

Pushing New Zealand roads to the limit: Chosen speeds of young and inexperienced drivers across differing road conditions

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Abstract

Young and inexperienced drivers are overrepresented in the number of injurious and fatal crashes occurring on New Zealand roads each year. Driving at an inappropriate speed for road conditions is a significant contributing factor in road crashes for drivers aged under 25. We used a slightly modified version of the validated video-based speed choice task from Horswill and McKenna (1999), in order to investigate young inexperienced and older experienced drivers' speed choices across 5 different New Zealand road environments (motorway, rural, semi-rural, urban, suburban). Results revealed that young novice drivers selected speeds adhering closely to the posted speed limit, irrespective of driving conditions, whereas older experienced drivers selected speeds clearly below the posted limit whilst demonstrating greater variation in preferred speeds across the different road environments. Faster preferred speeds were found to be related to riskier attitudes towards driving in general, and more lenient attitudes toward speeding in particular. In addition, faster preferred speeds were found to be related to a heightened enjoyment in risk taking, as well increased number of speeding convictions during the previous 12 months.

Key words: Young inexperienced drivers, speed choice, differing road conditions, risky attitudes

1. Introduction

In New Zealand, young inexperienced drivers are over-represented in the number of serious and/or fatal road crashes, with drivers aged 15 to 25 being at fault in more than half of all serious road accidents, despite only comprising 18% of road users (Ministry of Transport, 2011). According to a recent report compiled by the Ministry of Transport (2011), 42% of fatal crashes involving young drivers were attributed to driving at a speed inappropriate to road conditions. Excessive or inappropriate speeding, leading to a loss of vehicle control, is one of the most common precipitants of severe crashes, and it has been suggested that driving too fast elevates the crash risk at a similar extent to that of driving under the influence of alcohol (Kloeden, McLean, Moore, and Ponte, 1997). Given this, choosing appropriate driving speeds for the road conditions is an important component of driver training, alongside hazard awareness, risk management, and safe vehicle manoeuvring. As driving experience accumulates, drivers become better at detecting hazards, make more accurate assessments of risk and become better at speed adaptation in response to changing road conditions (e.g., Renge, 1998).

Various factors have been implicated in the high rate of speeding offences by young drivers, including failing to accurately recognize the risk associated with speeding (Sarker and Andreas, 2004), higher levels of sensation seeking and risk taking (Arnett, 1996), and over-confidence (Harrison, Fitzgerald,

Pronk and Fildes, 1998). The current study was undertaken to further investigate factors involved in speed choice of drivers.

The first aim of the present study was to use a laboratory based validated speed choice task (Horswill and McKenna, 1999), which was slightly modified and adapted to different New Zealand road conditions, in order to examine the speed choice behaviour of young, inexperienced and older, experienced drivers. Self-report measures focusing on attitudes to risk taking and speeding were also gathered from all drivers. The second aim of the study was to determine if the self-report measures would reflect the more objective measure of the speed choice task.

2. Method

2.1. Participants

Thirty-six participants were recruited from the psychology student population to participate in this study. While the majority of participants classed themselves as New Zealand European (N=25), there were representatives from other ethnic groups (New Zealand Maori, N=4, Continental European, N=4, Asian, N=2, and Canadian European, N=1). Participants were required to hold either a current New Zealand restricted, full, or international driver licence in order to take part, and to have driven for a period of at least 6 months on New Zealand roads. The 'inexperienced' group was comprised of 19 drivers (9 male, 10 female) aged between 17 and 24 years, with a mean age of 21 years (SD=2.1, N=19). Of these, 7 drivers currently held a restricted licence (M=3.4 years, SD=2.6, N=7), and 12 held a full licence (M=2.7 years, SD=1.9). A second 'experienced' group was comprised of 15 drivers (6 male, 9 female) aged between 25 and 53 years, with a mean age of 36 years (SD=8.2). These drivers all held a full driver licence (M=18 years, SD=9.6).

2.2. The video speed-choice task

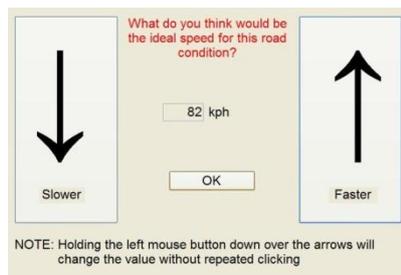
A video speed-choice task (VST) was developed, based on that described by Horswill and McKenna (1999). The road scenarios used in the VST were filmed according to the criteria established by Horswill and McKenna (1999), ensuring that a reasonably constant vehicle speed was maintained for the duration of each video clip, with relatively clear road (approximately 50-100m clear road) ahead to allow for the option of speed increase. It was also ensured that there were minimal static hazards in the footage (e.g., parked cars), and no external or internal speed cues (e.g., speed signs or passing vehicles). The video footage was filmed to provide a realistic impression of the forward view a driver would experience when travelling along a stretch of road.

