

Running Head: MEASURING PERCEIVED RISK: SELF-REPORTED AND ACTUAL HAND POSITIONS OF SUV AND CAR DRIVERS

Measuring perceived risk:  
Self-reported and actual hand positions of SUV and car drivers

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### ABSTRACT

This research examines the observed steering wheel hand positions and the reported steering wheel hand placements of a sample of Sports Utility Vehicle (SUV) and car drivers. Following the method of Walton and Thomas (2005), variation in hand position is found to be an effective, indirect measure of drivers' perceived risk. As perceived risk increases, drivers are more likely to adopt a '10-2 o'clock' hand position to increase their control over the vehicle. Because they are a larger vehicle, SUVs are typically perceived by drivers as being safe, so it is also expected that SUV drivers would have a lower level of perceived risk, as evidenced by their hand positions. A questionnaire examining drivers' hand placements confirmed that drivers do perceive that two hands on the top half of the steering wheel will give the most control over the vehicle, and also revealed that drivers overestimate their use of this hand position, when compared with actual observation. Observed hand positions reveal that SUV drivers are more likely to drive with one hand instead of two hands on the top half of the steering wheel, indicating a lower level of perceived risk.

**Keywords:** Hand Positions, SUV, Vehicle Size, Steering Wheel, Drivers, Risk Perception

## INTRODUCTION

Drivers manage the road environment as it varies in complexity by making adjustments to their own behaviour (Zeitlin, 1998). A driver's perception of risk alters with different environmental factors such as traffic density, and different driving contexts such as highway versus residential driving (Galski, Ehle & Williams, 1998). Similarly, driver risk-taking behaviour increases with certain vehicle types, such as high performance vehicles or vehicles with a greater number of safety features (Horswill & Coster, 2002). Contemporary measures for examining drivers' perception of risk involve complex physiological equipment, secondary driving tasks, subjective tests, and measures of driver performance, such as speed (Zeitlin, 1998). It is particularly important to measure how a driver interprets their environment, as a road design that aligns with a driver's expectations will reduce driver error (Kaptein & Claessens, 1998).

Walton and Thomas (2005) provide evidence that observations of hand placement on the steering wheel may be used as an indirect measure of a driver's perceived level of risk. Hand positions alter with the complexity of the driving task, such that drivers are more likely to increase their ability to control their vehicle by placing their hands on the top half of the steering wheel when speed zone and number of driving lanes increase (Walton & Thomas, 2005). The '10-2 o'clock' placement refers to matching a driver's hands on the steering wheel to the equivalent 10 and 2 position on an analogue clock face. It is contended that as perceived risk increases, drivers adopt the '10-2 o'clock' hand placement recommended for improved vehicle control (LTSA, 1999; Brown, 2002).

The hand position measure is effective in different environmental settings (see Walton & Thomas, 2005), but has yet to be examined across different vehicle types. Observations of driver risk

taking behaviour such as reduced seat belt use, closer following distances, and higher vehicle speeds, show that risk taking increases with car mass (Wasielewski & Evans, 1985). Vehicles of a larger mass, such as Sports Utility Vehicles (SUVs) have a perception of safety within the general public (Davis & Truett, 2000). This perception of safety exists despite contradictory epidemiological data indicating higher likelihood of rollover accidents for SUVs (Davis & Truett, 2000), and a reduction in overall vehicle fleet safety for larger mass vehicles (Tay, 2002). Consequently, observations of SUV drivers will most likely find that they have more relaxed hand positions when compared with car drivers.

This research uses the hand position measure developed by Walton and Thomas (2005) to detect differences in risk perception between SUV drivers and other private motor vehicle drivers. A limitation of this method is that it has not been confirmed that drivers actually perceive that two hands on the top half of the steering wheel offers the most control and corresponds with a need for control in more tense driving contexts. In this study, questionnaires examine which hand placement gives drivers the most control over their vehicle, as well as reported hand placements under different driving contexts. Perceptions of vehicle size and safety are also examined.

The hypotheses of this study are:

1. Drivers perceive that two hands on the top half of the steering wheel will give them the most control over the vehicle.
2. SUV drivers have lower perceived risk, as measured by hand positions on the steering wheel, when compared with other car drivers.

## METHOD

### *Participants*

Participants consisted of a selection of people driving into Wellington City, New Zealand over 5 different weekdays during clement weather conditions. Observations of hand positions were made for 1196 drivers. A sample of driver license plates were also recorded from which 1500 drivers were selected as recipients for mailed questionnaires. The response rate to questionnaires was 39% (N = 569).

### *Materials*

The questionnaire items reported here are components of a larger questionnaire examining vehicle size and road safety. Participants were presented with images of the three hand positions shown in Figure 1, and given five items to respond to regarding these hand positions. The hand position items asked which of the three hand positions best shows: “Your typical hand positions when driving”, “The hand positions that will give you most control over the vehicle”, “The most natural hand positions when driving”, “Your hand positions when relaxed”, “Your hand positions when tense”. Nine Likert scale items (1 = Strongly Disagree to 5 = Strongly Agree) examined general perceptions of the relationship between vehicle size and safety. Demographic information was also recorded.

