Reed in Partnership

ESITU SOLUTIONS

Designing and Deploying a Virtual Reality Driver Training Course for Young and Novice Drivers

Esitu Solutions and Reed in Partnership research report

Policy & Research

reedinpartnership.co.uk

Foreword

Young drivers are more likely to be killed or injured on the roads than older drivers, with their inexperience making it harder for them to notice potential hazards.

That is why Reed in Partnership was pleased to support the rollout of Esitu's innovative road safety training for young people - the first of its kind to use virtual reality to help them spot and predict driving hazards in a 360-degree simulation of the world.

Reed in Partnership wants to play its part in supporting the safety of our young people on the roads. Through our secure test centre network for the Driving and Vehicle Standards Agency, Reed in Partnership conducts around 2.5 million driving theory tests a year, across two-thirds of the UK's geography. Inclusion is critical to this service, whether through bespoke mobile solutions for remote communities, or ensuring that people with a health condition, disability or learning difference have the support they need for a level playing field to take the test.

Outside of the road safety sphere, Reed in Partnership delivers a variety of people-centric services for public sector commissioners, whether that is supporting unemployed people into work, helping people give up smoking or working with schools to support their careers advice and guidance. Supporting behaviour change is often a key element of these services, so we are keen to explore how both innovative training techniques and technology can help increase the impact and effectiveness of training.

As the report explains, hazard perception skill, of which hazard prediction is a crucial part, has been consistently linked to driver crash risk. The training uses VR clips that have been developed by researchers at Nottingham Trent University, but the Esitu team were able to deploy these clips and tailor the training around them to make the course as engaging and accessible for a young group of participants.

Esitu and Reed are grateful to the Bedfordshire Road Safety Partnership, which agreed to embed the VR-based hazard perception module within the Partnership's free, accessible road safety course for pre-drivers and novice drivers. This enabled the team to work with impressive numbers of young people and their parents, who took up this voluntary training opportunity in their own time. The Bedfordshire course is a great example of how road safety partnerships are supporting their communities.

This interesting report highlights some important considerations for supporting our young people to avoid danger on the roads. As with any piloting of tested approaches in the real world, it reveals plenty of areas for both further learning and continuous improvement, not least how we can focus on improving the effectiveness of training for the growing proportion of young people with special educational needs and disabilities. I would urge anyone who is interested in taking forward this work to get in touch with the Esitu team.

Simon Mitchell

Divisional Director

Reed Assessment

Executive Summary

Design and delivery

- Reed in Partnership commissioned Esitu Solutions to prepare, deliver, and evaluate a virtual reality (VR) driver training package targeting young pre-drivers, learner drivers, and novices who have recently passed their driving test, with the aim of improving young driver safety and ultimately reducing collisions on the road.
- Esitu Solutions collaborated with Bedfordshire Road Safety Partnership (BRSP), which runs a three-hour MORE course - a pre-driver training programme for individuals aged 16–30 in Bedfordshire. The VR course replaced a previous MORE course module that focused on a VR-depiction of a post-crash emergency response.
- The new course designed by Esitu focused on hazard perception training, using 360-degree hazard perception clips and direct instruction to improve their ability to detect danger on the road.
- Developed by traffic and transport psychologists at Esitu, the course comprised three distinct modules: the first explained the concept of hazard perception and how this is measured in the national hazard perception test, the second explained the processes involved in detecting hazards, and the final provided explicit guidance on what clues to look out for when predicting hazards.
- The course was delivered up to six times a day across three days with cohorts of young drivers. One of the days was devoted to training young people with Special Educational Needs and Disabilities (SEND).
- Participants completed questionnaires before and after the training to evaluate their self-perceived hazard perception knowledge, processes, and skills.
- The VR training lasted one hour. Participants' hazard perception skills were tested before and after Module 3 using 10 hazard prediction clips, each followed by feedback showing where they should have been looking and why.

Findings

- Our evaluation showed that the course increased trainees' self-rated knowledge of the DVSA hazard perception test and understanding of hazard perception processes. Participants also rated their hazard-spotting skills to be better after the training, with neurotypical participants reporting greater improvements than SEND participants.
- No significant difference was observed in participants' hazard perception scores before and after Module 3, likely due to limitations in the testing environment. However, it was noted that our neurotypical trainees significantly outperformed our SEND trainees regarding their total hazard scores across all ten clips.
- In conclusion, this project highlights the potential of VR training as an engaging training tool that improves knowledge, understanding of hazard perception processes, and confidence in their own skills. We recommend extending the course to 2–3 hours to enable more rigorous before-and-after assessments and incorporate additional training techniques.

