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Hazard prediction and hazard perception test in the Czech Republic

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Agenda & Aims

- to introduce a current **state of the art** in hazard perception and prediction testing
- to **show clips and techniques** we use to test hazard perception and prediction
- to **assess the cross-cultural applicability** of the hazard prediction and hazard perception methodology in the Czech Republic
- to **present results of the pilot study** of different approaches to produce clips in the context of Czech Republic

Background 1

- Hazard **perception** skill is the ability of drivers to read a road situation accurately to spot and respond to on-road hazards.
- Hazard perception tests comprise a series of video clips filmed from the driver's perspective.
- An alternative version, the **hazard prediction** test is very similar to the conventional hazard perception test however, in this test video clips typically stop immediately prior to a hazardous situation.
- Hazard perception skill is recognized as the only higher-order driving ability that correlates with lower crash risk.
- United Kingdom, Australia, The Netherlands, and New Zealand; other European countries (e.g., Czech Republic or Germany) are testing

Background 2

Different approaches to produce clips and collect responses:

1. ***Real footage from driving***
2. ***Real footage based on the staged scene***
3. ***CGI based on the real footage or staged scene***
4. ***CGI based on the hazards selected by experts***

Procedure and methodology

- We have filmed driving footage and developed a hazard prediction and perception clips adapted to the Czech driving context. None of the hazards were staged.
- In total, four groups of clips were produced: hazard perception and prediction clips featuring real hazardous situations filmed during real-world driving (31 clips), hazard perception and hazard prediction CGI (computer generated images) clips (25).
- To validate the newly developed tests different driving groups were tested (learners, novices and experienced drivers) – pilot test.
- Comparisons of these driver groups revealed which clips best differentiate on the basis of driving experience.

Procedure and methodology

- Hazardous situations were selected by a group of traffic psychologists, experts in the field, who reviewed the raw footage.
- Each clip included at least 1 hazard and no more than 5 hazards.
- A pilot study was conducted to select the final version of the clips, with participants recruited from different regions across the Czech Republic. In total, **34 learners and novice drivers** (less than 1 year of driving experience) and **45 experienced drivers** (more than 3 years of driving experience) were recruited to validate the clips.
- The theory says that an **experienced driver should detect risks better/faster than an inexperienced driver**, i.e. the experienced group should score better than the inexperienced group.

Background 2

Different approaches to produce clips:

Hazard perception clips based on the real footage from driving in CR

Background 2

- The hazard window began at 33 seconds and ended at 36 seconds. The hazard in this clip being the grey car pulling in front of the driver.
- Responding in this window indicated participants correctly responding to the hazard, and participants could earn between **1 and 5 points depending on where in the hazard window they responded.**
- A score of 5 indicates they spotted the hazard as early as it was possible to do so, and a score of 1 being the latest possible response they could make.
- Participants were told to respond as soon as possible to any hazard they observed in the clip.

Background 2

Different approaches to produce clips:

Hazard prediction clips based on the real footage from driving in CR

Background 2

Different approaches to produce clips:

- The occlusion point occurs at 23 seconds. The hazard in this clip is the **pedestrian stepping out from the parked car on the right.**
- Particiaptns were told that the clip would cut immediately before a hazard took place and they should select one of **four multiple choice options** to indicate what they thought the hazard was going to be.

Background 2

Different approaches to produce clips:

- ***Hazard perception CGI clips based on selected hazards typical for CR***

- ***Hazard prediction CGI clips based on selected hazards typical for CR***

Background 2

- The task is to spot and click on the hazard as soon as possible (double click).
- In this case hazard perception and hazard prediction are tested within the same clip.
- Hazard is scored as „prediction“ up to selected cut off time (hazard is not present only clues), after this cut off time, hazard recognition is scored as hazard perception.
- In each clip 1 – 5 hazards, with scores 1 – 5 points.
- No hazard note (red message); if too many no hazard clicks, test is ended.
- When used as a training tool, correct answers and drone view available.

playlists-delta.vercel.app

Results 1 – Real footage clips

- In the **hazard perception clips** here was a **significant difference** between experienced and novice drivers in terms of their **reaction time**, though the effect size for this was small.
- There was **no significant difference** between experienced and novice drivers in terms of their overall **accuracy in the hazard perception test**.
- This suggests that both experienced and novice drivers were equally likely to respond within the window, **but that experienced drivers were able to respond faster to the hazards and so were likely spotting them faster than the novice drivers**.
- There is also a **significant difference** between experienced and novice drivers in terms of their **accuracy rates in the hazard prediction task**. The effect size for this is also small but is larger than the effect size of experience on hazard perception reaction times.

Results 2 – CGI clips

- In terms of the number of detected/undetected hazards or the speed of risk detection, it is clear from a glance that there are **no differences between the groups** (see Table). Experienced drivers missed on average 24% of risks, inexperienced drivers 22% of risks.
- We can also see, that the majority of drivers (both novice and experienced) scored 3 or 4 points what means rather fast/early detection of hazards. **This may suggest, that hazards were too obvious and thus without and potential to discriminate between both gourps**.

Average number of undetected/detected risks and average quality of risk detection (1 = low, late detection; 5 = high, early detection)

Group	0 points (risk not detected)	1-5 points (risk detected)	1 point	2 points	3 points	4 points	5 points
Inexperienced	**12** (22 %)	**43** (78 %)	4	9	13	12	6
Experienced	**13** (24 %)	**42** (76 %)	4	5	13	13	7

Conclusions

1. Based on the pilot study, we were **able to show that most of the clips (real footage), we used have potential** to differentiate between novice and experienced drivers, in both hazard prediction and perception.
2. We succeeded in clips selection for the major validation study, that means we identified clips which have the best discrimination potential.
3. It seems, that hazard **prediction** tasks are performing better.
4. One of the reasons why there are no differences (or with small effect size) between experienced and novice drivers might be, that **hazards are too obvious**, or easy to detect (especially in the case of CGI clips).

Thank you for listening!

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