When did the collision happen? Exploring predictors of RTC involvement

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ABSTRACT

Road transport often represents one of the major safety risks to which individuals are exposed. In the present study, variables known to be associated with road traffic collision involvement and risktaking, such as demographics, mental health, job characteristics and appraisals, issues of work/life balance, accidents and cognitive failures and propensity to socialise were measured. Analyses examined whether there were unique predictors depending upon what type of driving the road user was engaging with: commuting, driving as part of a job, or during leisure time. A secondary analysis of a survey of 2488 individuals presenting at accident and emergency departments revealed risk-taking was predicted by established factors, affording confidence in findings related to road traffic collision occurrence. Multinomial regressions revealed that collisions occurring as part of the commute into work were predicted by high job stress, minor accidents at work and jobs with high noise levels. Collisions during the commute home from work were associated with being female, high levels of bullying at work, and issues of work/life balance. Collisions when travelling as part of a job were predicted by failures of cognition, low satisfaction with how ability is utilised, being younger, harassment at work and working long, unsociable hours, and being frequently on-call. Finally, collisions taking place in leisure time were associated with failures of cognition, low satisfaction with how the work organisation was run, harassment, high levels of risk-taking and frequently socialising with friends. Such insights provide potential ways in which employers and policymakers may tailor interventions to achieve more positive safety behaviour for drivers.

KEYWORDS

Road traffic collision, risk-taking, job characteristics, job appraisals, commuting, class 1, leisure driving

Introduction

Driving is a complex task, and, despite changes in legislation and social attitudes (such as seat belt usage and tight controls and social stigma surrounding drink driving) the very human toll of road traffic collisions (RTCs) remains high, with around 2,500 deaths or serious injuries on UK roads every year (RAC, 2019). Without doubt, human performance plays an integral role in RTC involvement and this cannot be *completely* assuaged by legislation, education or enhanced safety features in vehicles, as evidenced by the plateauing victim statistics year on year. There exists a large body of literature addressing risk factors for truck, bus and taxi drivers (see Crizzle et al., 2017 for a review), however less consideration is afforded to the general public, who are also often involved in fatal or life-changing collisions on the roads. That said, it is generally acknowledged that factors such as demographics, high levels of risk-taking, driver fatigue and poor driving behaviour (driving violations such as speeding and driving errors) are implicated in RTC involvement amongst the general public (for example Bener, Yildirim, Özkan & Lajunen, 2017). Findings from our previous research supports this view (Bowen and Smith, 2019a, b). In addition to the known risk-factors, we have added more novel factors, such as job characteristics and

appraisals, mental health, perceived stress, accidents and cognitive failures (defined by Allahyari et al., 2008 as failures of perception, memory and motor functioning) as well as issues with work/life balance which, with the established predictors held constant, have also been found to be predictive of RTCs and risk-taking (Bowen & Smith, 2019b). The focus on personal and job factors is justifiable; the average worker spends a considerable proportion of their working life in the work environment, with many commuting to and from work by driving. It is therefore reasonable to suggest that job characteristics may contribute to how an individual may drive and, by extension, to RTC causality.

The purpose of the current research, given the associations found, is to further explore the underpinnings of RTC involvement: just as other situations can be predicted by different factors dependent on the setting, the analyses examined whether there were different predictors depending on whether the driver was driving as part of the commute to and from work, when travelling as part of their job (during the working day) or when driving during leisure time. The impact of such insights could be far reaching, enabling employers and policy makers to design tailored interventions supportive of road users achieving more positive safety behaviour. The predictors examined have been chosen as they have previously been associated with either RTC involvement or risk-taking behaviour (detailed in Table 1). The study hypothesis was that different predictors will emerge as significant depending on when the RTC took place: driving to work, driving home from work, driving as part of a job (class 1 in insurer parlance), or driving during leisure time. This information was available from a study investigating risk factors for health and safety (Smith, et al., 2000a, b) and secondary analyses addressing the current hypothesis are reported here.