Introduction

I

Reed in Partnership commissioned Esitu Solutions to prepare, deliver and evaluate a virtual reality (VR) driver training package targeting young pre-drivers, learner drivers, and novices who have recently passed their driving test. The primary aim of the course is to improve young driver safety and ultimately reduce collisions on the road. As part of this initiative, we enlisted the support of the Bedfordshire Road Safety Partnership (BRSP).

BRSP runs the MORE course, a 3-hour driver and pre-driver training programme for individuals aged 16–30 who reside in Bedfordshire. This course includes hands-on driving experiences, practical workshops, and safety-focused learning activities to enhance driving skills and awareness. BRSP organises four double courses annually, with each session lasting three hours. On course days, 40 participants attend in the morning and 40 in the afternoon. The 40 attendees are divided into three groups, rotating through three 1-hour long activities: car maintenance, on-road driving and skid-pan training, and a module on choices and consequences. The current course was designed to replace the latter module which previously featured a VR film that allowed participants to experience a post-crash emergency response. The new course focused on hazard perception training, using 360-degree hazard perception clips and direct instruction to improve their ability to detect danger on the road.

1.1 Why Hazard Perception?

Hazard perception is the ability to spot and respond to a hazard quickly enough to avoid a collision. It is the only higher-order cognitive skill that has been consistently linked to driver crash risk. It is typically measured using a video-based test that is shown from the driver's perspective. A driver watches a clip and presses a button when they see a 'hazard'. This is usually defined as an event that would make the driver stop, slow down, or change direction to avoid a collision. The faster the driver responds with in a predefined window, the more points they score. Decades of research show that drivers with faster hazards responses have fewer real-world collisions (e.g., Pelz & Krupat, 1974; Watts & Quimby, 1979; Renge,1998; Wallis & Horswill, 2007; Horswill et al., 2008; Deery, 1999; Pradhan et al., 2009). The UK government were so convinced by this evidence that in 2002, they introduced the hazard perception test as part of the national driver licencing procedure, meaning that all new drivers must pass this test before they can get a full driving licence. The introduction of the test been a great success for road safety. A study by the Transport Research Laboratory in 2008 reported that the test lowered the collision risk of newly qualified drivers (Wells et al., 2008). More recent estimates suggest the test saves the UK nearly £90m per year by preventing over 1,000 injury collisions and more than 8,000 damage-only collisions (Horswill, 2016). This success has been acknowledged with two Prince Michael Road Safety Awards.

For this project we have used a simpler response mechanism than traditional hazard perception tests. Whereas the DVSA test requires a button press as soon as the participant spots a hazard, we chose a *hazard prediction* test: instead of a button response, the screen cuts out at the point of hazard onset, and participants are asked, "What happens next?" They are then presented with four on-screen options, only one of which correctly describes the next event. If they choose the correct answer, they score one point. This methodology was chosen for the course as it provided a straightforward and transparent scoring mechanism that was easy for young drivers to understand, and it better suited group delivery across multiple headsets. It is important to note however that a *hazard prediction test* is just another (arguably better) way to measure a construct commonly known as *hazard perception skill.*

1.2 Why Use Virtual Reality?

In a recent study, we demonstrated that using VR to present hazards offers several advantages over traditional computer-based methods. Participants who used VR reported that it was more engaging, immersive, and realistic compared to conventional approaches. More importantly, the study revealed that VR-based hazard perception tests can be more effective than similar tests presented on a standard computer screen, with VR tests showing greater performance differences between safe and less-safe drivers (Crundall et al., 2022).

1.3 Which Training Method?

Although watching hazard perception clips serves as training by providing exposure to multiple hazards in a short time, something that would take hours to replicate through on-road training, we wanted to incorporate an evidence-based method of hazard training within the course. The current best practice as advocated by US researchers, and the one adopted for this study, is termed '3M training' (e.g. Agrawal et al., 2018; Fisher et al., 2002; Pradhan et al., 2009). It refers to a three-stage process. First, trainees have an opportunity to test their skills in an initial assessment, during which they are likely to make one or more mistakes (the first 'M'). Once they realise that there is room for improvement, they are provided with error-based feedback and are told how to avoid such mistakes in the future. This is termed the mitigation stage, the second 'M'. Finally, they demonstrate mastery of their new skills in a similar test environment to stage 1. The course also included explicit guidance on which hazard clues to look for.

