The Seven Sins of Hazard Perception

David Crundall, Nottingham Trent University
Peter Chapman, University of Nottingham

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SIN 1: “Hazard Perception skill predicts crash involvement”

- Spicer (1964); Pelz and Krupat (1974), Hull and Christie (1992) – **accident-involved vs. accident-free**.
- Watts and Quimby (1979) **correlated HP RT with accident history**
- Most others use the surrogate measures of experience
- But the relationship between experience and driving performance is varied (Duncan et al, 1991; Crundall et al., 2012; Horswill et al, 2013)
- And neither is the relationship between skill development and driving performance straight forward (Skid pan training)

Key studies

- Wells et al (2008) reported that the introduction of the HP test into the UK lead to at least a 3% reduction in non-low speed public road accidents where the driver accepted some of the blame.
- Drummond (2000) reported a prospective study linking fatal and serious injuries to prior HP scores
- Boufous et al (2011) linked repeated HP failure to increased accident risk

SIN 2: “Hazard Perception training reduces crash involvement”

Assuming HP is a real and valuable skill, how could you train it?

- Exposure training (repetition)
- Guided exposure training (repetition with feedback, expert commentary, or visual highlights)
- Information (explicit instruction)
- Commentary driving (maintain active HP)

Many studies have demonstrated that HP training improves performance on a hazard perception test:

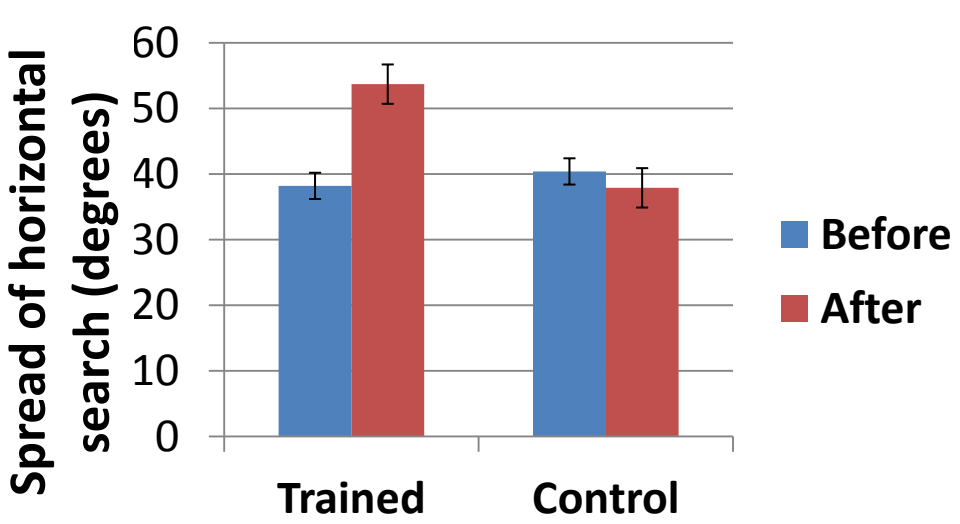
- McKenna & Crick (1991) Mixed training
- Wallis and Horswill (2010) Expert Commentary
- Horswill et al (2010) Expert Commentary
- Horswill et al (2013) Mixed training
- Wetton et al (2013) Mixed training

Some studies have looked at the effects of HP training on simulated driving:

- Crundall et al (2010) Self-generated commentary
- Isler et al (2009) Mixed training
- Horswill et al (2010) Expert Commentary
- Wang et al (2010) Mixed training

A few studies have even examined the effects of HP training on real driving:

- Isler et al. (2011) Mixed training improved on-road behaviour
- Pradhan et al (2009). RAPT training with public road testing. DV – judged relevance of fixations
- Chapman et al (2002) mixed training increased on-road spread of search



"However, there are no data yet on whether hazard perception training affects crash risk", p102.