Video footage was obtained from five different road environments commonly encountered by New Zealand motorists. Each road environment was filmed using 4 different camera vehicle speeds: motorway, 100 km/h (speed limit), 80 km/h, 50 km/h, 30 km/h; rural (or open road), 100 km/h (speed limit), 80 km/h, 50 km/h, and 30 km/h; semi-rural, 80 km/h (speed limit), 50 km/h, 30 km/h, 20 km/h, 10 km/h; urban, 50 km/h (speed limit), 30 km/h, 20 km/h, 10 km/h; suburban, 50 km/h (speed limit), 30 km/h, 20 km/h, 10 km/h. From the video footage, six clips were selected from each of the 5 road environments (2 clips driven at the posted speed limit, 1 driven at each of the other speeds in daylight, and 1 night-time clip, driven at the posted speed limit). In addition, three clips were presented twice to provide a measure of reliability. Thus 33 scenarios, presented in a pseudo-random order were included in the final video speed choice task.

The video clips were displayed to participants on a flat screen computer monitor (10 inch). Participants were initially presented with a blank screen and after clicking on a button in the centre

of the screen they were presented with a five second countdown to the video clip. At the end of each scenario, (see Figure 1), participants were asked to estimate the speed at which the vehicle had been travelling in kilometres per hour (i.e., “How fast do you think you were going?”). They were subsequently asked to select a speed they thought was most appropriate for the road conditions (i.e., “What do you think would be the ideal speed for this road condition?”). After this, the 5 second countdown for the next video scenario began.

Figure 1. The speed choice selection display.



For each scenario, two variables were calculated from the VST. *Speed Estimation* was determined by calculating the difference between the camera vehicle speed and the participant’s estimation of the speed. A positive value corresponded to over-estimation of the vehicle speed, a negative value under-estimation of vehicle speed. Speed estimation values were averaged across all scenarios for each participant. *Speed Choice* was determined by calculating the difference between the participants preferred speed and the posted speed limit for each road. A positive value for *Speed choice* corresponded to a preferred speed greater than that of the posted speed limit, and a negative value corresponded to a preferred speed below the speed limit. The average speed choice for each of the 5 road environments was then calculated for each participant.

2.3. Self-report measures

Demographics were recorded for each participant, which included age, gender, ethnicity, current driver licence (full or restricted vehicle licence) and licence issue date, average kilometres driven in the period of a usual week, and years of driving experience. Participants also provided a brief driving history of the previous 12 months, including the number of accidents that had occurred, regardless of who had been at fault, and how many traffic offences resulting in convictions or warnings they had received - including speeding, dangerous overtaking, driving with a revoked licence, driving under the influence, and driving outside restricted license conditions.

Impulsiveness was measured using the 30-item Barrat Impulsiveness Scale (BIS-11; Patton, Stanford and Barrat, 1995). Participants were required to select the response that best described them on the 4 point Likert scale (from “Rarely/Never” to “Almost Always”). The total score and three subscales representing the motor, attentional, and non-planning components of impulsivity were used for analyses. Higher scores in each component indicated greater impulsive tendency along each subscale (Patton et al., 1995).

Attitudes towards risk (AR) were measured using a shortened (10 item) version of the questionnaire by Franken, Gibson, and Rowland (1992). Items were scored on a 5-point Likert ranging from 1 (“Not like me”) to 5 (“Like me”). Summation of the scores for each individual item yielded an overall attitude toward risk-taking score, and two subscale scores for social deviancy and risk enjoyment. Higher scores indicated a more lenient attitude toward risk-taking.

Participants were also asked to *self-evaluate their accident* concern and risk taking driving behaviour (AC/RT) (Horswill, Waylen and Tofield, 2004) with regard to their personal driving ability and accident likelihood (responses on a 9-point Likert scale), concern over being involved in an accident, and receiving an exhilaration sensation when driving (responses on a 11-point Likert scale). For each of these four questions answers around the midpoint (5 or 7 respectively) indicated participants thought their driving or accident risk was similar to other drivers.