Variables of interest – RTC/risk-taking							
Demographics	Fatigue/perceived stress/mental health	Accidents/cognitive failures/RTC	Work/life balance				
Age	Life stress	Accidents outside work (minor injury)	Family reducing time for work				
Gender	Work stress	Accidents at work	Family obligations reducing time to relax				
Salary	Fatigue	Cognitive failures at work	Family obligations reducing time to sleep				
Marital status	Anxiety	Cognitive failures outside work	Frequent socialising with friends outside work				
Job role	Depression	High levels of RTCs (as the driver)	Frequent socialising with work colleagues				
Job ap	praisal	Job characteristics					
Bullying stress	Satisfaction with conditions	Long, unsociable hours	High levels of fumes				
Satisfaction with prospects/pay	Satisfaction with running of organisation	Unpredictable hours/frequently on call	Handling harmful substances				
Satisfaction with use of abilities	Satisfaction with work colleagues	High noise at work	Night work				

Table 1: Variables of interest

Method

Participants

Eight accident and emergency units participated in the research. They were selected to be representative of cities and similar towns in different geographical locations. These were: The University of Wales Hospital, Cardiff; Prince Philip Hospital, Llanelli; Glan Clwyd Hospital, Rhyl; Wrexham Maelor Hospital, Wrexham; Royal Gwent Hospital, Newport; Morriston Hospital, Swansea; West Wales General Hospital, Carmarthen and Princess of Wales Hospital, Bridgend. The final sample size was 2488, of which 1229 were female (49.4%).

The Accident and Emergency Study was approved by the Multi-Research Ethics Committee for Wales. In addition, approval was obtained from all the relevant Local Research Ethics Committees, and from all the relevant NHS Research and Development Committees.

Design and procedure

Each unit was asked to select: 1000 individuals aged between 18 and 40 years who had attended following an accident at work in the previous six months; 1000 individuals aged between 18 and 40 years who had attended following a road traffic, sports, or home accident in the previous six months; and 500 individuals aged between 18 and 40 years who had attended for a non-trauma (a medical) reason. They selected the most recent attendees who fitted the criteria, up to a maximum of 2500, and they never went beyond the six month cut off. Two of the smaller accident and emergency units were unable to reach the required numbers, so they sent as many as possible before the six month cut off.

Upon receipt of all relevant ethical approval each individual selected was sent one copy of the questionnaire, a covering letter and a freepost return envelope. There was no reminder or follow-up questionnaire and it was requested that all respondents kept their anonymity.

Measures

The study was an anonymous postal questionnaire survey. No identifiers were attached to the questionnaires, and no identifying details were requested. There was, therefore, no reminder or follow-up questionnaire.

The questionnaire and covering letter were based on those used in the Bristol Stress and Health Study (Smith, 2000), with additional sections on accidents at work (based on the HSE proforma). RTC involvement was measured by asking participants to indicate whether they had been involved in any traffic collisions in the last twelve months (responses ranging from 0-6+) and if so, whether they were the driver at the time of the collision. RTC occurrence was measured by asking the participant to indicate when the collision occurred (on your way to work; on your way home from work; travelling outside your workplace as part of your job; travelling within your workplace; other).

Results

Derived scores

All variables were dichotomised using a median split and categorised into 'high or low'. When the RTC occurred was split into commuting, travelling as part of work and travelling in leisure time in

order to examine whether RTC occurrence is predicted by different variables, dependent on the reason for the journey.

Logistic regression – risk-taking

A logistic regression (using the ENTER) method was conducted with risk-taking as the dependent variable. The full model significantly predicted RTCs (omnibus $\chi 2 = 241.57$, df = 50, p = .001). The Hosmer and Lemeshow test indicated a good model fit: p = .827. The model accounted for between 13% and 21% of the variance in risk-taking. Table 2 gives the coefficient, Wald statistics and probability values for each of the significant predictor variables. Overall, 94.3% of predictions were accurate, an 11.3% increase on the intercept model. Analysis of the demographic, job (characteristics and appraisal), mental health, fatigue, stress, accidents, cognitive failures (both in and outside work) and RTCs revealed the following significant factors in risk-taking:

- Being male
- Earning a higher salary
- Family life reducing time for work
- High levels of life stress
- High levels of anxiety
- Being the driver in an RTC

Table 2: Logistic regression of risk-taking

- Being stressed by bullying at work
- Low satisfaction with job prospects
- Being younger
- Frequently working at night
- Having a minor injury outside work
- Frequently socialising with friends