1.4 The Course

The course was designed with the above principles incorporated, as well as pre- and post-training questionnaires regarding participants' self-beliefs about their hazard perception skills. Following an introduction to hazard perception and a discussion about identifying 'developing hazards' (the terminology used by the DVSA for those preparing to take the hazard perception test as part of their licence acquisition), trainees were provided with five hazard clips for the initial assessment, allowing them to make mistakes. They were then given error-based feedback clips, which pointed out where they should have been looking and why (the mitigation stage). After this, they received explicit guidance from the presenter regarding the clues to hazards. Finally, they were allowed to demonstrate their improved hazard perception skills in a final assessment, where they could show their mastery of the skills they had learned. Participants were also given questions regarding their self-beliefs of their hazard skills before and after the training.

The course was run by Bedfordshire Road Safety Partnership during three MORE courses throughout Autumn 2024, one of which was run with only special educational needs and disabilities (SEND) participants. It was predicted that the training would improve hazard scores for all drivers and boost their self-beliefs about their own hazard perception knowledge. Furthermore we expected improvements in participants', understanding of the hazard perception process, and confidence in their hazard perception skill. It was also considered that the training might improve the skills of neuro-typical (NT) or SEND drivers differently. By comparing NT and SEND scores on the hazard assessment clips, we sought to identify potential differences in training effectiveness between the two groups and improve our understanding of how the training might influence skill development across these population.

Method

2

2.1 Participants

Across all three MORE courses there were a total of 160 participants. The demographic details of the participants in each course are given in Table 1.

Table 1. Demographics of all participants who completed the MORE course.

Course	N	Gender	Mean Age (years)	Driving Experience
Course 1	56	14 F 40 M 2 Other	18.1	36 non-drivers 6 Learners 14 Passed
Course 2 (SEND only)	39	12 F 27 M 1 Other	17.6	26 non-drivers 10 Learners 4 Passed
Course 3	64	34 F 29 M	16.9	50 non-drivers 6 Learners 8 Passed

2.2 Design

A 2 x 2 mixed design was used to compare participant type (neurotypical versus SEND) across testing times (pre-training versus post-training scores). Both the pre- and post-training assessments included five clips each, with a total score of five per clip set (each clip offering a single point), resulting in a maximum score of 10 for both pre- and post-training assessments combined. Other dependent variables included participants' ratings for the self-beliefs regarding their hazard perception skill.

2.3 Stimuli

2.3.1 The course

The course was developed by a team of traffic and transport psychologists at Esitu Solutions. Much of the content was adapted from pre-existing training materials created by Esitu. However, the language and intended delivery style were modified to better suit a younger audience, ensuring the content was engaging, relatable, and accessible for participants aged 16–30, as well as designed to fit within a 1-hour session.

The course was designed in PowerPoint, though the VR elements were completed using Class VR headsets. At three points during the course, participants were invited to don the VR headsets and watch hazard prediction clips. Each hazard prediction clip played up to the point where a hazard starts to appear. The screen then suddenly disappears, and participants are asked, "What happens next?". Four options then appear within the headsets for them to choose between. Each hazard prediction clip was always followed by a feedback clip. These clips were the same as the hazard clips but included circles highlighting where our participants should have looked, and a voice-over to explain why they should have looked in those locations. The feedback clips continued past the occlusion point to show the complete hazard.

Three explicit training modules were also included in the course. The first module (the hazard perception test) explained the DVSA hazard test using an example of a typical hazard. A discussion on what constitutes a developing hazard was included to provide trainees with a clear explanation of when and where they should press during a hazard perception clip to achieve the maximum possible score.

A second module (the hazard perception process) explained the five processes that we engage in when detecting hazards: look, identify, prioritise, predict, and avoid, with picture or video examples for each (see Figure 1).

Figure 1 – Screenshots taken from module to explaining the five processes we engage in when detecting hazards.