Attitudes towards risky driving (DRT) were measured using the 24-item questionnaire adapted from Conner and Lai's (2005) and Reason, Manstead, Stradling, Baxter, and Campbell (1990) questionnaires. The questionnaire was constructed to measure risk-taking attitudes towards a number of driving behaviours - though with a particular emphasis on speeding (see Parker et al., 1996) (5 items), dangerous overtaking (6 items), driving whilst intoxicated (6 items), and close following of other vehicles (5 items). Additionally, two questions were included regarding the use of mobile telephones when driving. Items were rated on a 5 point scale ranging from 1 ("*strongly disagree*") to 5 ("*strongly agree*"). Items were scored such that a higher score indicated greater risk acceptance.

2.4. Procedure

Ethics approval was received from the School of Psychology Research and Ethics committee. Participants were recruited via advertisements posted on noticeboards in the School of Psychology. The participants were tested individually and completed the self-report measures (demographic questionnaire, BIS-11, AR, AC/RT, and DRT) followed by the Video Speed Choice task (VST). Participants were provided with a \$10 gift voucher as a token of appreciation for their time and effort.

3. Results

3.1 Driving History

The young inexperienced drivers reported a greater number of traffic offenses and crashes than the older more experienced drivers. The inexperienced group reported involvement in 6 crashes (67% of total), and had been issued 16 convictions (94% of total) and 11 warnings (73% of total). In contrast, the experienced drivers reported having been involved in a total of 3 crashes (33% of total), and had been issued 1 conviction (6% of total) and 4 warnings (27% of total). The inexperienced drivers were also disproportionately represented in relation to speeding offences, receiving in total 12 convictions and 6 warnings, compared to no convictions and only one speed related warning for the experienced drivers.

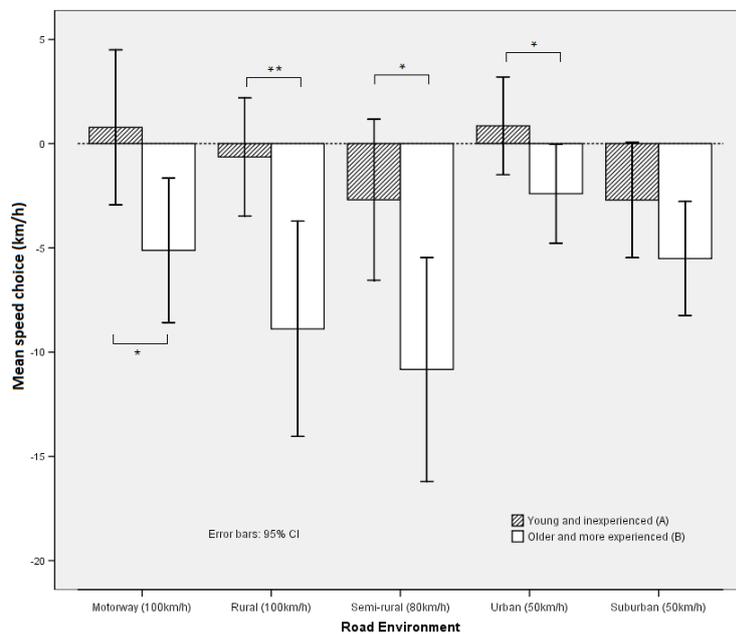
3.2 Speed Estimation and Speed Choice

The first analysis focused on the accuracy of the speed estimation in the VST (estimated speed - camera vehicle speed). The young, inexperienced drivers had an overall mean speed estimation accuracy of +10.1 km/h (SD = 5.96) and the older, experienced drivers had an overall mean speed estimation accuracy of +8.1 km/h (SD = 7.98). This suggested that both driver groups were prone to over-estimate the actual speed of the vehicle 'driven' in the video footage. Independent t-tests revealed no significant differences in the speed estimation accuracy between the two driver groups, $t(34)=0.792$, $p>0.05$.

In contrast to this, differences were apparent between the two groups with regard to their preferred speed. When preferred speeds were pooled over all road conditions, the inexperienced drivers ($M = 0.8$ km/h, $SD=3.48$) chose significantly faster speeds, $t(34) = 3.952$, $p < 0.01$, compared to the

experienced drivers, ($M = -6.5$ km/h, $SD = 4.55$). To further investigate this, analyses were also carried out separately for each road type (see Figure 2). As shown in Figure 2, the young, inexperienced drivers chose greater speeds (closer to the posted speed limit) across all road environments; whereas the experienced drivers selected slower speeds (below the posted speed limit), which varied across road environments.