Horswill, Taylor, Newnam, Wetton and Hill, 2013

SIN 3: It is obvious what a hazard is

Standard Instructions (1):

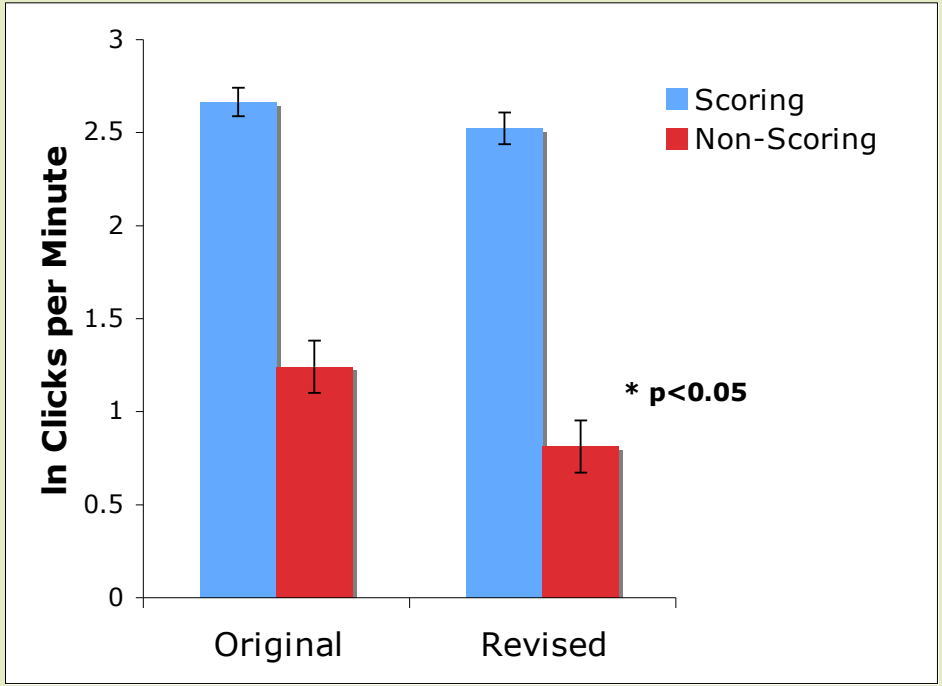
During this hazard perception test, we will test you on the skills you should have already developed whilst learning to drive. In each clip during the test there are hazards just like those you will see on the road, some of the hazards develop; these are the ones that might cause you as the driver to slow down or change direction, just like on the road some are hazards that you might just need to keep an eye on in case the situation changes. Others will develop and these are the ones we will measure your response to.

Modified Instructions (1):

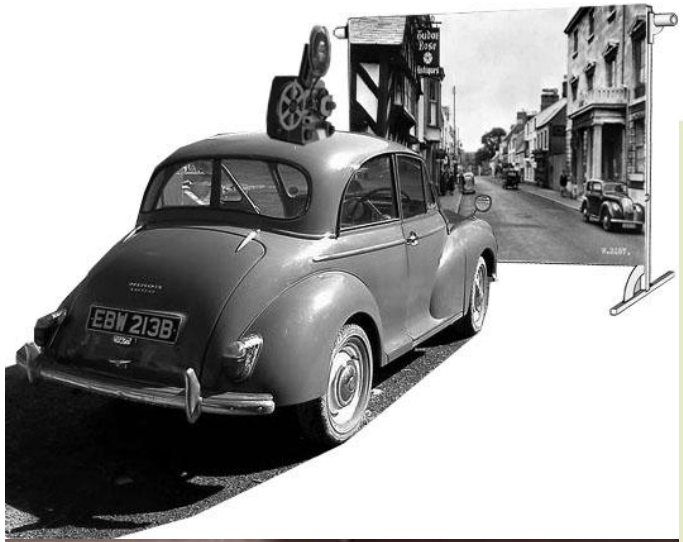
During this hazard perception test, we will test you on the skills you should have already gained whilst learning to drive. In each clip during the test there are a wide range of potential hazards just like those you will see on the road. A few of these hazards develop into something more dangerous; these are the ones that might cause you as the driver to slow down or change direction. This hazard perception test is designed to measure your ability to spot these developing hazards.