[Figure 1 about here](#)

### *Procedure*

Observations of hand positions on the steering wheel were made of motorists travelling into the city at two different sites along the same road. Hand positions were recorded following the method of Walton and Thomas (2005). The number of hands in the target zone on the top half of the steering

wheel (between 3 O'clock and 9 O'clock on an analogue clock face), was recorded as either zero, one or two (see Figure 1).

One observer was placed at a 4-lane highway and a second observer was placed further down the road at a 6-lane motorway. Both sites were 100 kph speed zones. Drivers of heavy vehicles, motorbikes, and easily identifiable commercial vehicles were excluded from the study. The sample of 1196 drivers was collected across 5 weekdays in clement weather conditions at off-peak travelling times, around mid-morning and mid-afternoon, to ensure relatively free-flowing traffic speeds.

Dictaphones were used to record the hand positions and licence plate details of an even mix of sports utility vehicles (SUVs) and cars. For the purposes of this study, SUVs were identified by several simple visual criteria including passenger carrying capacity, vehicle make and model, vehicle body shape, and high ground clearance. From observed number plate details a sample of 750 SUV driver and 750 other car drivers were mailed questionnaires. For reasons of anonymity the driver hand position information was not directly matched to the questionnaire response.

## RESULTS

Actual observations of hand positions reveal that significantly more car drivers were observed to have two hands on the top half of the steering wheel as compared with SUV drivers (see Table 1). Significantly more SUV drivers were observed to have one hand on the top half of the steering wheel as compared with car drivers (see Table 1). There are no significant differences between SUV drivers and car drivers in terms of their reported hand placement preference ( $p > .05$ ).

[Table 1 about here](#)

Overall, drivers perceive that larger motor vehicles and motor vehicles that have greater mass offer better passenger protection in a collision (see Table 2). Drivers represent themselves as being very cautious, and drivers of small cars are not perceived to be more cautious when driving (see Table 2). When all factors are considered, car drivers are less likely to agree that larger motor vehicles are safer to drive. SUV drivers are more likely to rate their car as being safer than the average car.

Table 2 about here

Ninety-five percent of participants stated that two hands on the top half of the steering wheel gave them most control over their vehicle. Self-reported “tense” hand placements align most closely with the hand placement of most control, with 92.6% of participants reporting that they drive with two hands on the top half of the steering wheel when they are tense.

When asked about their actual driving under normal conditions, 73.5% of drivers claim that they typically drive with two hands on the top half of the steering wheel, with a further 24% driving with one hand on the top half of the steering wheel, and only 2.5% reporting that they drive with zero hands on the top half of the steering wheel. Actual observations from the same sample of drivers finds that only 28% of drivers are observed to have two hands on the top half of the steering wheel.

Self-reported “relaxed” hand placements align most closely with actual hand positions, with the most common relaxed hand placement category being one hand, which may indicate that people are typically relaxed when driving (see Table 3). Sixty percent of participants reported that the most “natural” hand placement when driving is with two hands on the top half of the steering wheel, with a further 31% reporting that one hand on the top half of the steering wheel is the most “natural” hand placement. However, observations of actual hand positions favours the inference that one hand on the top half of the steering wheel is typical or afforded by steering wheel design.

## DISCUSSION

Risk taking behaviour increases with car mass (Wasielewski & Evans, 1985). This research found that drivers of SUVs have a lower observable and self-reported level of perceived risk as compared with car drivers. Being in larger vehicles, SUV drivers believe they are safer, and consequently are less likely to maximise control over their vehicle by placing both hands on the top half of the steering wheel in the recommended '10-2' position.

Drivers in general tend to agree that larger vehicles offer better occupant protection in a collision. Drivers of SUVs are also more likely to believe that their vehicle is safer than the average vehicle. These findings support Davis and Truett's (2000) observation that drivers perceive less risk as a consequence of driving an SUV. Previous research suggests that SUVs are not safer vehicles, with greater likelihood of rollover accidents (Davis & Truett, 2000), and with greater likelihood of fatalities in two vehicle collisions, especially when the other vehicle involved is smaller (Tay, 2002). The disparity between actual and perceived risk may reveal itself in overconfidence when driving a larger vehicle.

Both SUV and car drivers report that two hands on the top half of the steering wheel will maximise control over the vehicle. Further, in a perceived high risk situation drivers recognise that their safest hand placement is two hands on the top half of the steering wheel. Drivers report that a tense driving situation encourages two hands on the top half of the steering wheel, whereas a relaxed driving situation promotes one hand on the top half of the steering wheel. As perceived risk increases, the self-reported ordinal ranking of hand positions increases, supporting Walton and Thomas's (2005) finding that the complexity of the environment correlates with observed hand position ranking.

There is a large difference between observed hand positions and self-reported typical hand placements, such that participants overestimate the likelihood that they will have two hands on the top half of the steering wheel. Other observable driver behaviours, such as seat belt use, speed, and lane position are associated with enforcement and negative contingencies that hand placements do not have. Consequently, drivers may be more actively focussed on speed maintenance, for example, and have only passive awareness of hand placement. Therefore, drivers may recall their hands as being in the recommended '10-2' placement, but are in fact unaware of their actual hand positions when driving.

