that participants who reported having been involved in an accident perceived road travel as less risky compared with those who had not, but both groups reported similar use of safe behaviour. This result was consistent with studies showing that personal accident experience was not associated with reported seat belt

use (Manheimer, Mellinger, and Crossley 1966; Svenson, Fischhoff, and MacGregor 1985), observed seat belt use (Robertson 1975) or risk taking (Peltzer and Renner 2003). But in these studies (Weinstein 1989), this result did not take into account the characteristics of accidents in which participants reported having been involved. Our study addressed this problem and the pattern of associations these analyses revealed represent this study's main contribution to the literature.

We found that participants who had been involved in three or fewer accidents perceived road travel as risky and reported behaving safely. This result indicated – unlike some other studies (Peltzer and Renner 2003; Weinstein 1989) – that involvement in fewer accidents was positively associated with perception of risk and reported safe behaviours. It partially corroborated the study by Kouabenan (2002), which reported that drivers who had been involved in accidents tended to fear traffic risks more than did those who had not. We agree with the argument that being involved in an accident gives people a more vivid perception of the risks of road travel and a stronger fear of road accidents, and that this prompts them to behave more safely.

However, participants who had been involved in more than three accidents perceived road travel as less risky and reported behaving less safely than did those who had been involved in one, two or three accidents. This result showed that people who survived more than three accidents actually perceived road travel as less risky and reported behaving less safely than did those with a lower accident history. We suggest that this is because they had become habituated to the dangers and had become blasé about the risks of road travel and therefore tended to neglect basic safety measures. This interpretation is consistent with research in the industrial sector (Gonçalves et al. 2008; Gyekye 2006), showing that workers who were frequently involved in industrial accidents tended to underestimate the risks associated with their work behaviour, to perceive safety measures negatively and to neglect them.

The second interesting result revealed that involvement in severe accidents appeared to be negatively associated with perception of risk and reported safe behaviour. Participants involved in accidents that resulted in serious injuries or the death of several people underestimated the risks of road travel, and reported behaving less safely than did participants involved in less serious accidents. This result is consistent with a report that involvement in a serious accident actually reduced perceptions of the threat posed by the accident context (Lindell and Perry 1990). It corroborated a report that pre-drivers who had been injured tended to neglect road safety issues more than did pre-drivers who had not been injured (Arnau-Sabatès et al. 2013).

The result showing that participants who had been involved in severe accidents perceived road travel to be less risky and reported behaving less safely than did those involved in less severe accidents can also be explained by perceptions that people have about their control over accidents. Surviving a fatal accident might reinforce a belief in one's invulnerability or encourage the belief that one was protected by a supernatural power, and such beliefs might have reduced fear of accidents, and led to neglect of safety precautions. This explanation is plausible in the Cameroonian context and in other countries where people seem to believe that the main causes of misfortune are external.

In Cameroon, as in some Western societies, it is customary to perform religious or traditional rituals for protection, particularly if one has been involved in an adverse event. There is extensive evidence that various superstitious beliefs are held in both African and Western societies (Dake 1992; Hewstone 1993, 1994; Morris and Peng 1994). Unlike in Western societies where most research suggests primary control over events (Skinner 1996), socio-instrumental control beliefs, such as belief in the protective power of supernatural forces, (Spector et al. 2004) seem to predominate in collectivist cultures such as Cameroon. We suggest that an extensive history of involvement in serious accidents promotes socio-instrumental control and leads, in consequence, to use of culturally determined protective practices (social ceremonies, sacrifices to the ancestors, prayers, traditional rituals, etc.) which are directed towards external protectors (God, ancestors, relatives, etc.) rather than to changes in unsafe behaviour. This would explain why participants with an extensive accident history seem to minimise road travel risks, and report engaging in less safe behaviour.

Contrary to our expectations, people who had witnessed serious accidents were not more likely to perceive road travel as risky and report behaving safely than were those who had witnessed less severe ones. This conflicts with a report that people whose relatives had been involved in traffic accidents, or who had lost their property in an earthquake, were more committed to protective measures (Türküm 2006). Like those directly involved in accidents, witnesses may rely on supernatural powers for protection. Given the prevalence of traffic accidents in developing countries, future research could usefully further investigate the effects of beliefs in the protective influence of supernatural powers upon safety behaviours.

8. Conclusion

The limitations of this study should be considered when attempting to generalise the results. We did not verify participants' claims about their behaviour or accident history.

Our self-report data were probably subject to social desirability bias; we attempted to minimise this using inverted scoring for half the items on the reported safe behaviour scale. Participants were not asked who was injured in the accidents they reported, which was a potential source of endogenous bias. Because the data were correlational, we cannot draw any conclusions about causality. It is possible that the pattern of associations we observed occurred because underestimating the risks of road travel and behaving unsafely were factors in people having more accidents.

Despite these limitations, our results suggested ideas for improving road safety. We agree with Kouabenan's (1999) argument that the beliefs and past experience of the target population should be taken into account when designing and communicating accident-prevention strategies in order to improve adherence to safety measures. Our research suggested that rather than relying on the traditional approach of disseminating general hazard information to the public, accident prevention strategies should be targeted at people who have been involved in several accidents, or in a severe accident. Accident prevention campaigns targeting people with a less extensive accident history should focus on increasing hazard awareness and awareness of the potential severity of accident consequences and explaining how easy it is to take preventive measures. Campaigns targeting those with an extensive accident history, and the survivors of serious accidents, should attack feelings of invulnerability and helplessness. Attempts to highlight the severe consequences of accidents seem unlikely to succeed with this population. In collectivist societies, it may be appropriate to deliver road safety campaigns via community meetings and other important community events. Such campaigns should also not seek to undermine beliefs in the supernatural protective power of religious and traditional practices; instead, they should emphasise the role of personal action in achieving the said supernatural protective power. In other words, it may be useful to try to convince people that a given supernatural power can operate only through their personal preventive actions. Accident prevention campaigns that are effective in one population may be completely ineffective in another population.

Note

1. In this study, a pedestrian is defined as someone who did not hold a driving licence, and who was a non-driver used to travelling on foot or by public transport.

Disclosure statement

No potential conflict of interest was reported by the authors.

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