Results - Clicks per Minute

The revised instructions significantly reduce the rate of responding outside hazard windows ($p<0.05$) while leaving the rate of responding to actual hazards unchanged.



SIN 4: Apparatus can be reduced to bare essentials



Watts and Quimby, 1979

Modern day (cf. McKenna and Crick, 1991)

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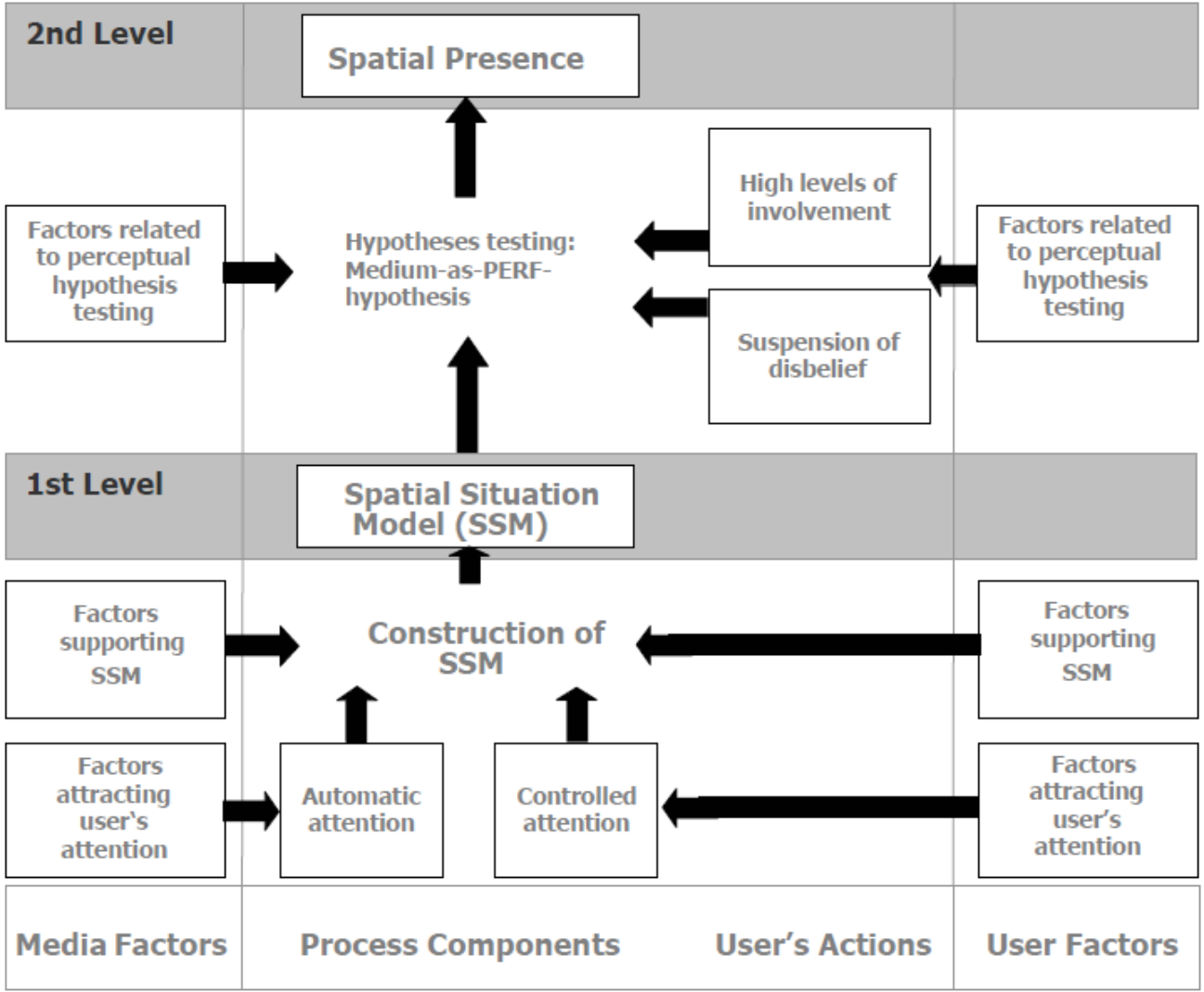