				Odds	95% confidence interval fo EXP(β)	
		Std.	Wald	ratio		
	β	error	statistic	exp (β)	Lower	Upper
Demographics						
Younger driver	.676**	.154	19.32	1.97	1.45	2.66
Male	.904**	.175	26.80	2.47	1.92	3.32
Higher salary	.439*	.181	5.87	1.55	1.09	2.21
Fatigue/perceived stress						
Life stress	.730**	.222	10.79	2.08	1.34	3.21
Accidents/cognitive failures						
Accidents outside Work (minor	.617**	.145	18.10	1.85	1.39	2.46
injury)						
High levels of RTCs (as the driver)	.244*	.228	1.14	1.28	.816	1.99
Mental health						
High anxiety	.467*	.161	8.48	1.60	1.17	2.19
Job characteristics						
Night work	.340*	.160	4.51	1.40	1.03	1.92
Job appraisal						
Bullying stress	.541*	.260	4.32	1.72	1.03	2.87
Low satisfaction with prospects	.371*	.183	4.12	1.45	1.01	2.07
Work/life balance						
Family reducing time for work	.395*	.163	5.88	1.49	1.08	2.04
Frequently socialising with friends	.492*	.178	7.63	1.64	1.15	2.32
outside work						

Note. *N* = 2488; * = *p* <.05; ** = *p* <.001

Multinomial logistic regression – RTC occurrence

All variables were entered into the regression to examine whether there were unique predictors depending on when the RTC took place (commuting to and from work; travelling as part of work; travelling in leisure time). Only cases where the participant was the driver (as opposed to a passenger, pedestrian, or cyclist) were analysed. The reference variable was 'No RTC'. Additions to a model containing only the intercept significantly improved the fit between the model and data, omnibus $\gamma 2$ (220, n = 2488) = 283.41, Nagelkerke $R^2 = .23$, p < .05. As illustrated in Table 3, significant unique contributions were made for RTCs occurring on the way to work by job stress, having a minor injury at work and being in a job with high levels of noise (resulting in a ringing in the ears); RTCs occurring on the way home from work were predicted by high levels of family distractions (reducing time for work), bullying at work and being female; RTCs during leisure time were predicted by failures of cognition outside work, low levels of satisfaction with the running of the organisation in which they are employed, harassment at work, high levels of risk-taking and frequently socialising with friends; RTCs occurring when travelling as part of the job were predicted by failures of cognition outside work, low levels of satisfaction with ability, being younger, harassment at work and working long, unsociable hours, frequently on-call (see Table 4). Goodness of fit was ascertained by conducting Hosmer Lemeshow tests, which were not statistically significant.

RTC Occurrence:								
						95% confidence		
Commuting to			Std.	Wald	Odds ratio	interva	l for EXP	
work ^a	Predictors	β	error	statistic	EXP (β)	(β)		
						Lower	Upper	
Perceived stress:	Job stress	.904**	.365	6.13	2.47	1.21	5.05	
Accidents:	At work	.249*	.498	.250	1.28	.483	3.41	
Job	High noise	.042*	.502	.007	1.04	.390	2.79	
characteristics :	Ringing in ears	1.20*	.569	4.42	3.31	1.09	10.08	
Commuting from work ^b								
Demographics	Gender: female	.724*	.426	2.88	2.06	.894	4.76	
Job appraisals	Bullying stress	.839*	.612	1.88	2.31	.698	7.68	
Work/life balance	Reduced time							
	for work	.246**	.431	.325	1.28	.549	2.98	
Leisure driving ^c								
Cognitive failures:	Outside work	.678*	.331	4.20	1.97	1.03	3.77	
Job appraisals:	Harassment	.163*	.694	.055	1.18	.302	4.59	
Low satisfaction with:	Running of organisation	.019*	.610	.001	1.02	.308	3.37	
Frequent socialising	With friends	.454*	.252	3.24	1.58	.960	2.58	
High risk-taking	At/outside work	.705*	.272	6.72	2.02	1.19	3.45	

Table 3: Multinomial regressions of RTCs occurring during commute/leisure time

Note. ^a = n = 51; ^b = n = 40; ^c = n = 127; ^{*} = p <.05; ^{**} = p <.001

RTC Occurrence: Travelling as part of job ^d	Predictors	β	Std. error	Wald statistic	Odds ratio EXP (β)	95% confidence interval for EXP (β)	
						Lower	Upper
Age	Younger driver	.272*	.582	.218	1.76	.243	2.39
Cognitive failures	Outside work	1.05*	.748	1.97	2.86	.660	12.39
Work patterns/	Frequently on-call	1.11*	.582	3.61	3.02	.966	9.46
hours	Long, unsociable	1.76*	.737	5.72	5.82	1.37	24.67
Job appraisals:	Harassment	.222*	.288	.595	1.25	.710	2.20
Low atisfaction							
with:	Use of abilities	.453*	.654	.480	1.57	.437	5.66
Work/life balance:	Reduced time for work	.246*	.431	.325	1.28	.549	2.98