Figure 2. Mean speed choice (km/h) on five different road environments by inexperienced and experienced drivers. Data are expressed as the difference from the posted speed limits \pm 95% confidence intervals (= $p < 0.01$, * = $p < 0.05$).**

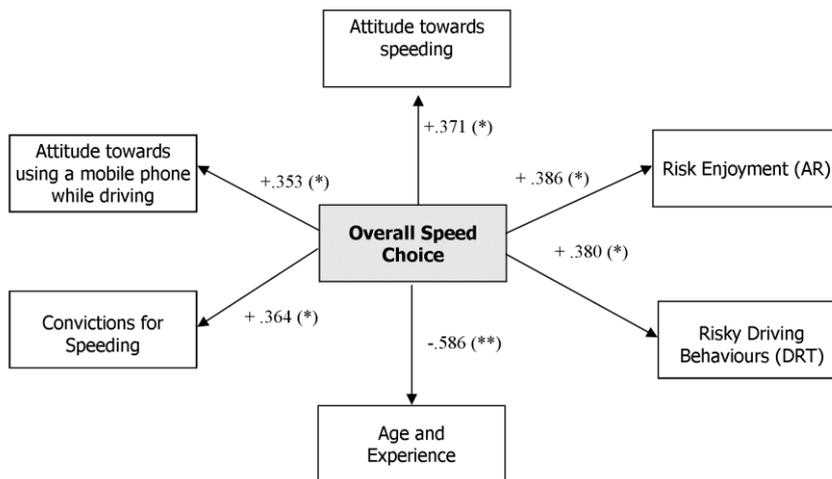


A Shapiro-Wilk test for normality showed that the speed choice was normally distributed ($p > 0.05$) for each road environment and therefore the use of parametric statistics was justified. Subsequent independent t-tests for each road environment confirmed that the young and inexperienced drivers chose significantly faster speeds than the older and more experienced drivers on the motorway, $t(34) = 2.5$, $p < 0.05$; rural, $t(34) = 3.1$, $p < 0.01$; semi-rural, $t(34) = 2.7$, $p < 0.05$; and urban, $t(34) = 2.071$, $p < 0.05$ roads, but not on the suburban road ($p = 0.135$).

3.3 Speed choice in relation to the self-report measures

To examine the relations between speed choice and the self-report measures of risk, a series of bivariate Spearman's correlations were calculated. Figure 3 summarises the statistically significant correlations and the correlation coefficients for each of these measures. These correlations suggest that higher levels of risk enjoyment, more positive attitudes towards speeding, increased acceptance of risky driving, and a greater number of speeding convictions were associated with higher preferred speeds in the VST. In addition, as shown in the earlier analyses, increased age and experience were associated with lower preferred speeds.

Figure 3. Correlations between self-report measures and overall Speed Choice (*p<0.05, ** p<0.01)



4. Conclusion

This study was conducted to 1) examine the speed choice behaviour of young, inexperienced and older, experienced drivers and 2) to examine the association between self-report measures of personality and risk-taking and speed choice.

With regard to VST, both the inexperienced and experienced drivers over-estimated the speed of the camera vehicle, and there was no significant difference in the accuracy of speed estimation between the groups. In contrast, for speed choice, the young and less experienced drivers preferred higher speeds, compared to the older and more experienced drivers. Interestingly, the speeds chosen by the younger drivers were generally close to the posted speed limit across all road types, whereas the older drivers' preferred speeds were substantially lower than the posted speed limit and showed some variability, depending on the type of road. This suggests that for young drivers, speed choice may be primarily influenced by their knowledge of the prescribed speed limit for each type of road, whereas for the experienced drivers, speed choice involved factors specific to each road environment. Closer examination of the speed choice data showed that the greatest difference between the young inexperienced drivers' and older experienced drivers preferred speed was for rural roads. This is in keeping with crash statistics, which indicate that young (particularly male) drivers are prone to speed related crashes on rural roads.

Speed choice on the VST also related to some of the self-report measures of personality and risk-taking. Generally, higher preferred speeds on the VST were associated with greater self-reported acceptance of speeding and also other factors such as risk-enjoyment, riskier attitudes towards dangerous driving and higher numbers of speeding convictions. The research seems to further validate the VST as a reliable and objective laboratory measure of speed choice, which can be easily administered to drivers.

In future studies, the VST might be useful in investigating how drivers choose ideal speeds in a multitude of different road scenarios not explored in this study, and may provide a simple and useful tool in assessing real-world driver behavior, when accompanied by other measures such as eye-scanning and hazard perception. Speed choice tasks may be also useful in evaluating the effectiveness of driver training interventions in influencing speeding behavior.

5. References

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