Wirth et al. (2007)

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Single screen RTs 2.87s

Multiple screen RTs 3.89s

Shahar, Alberti, Clark and Crundall (2010)

HP performance is sensitive to the apparatus employed to present the stimuli, and this needs investigation

SIN 5: HP items are easy to create

- Natural hazards: 90 mins per hazard; are they *that* hazardous?
- Staged hazards: costly and potentially dangerous to recreate; do they reflect the designer's biases?
- CGI hazards – the way of the future?


TCR 00:00:02:22
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25
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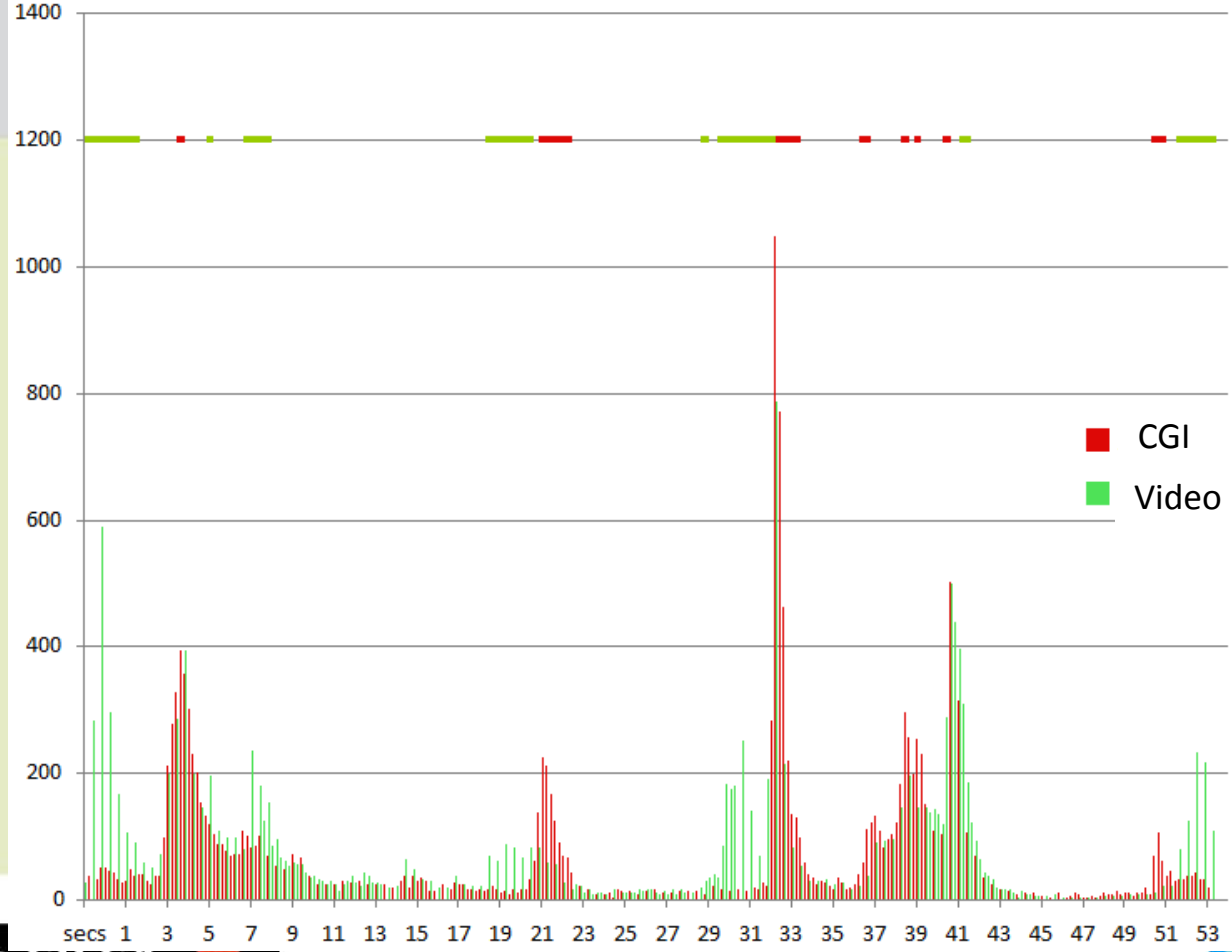
35
40
45
50