Table 4: Multinomial regressions of RTC occurring whilst driving as part of a job

Note. $^{d} = n = 51; * = p < .05$

Discussion

The aim of the present study was to examine whether there were differing predictors of RTCs, depending upon when the driving takes place. First, an analysis was done of the variables in relation to risk-taking (a known predictor of RTCs) to establish whether predictors previously found to be implicated, such as demographics, life stress, job characteristics or appraisals, issues of work/life balance and mental health (Bowen and Smith, 2019b) were present in the current sample, affording confidence in the more novel approach of analysing the predictors of when the RTC occurred. This was found to be the case. Certainly, the current findings provide some support for the hypothesis that RTCs are predicated by factors which differ according to when the collision occurs. Commuting to and from work is perceivably when one ruminates over the day and as such, high levels of job stress and bullying at work may lead to a distracted, or even an aggressive style of driving, in which driving errors and violations are committed. Interestingly, harassment at work also features for those involved in collisions during leisure driving, suggesting that the impact of bullying and harassment at work lasts over a longer period. High levels of risk-taking were associated with collisions during leisure time as was frequent socialising with friends; it is possible this may be linked with personality traits previously found to be connected to extraverted individuals and driving (Bowen and Smith, 2019b). Perhaps the most enlightening findings were those connected with driving as part of a job. Here, the predictors paint a picture of a highly pressurised environment, with individuals working long, unsociable hours, frequently on-call. Indeed, issues of work/life balance, specifically family issues reducing time for work, were significant predictors of collisions when driving as part of a job and when commuting home, again suggesting that effects of this pressure last over a longer period. Lack of satisfaction with the use of abilities at work, a factor for those driving as part of the job, also appeared to carry over into leisure time in the form of dissatisfaction with the running of the organisation within which the individual was employed.

The current findings call for an information campaign designed to make individuals and organisations more aware of the carry over effects of the job. Similarly, for those who drive as part of their employment, whether this is driving from site to site, or wider distances (such as the case

with sales representatives or home carers) consideration ought to be given to the levels of pressure under which these individuals are exposed. In terms of interventions, it is possible that for those instances where rumination may be a factor, mindfulness, a term used to describe a particular way of paying attention to the current moment, characterised by a receptive and non-judgemental attitude (Kabat-Zinn, 1994) may be of utility. The approach has received considerable empirical support in recent years and is potentially particularly suitable in the remit of driving, when one is encouraged to attend to the present moment, rather than being preoccupied (Sauer et al., 2012).

Whilst careful consideration was given to the methodology employed in this research, some limitations must be acknowledged, and these form the basis for recommended future directions. Firstly, the study was cross-sectional, and as such, causality is problematic. Along a similar vein, the data was based upon self-report which may have been biased to some extent with social desirability issues and respondent carelessness a possibility (discussed in depth by Bowling and Huang, 2018). Whilst encouragingly, self-reports focusing on driver behaviour have been found to be largely unbiased (Sullman and Taylor, 2010), methodological robustness would be improved by the inclusion of a social desirability scale in such research. In addition, longitudinal research would allow for an examination of causality. Sample size in the current study is reasonably small, this being perhaps an inevitable by-product of breaking overall RTC involvement into the different driving contexts. Finally, it would be beneficial to also examine the driving behaviour, annual mileage and driver fatigue variables used in other research (for example Bowen and Smith, 2019a, b) in order to fully examine the underpinnings of RTC involvement: for example, does bullying at work translate to higher propensity to commit driving violations, such as indicating hostility to other drivers and/or speeding, or does the psychological weight of rumination distract such as to lead to the driver making errors whilst driving, or becoming particularly fatigued? Further studies, exploring these variables, with larger sample sizes may hold the key to a more holistic approach in this regard.

The present study has supported the notion that there are different predictors for RTCs, depending on the context of the driving – the Sunday afternoon leisure driver differs to the Monday morning commuter and this insight affords pause for thought for employers, policymakers and drivers alike.

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