



Reward versus punishment: Reinforcement sensitivity theory, young novice drivers' perceived risk, and risky driving



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ABSTRACT

One reason that young novice drivers remain statistically over-represented in road deaths is their rate of engagement in risky driving. Prominent contributing factors include driver's age, sex, personality, risk perception, and their driving experience. This study applied reinforcement sensitivity theory (RST, specifically reward sensitivity and punishment sensitivity) to predict young novice drivers' perceived risk and self-reported risky driving engagement, while accounting for potential influences of age, sex, and driving experience. Drivers ($N = 643$, 490 females, 17–25 years, $M = 20.02$, $SD = 2.32$) who held an Australian driver's license (P1, P2, or Open) anonymously completed an online survey containing the Behaviour of Young Novice Drivers Scale, the Sensitivity to Punishment and Sensitivity to Reward Questionnaire, and a measure of perceived risk of driving-related behaviours. A path analytic model derived from RST showed that perceived risk had the strongest negative association with reported risky driving engagement, followed by reward sensitivity (positive association). Respondent's age and reward sensitivity were associated with perceived risk. Age, reward sensitivity, and perceived risk were associated with reported engagement in risky driving behaviours. Driver sex only had direct paths with RST variables, and through reward sensitivity, indirect paths to perceived risk, and reported risky driving. Neither punishment sensitivity nor driving experience contributed significantly to the model. Implications and applications of the model, and the unique set of variables examined, are discussed in relation to road safety interventions and driver training.

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1. Introduction

1.1. The young novice driver

Despite declining fatalities (BITRE, 2014, 2015), road safety remains a major concern in Australia and internationally. Although driving on average fewer hours and less kilometres than more mature drivers do, young novice drivers are over-represented in national road deaths (Bureau of Infrastructure & Transport & Regional Economics, 2014; Scott-Parker, Watson, King, & Hyde, 2012a; Scott-Parker, Watson, King, & Hyde, 2013). One reason is young drivers' engagement in risky driving, contributing factors to which include: driver's age, sex, personality, risk perception, and their driving experience.

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This study applied reinforcement sensitivity theory (RST, specifically reward sensitivity and punishment sensitivity) to explore young novice drivers' perceived risk and self-reported risky driving engagement, while accounting for potential influences of age, sex, and driving experience.

Younger drivers' (<26 years) risky driving behaviours (e.g., speeding, drink-driving) contribute to their comparatively higher crash, injury, and death rates (Laapotti, Keskinen, Hatakka, & Katila, 2001; Machin & Sankey, 2008). Novice drivers in their early to mid-20s report engaging in risky driving for reasons that include: gaining autonomy, self-enhancement, optimism bias, to please friends, and to gain more adult-like status (Arnett, 1992; Begg & Langley, 2001; Harré, Foster, & O'Neill, 2005; Hartos, Eitel, Haynie, & Simons-Morton, 2000).

The safest period for young drivers is the newly licensed learner stage, when risk exposure is attenuated by an in-vehicle supervisor (Bates, Watson, & King, 2009). Novice drivers' crash risk peaks during the first few months' of unsupervised driving upon obtaining their Provisional 1 (P1) license (Bates et al., 2009; McCartt, Shabanova, & Leaf, 2003; Preusser & Tison, 2007), decreasing substantially after the first 1600 km driven (Kinnear, Kelly, Stradling, & Thomson, 2013; McCartt et al., 2003). Crash risk continues to fall over the next 18 months (Williams, 2003), further decreasing after 4000 km of driving (Kinnear et al., 2013). It is not until they have driven independently for at least three years (transitioning to an Open license) that a novice driver's crash risk reduces to that of more experienced drivers (Queensland Transport, 2005). Apart from the effect of increased experience on the road, this decrease may be due to improving important skills, including hazard perception (Deery, 1999; Machin & Sankey, 2008; Wang, Zhang, & Salvendy, 2010).