1400
1200
1000
800
600
400
200
0
secs 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53
CGI
Video

SIN 6: Simple RTs are sufficient to assess hazard perception skill

Is a simple button press enough?



TIME

Tractor emerging from right?

Parked car on a blind bend – a risky overtake is required

Dark shading suggests oil on road

Oncoming car will overtake cyclist

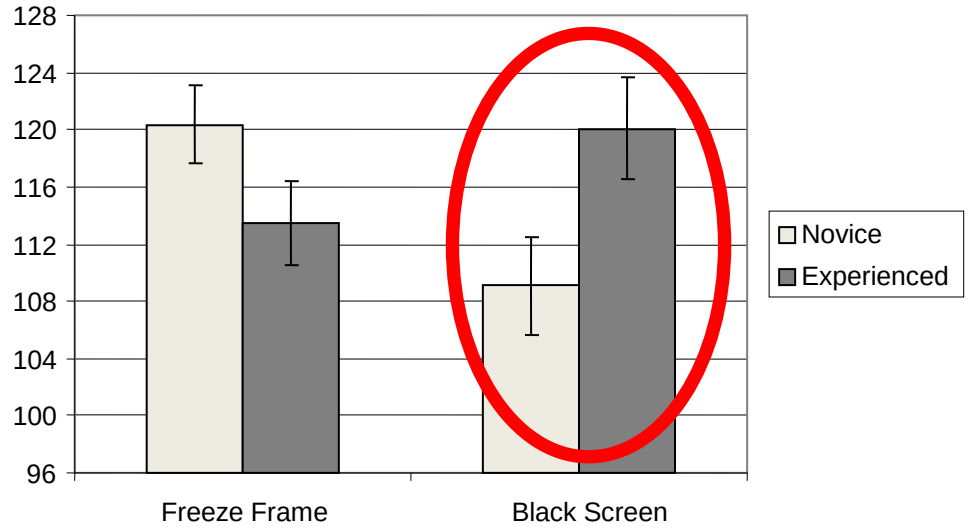
Scoring window

- No measure of accuracy
- Windows are harsh arbitrators of success
- Response bias

An equally pragmatic alternative ?

Stopping a hazard perception clip before the hazard, and asking the drivers to predict ‘what happens next?’

- sidesteps response windows
- provides an accuracy measure
- avoids response bias
- can still be used for mass testing



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Jackson, Chapman, and Crundall (2009); Castro et al (2014); Lim, Sheppard & Crundall (in press); Crundall (submitted)