Driving in predictable environments and for long periods of time can result in a low level of stimulation and attentiveness (Wertheim, 1991). A self-reported relaxed hand position aligns best with actual hand positions. This may mean that drivers are typically more relaxed about the driving task than they report independently. Driving is a relatively habitual task, especially for experienced drivers with a high exposure to driving who have previous knowledge of the road on which they are travelling.

Drivers recognise the safest hand position and report that their hand positions are sensitive to change as a consequence of tense or relaxing driving situations, which is further evidence of the reliability of the hand position measure. Likewise, the observed differences in hand positions between different vehicle types show that when the driving context is constant and potentially confounding environmental factors (such as speed zone and traffic volume) are consistent, there is still a measurable difference in perceived risk.

The method of observing hand positions has strong application for the measure of road safety benefits. It allows road asset developers to interpret how drivers will react to new road designs and safety solutions. If a road design can match a driver's expectations then there is less likelihood of driver error (Kaptein & Claessens, 1998). Hand position measurement is a simple technique that is cost

effective to use and could be applied to the road network to assess drivers' perception of risk at sites that have already been identified as problematic.

### *Conclusions*

Observed hand position patterns and self-reported hand placement reveal that drivers of SUVs possess a lower level of perceived risk as compared with car drivers, which may indicate overconfidence when driving an SUV. Drivers recognise that two hands on the top half of the steering wheel will give most control over the vehicle, but overestimate their actual use of this hand position. There is some evidence that drivers typically favour a relaxed hand position over a hand position that provides control when driving. The findings also substantiate the reliability of hand positions as a measure of perceived driver risk.

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Schedule of Figure and Table Captions

Figure 1. Three common steering wheel hand positions when driving (taken from Walton and Thomas, 2005)

Table 1. Actual observations of hand positions of SUV and car drivers

Table 2. Means and differences between degree of agreement with statements regarding vehicle size and safety for car and SUV drivers.

Table 3. Descriptives for self-reported hand placements under different driving contexts and actual observed hand positions. Hand positions are recorded as either 0, 1, or 2, which represents the number of hands in the target position.

Figure 1.



**Two Hands**

- Two hands on the top half of the steering wheel



**One hand**

- One hand on the top half of the steering wheel



**Zero hands**

- Zero hands on the top half of the steering wheel

Table 1.

|                      | SUV   | Car   | Sig |
|----------------------|-------|-------|-----|
| Zero hands           | 27.0% | 25.4% |     |
| One hand             | 49.0% | 42.4% | *   |
| Two hands            | 24.0% | 32.2% | *   |
| Mean number of hands | 0.97  | 1.07  |     |
| SD                   | 0.714 | 0.757 |     |
| N                    | 578   | 618   |     |

Table 2.

| Likert Scale Items  | Car  |      | SUV  |      | Sig |
|---|------|------|------|------|-----|
|   | Mean | SD   | Mean | SD   |     |
| You are at much greater risk of serious injury in a car-to-car collision if you are in a small car              | 3.64 | 0.91 | 3.72 | 0.8  |     |
| I am a very cautious driver   | 3.59 | 0.82 | 3.67 | 0.76 |     |
| Larger motor vehicles offer better protection for their passengers in a collision                               | 3.57 | 1.01 | 3.65 | 0.83 |     |
| When all things are considered, it is safer to drive a larger motor vehicle                                     | 3.14 | 0.88 | 3.51 | 0.78 | *** |
| Motor vehicles that are heavier (have greater mass) offer better protection for their passengers in a collision | 3.31 | 0.9  | 3.32 | 0.87 |     |
| My car is safer than the average car  | 3.15 | 0.88 | 3.35 | 0.75 | **  |
| Drivers of small cars are more cautious when driving  | 2.65 | 0.93 | 2.41 | 0.87 | **  |
| An SUV is the safest vehicle on the road  | 2.16 | 0.91 | 2.49 | 0.88 | *** |
| If all vehicles were small there would be less risk of injury in a car-to-car collision                         | 2.8  | 1.03 | 2.49 | 0.98 | *** |

1 = Strongly Disagree      3 = Not sure/Neutral      5 = Strongly Agree  
 \*\*\* = p < .001              \*\* = p < .01                      \* = p < .05

Table 3.

| Item  | N    | Mean | Median | Mode | SD   |
|---|------|------|--------|------|------|
| Actual observed hand positions                                      | 1196 | 1.02 | 1      | 1    | 0.74 |
| Your hand positions when relaxed                                    | 542  | 1.27 | 1      | 1    | 0.69 |
| The most natural hand positions when driving                        | 543  | 1.51 | 2      | 2    | 0.65 |
| Your typical hand positions when driving                            | 544  | 1.71 | 2      | 2    | 0.50 |
| Your hand positions when tense                                      | 542  | 1.92 | 2      | 2    | 0.32 |
| The hand positions that will give you most control over the vehicle | 547  | 1.94 | 2      | 2    | 0.24 |