While some aspects of risky driving may be relatively stable from adolescence into early adulthood (Vassallo et al., 2014), a 17-year-old driver with a P1 license is four times more likely to be involved in a fatal crash than is an Open license driver over 26 years (Australian Transport Council, 2011). Being a young driver contributes to lower perceived risk and higher risky driving (Arnett, 1992; Begg & Langley, 2001; Hartos et al., 2000). This increased crash risk is due to young drivers' relative inexperience and underdeveloped driving skills for various driving situations, and/or to having positive perceptions of, and/or attitudes towards, risk taking (Fernandes, Hatfield, & Job, 2010). What is less clear is whether changes occur in driving risk perception, and risky driving engagement, within the 17–25 age range, particularly as these years are critical to gaining on-road driving experience. It has been reported that lack of driving experience exacerbates age effects on crash and fatality rates (McCartt, Mayhew, Braitman, Ferguson, & Simpson, 2009; Queensland Transport, 2005).

While age is often confounded with driving experience (Groeger & Chapman, 1996), McCartt et al. (2009) found independent effects for driver age and experience on crash involvement. Controlling for length of licensure, McCartt et al. (2009) found that compared with older drivers, particularly those aged over 24, younger drivers had higher crash rates. However, driving inexperience has been found to be a stronger predictor of crash risk or near-crash events than has driver age (McEvoy, Stevenson, & Woodward, 2006), while driving experience, rather than age, has been found to contribute to reported risky driving (Harbeck & Glendon, 2013). Given evidence for both age and driving experience independently affecting crash likelihood, both variables were included in the current study.

1.2. Risky driving and risk perception

Cognitive processing that can lead to risky driving involves: (1) perceiving and recognising a risk, (2) estimating the level of risk (probability of negative consequence), and (3) willingness to accept the risk level for the behaviour (McKenna & Horswill, 2006; Nordfjærn, Jørgensen, & Rundmo, 2011). Risk perception is a subjective judgement about the severity and characteristics of a risk (Deery, 1999; Fernandes, Job, & Hatfield, 2007). For young drivers, this has been reported to be context-dependent (Ivers et al., 2009), and influenced by optimism bias (Deery, 1999; Harré et al., 2005). Perceived risk has been negatively associated with self-reported engagement in risky driving (Harbeck & Glendon, 2013; Machin & Sankey, 2008), although a positive relationship has also been found (e.g., Ulleberg & Rundmo, 2003). Identifying perceived risk as an independent predictor of young drivers' crash likelihood, Ivers et al. (2009) found that this relationship was attenuated by reported engagement in risky driving. Perceived risk is important in predicting risky driving (Rhodes & Pivik, 2011), for crash risk reduction, developing safety campaigns, and promoting safe driving among young drivers (Deery, 1999; Hassan & Abdel-Aty, 2012; Shope, 2006).

Risky driving encompasses aggressive driving, speeding, and road rule violations (e.g., drink-driving, red light running, speeding, tailgating), which could result in harm to driver, passengers, and other road users (Machin & Sankey, 2008). Due to their inexperience, young drivers may engage in, but not recognize, some driving behaviours as risky (poor risk perception), and make errors of judgement (Hatfield & Fernandes, 2009; McKenna & Horswill, 2006). Positive perceptions towards taking risks have been suggested as contributing to some young drivers' risky driving (Fernandes et al., 2010). Ivers et al. (2009) found that young drivers perceived certain traffic risks (e.g., speeding, peer passengers, mobile phone use) differently from older drivers. In the current study, risky driving encompassed intentional and unintentional behaviours: drink-driving, speeding, fatigue, not wearing a seatbelt, and distracted driving ("fatal five"), as well as: unsafe overtaking, tailgating, red light violations, illegal driving manoeuvres, drug-driving, and passenger safety.

1.3. Reinforcement sensitivity theory

Personality has been revealed as an indirect influence in motor vehicle crashes through its expression as risky driving (Constantinou, Panayiotou, Konstantinou, Loutsios-Ladd, & Kapardis, 2011; Ulleberg & Rundmo, 2003). Some personality

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