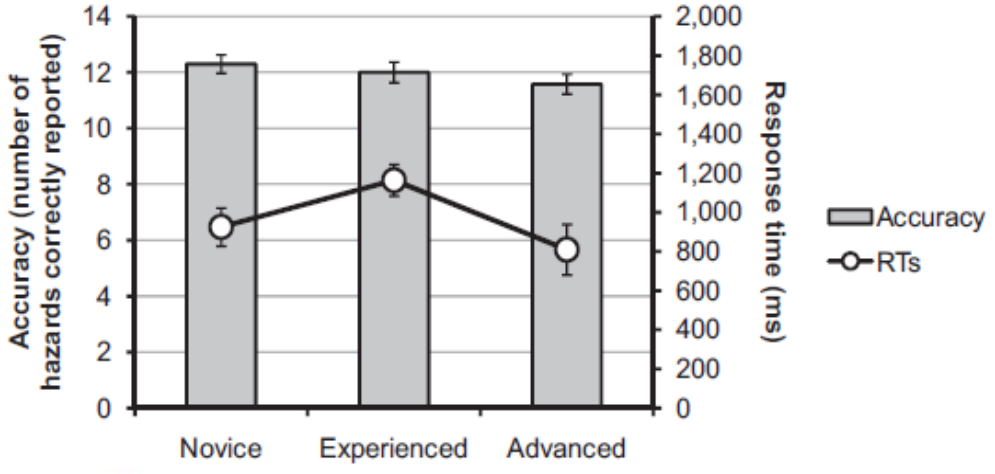
SIN 7: One size fits all

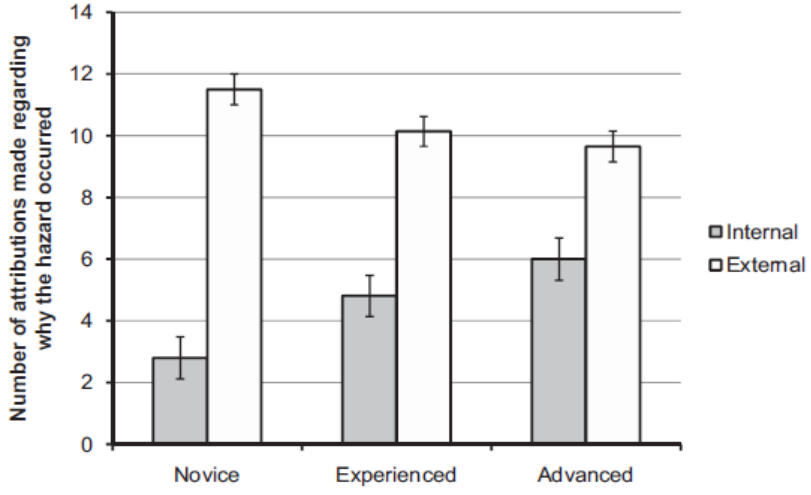
- HGV and motorcycle riders have to sit a (car perspective) hazard perception test
- Driving instructors have to sit the HP test
- A UK test was found to be equally effective in Australia (Wetton et al., 2010)

Is HP relevant to motorcyclists?

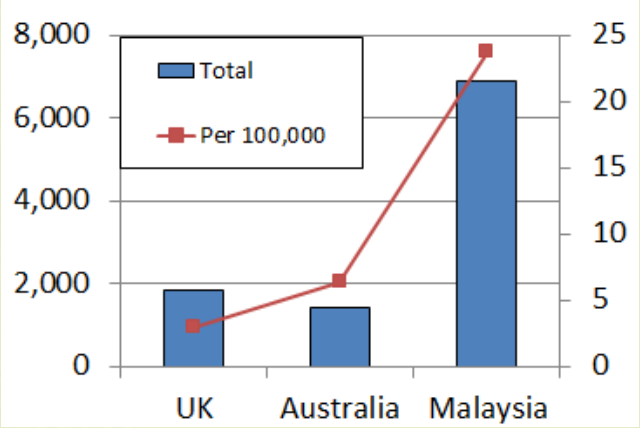
- Motorcyclists are better at car-perspective HP than drivers

  (e.g. Horswill and Helman, 2003; Rosenbloom et al. 2011)
- But no strong evidence that this is due to better motorcycle-specific hazard perception





Is the HP test culturally agnostic?



- MY clips encourage faster responses
- Malaysian drivers might never press a button watching UK clips
- Hazards across countries can be very different
- WHN better for Spain and MY

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Cheng, Sheppard and Crundall (2014)

CONCLUSIONS…?

- We believe HP tests could relate to crash liability and training should improve safety, but the evidence is still weak (more research needed)
- The exact nature and delivery of an HP test can affect participant responses and user acceptance (more research needed!)
- There is little consensus on how to design the ideal HP test (MORE RESEARCH NEEDED!!!)

The Future?

- Touch screen/mouse control accuracy
- Include mirror information
- CGI hazards
- Hazard prediction test
- Not just hazards
- Virtual reality (e.g. Oculus Rift)