The third module (spotting the clues) provided explicit guidance on what clues to look out for to help them predict hazards. It explained different precursors (environmental, behavioural, and clues-by-design). This module aimed to enhance participants' understanding of the clues that signal developing hazards.

The training modules were provided to BRSP as a PowerPoint presentation prior to the first MORE course, along with the VR hazard and feedback clips, so they could be integrated into BRSP's Class VR headset system. Esitu also conducted a "train the trainer" session in Bedfordshire, where all potential course presenters were trained on the theory behind the course and how to effectively deliver it to the audience.

2.3.2 The Questionnaires

All participants who took part in the MORE course were asked to complete a questionnaire collecting information on their age, gender, and driving status (non-driver, learner driver, or full licence holder). Prior to the course, they were also asked to provide ratings for the following questions to assess their self-beliefs about their own hazard perception knowledge, processes and skills:

- Knowledge: How much do you know about the DVSA hazard perception test?
- Processes: How much do you know about the processes involved in the skill of hazard perception?
- Skill: How good do you think you are at spotting hazards when driving?

Each question was rated on a 7-point Likert scale ranging from 1 (No knowledge) to 7 (Superior knowledge).

Following the training, participants were also asked the following questions:

- Knowledge: How much do you now think you know about the DVSA hazard perception test?
- Processes: How much do you now know about the processes involved hazard perception?
- Skill: How good do you think you will be at spotting hazards in the future?

Again, these were rated on a 7 -point Likert scale ranging from 1 (No knowledge) to 7 (Superior knowledge). Participants were also asked a series of feedback questions relating to the course content (see Appendix 1).

2.4 Procedure

Participants signed up for the MORE course through BRSP, who advertised the course in their local area. A total of three courses were held (6th July 2024, 15th August 2024, and 6th October 2024), with one course specifically for SEND participants. On each day, two 3-hour sessions were conducted: one in the morning and one in the afternoon, with new participants in each session. The majority of participants attended the course with a parent or guardian.

Upon arrival, participants were provided with a consent form for the day, along with demographic and pre-training questionnaires. This was followed by a briefing, which included a health and safety announcement and an introduction to the MORE course. Participants were then divided into three groups and informed that they would rotate around the three training activities: car maintenance, a driving experience, and the VR training course.

During the VR training, all participants were seated on chairs in an area dedicated to course delivery. Parents and guardians sat with their young people. The course was presented on large TV screens at the front of the seating area, while participants were provided with VR headsets controlled by a computer, ensuring that all videos started at the same time so everyone could view the same content simultaneously.

Following each hazard clip, the facilitator read out the multiple-choice options (though participants could read the same options within the headsets). Participants were asked to raise their hand to signify their response after each option was read out a second time. Participants remained in the headsets while giving their response so they could not see what answers other people gave. Their scores were recorded on a purpose-made answer sheet by their parent or guardian. For participants without a parent or guardian, event staff recorded trainee answers. Once everyone had provided an answer the feedback clip was then revealed. When the course was finished, participants were asked to complete the post-training questions and feedback and thanked for their participation.

The overall structure of the course was:

- An introduction to the DVSA hazard perception test (Module 1)
- 2 clips in VR followed by feedback clips
- An explanation of the five processes involved in hazard perception (Module 2)
- 3 clips in VR followed by feedback clips
- Explicit training in detecting hazard clues (Module 3)
- 5 clips in VR followed by feedback clips
- Conclusions and recommendations

Due to occasional technical difficulties, such as headsets not working for some participants or a participant not wanting to wear the VR headset, the course was adapted after the first MORE course. A non-VR version of the hazard and feedback training clip was added to the PowerPoint presentation so that participants could still watch the content.

Results

3

3.1 Self-rated Hazard Perception Skill

Participants gave ratings of their knowledge of the DVSA test, understanding of hazard perception processes, and estimation of their own hazard skill. Seven participants were removed from analyses due to missing data (three from the knowledge analysis and four from the processes and skill analyses).

Participants' ratings for each measure were analysed using a series of 2 × 2 mixed ANOVAs, with participant type (neurotypical vs. SEND) as the between-subjects factor and rating time (pre- vs. post-training) as the within-subjects factor.

Ratings for hazard test knowledge and hazard processes both produced a main effect of rating time. Participants rated their knowledge about the DVSA hazard perception test to be greater after the training compared to before the training (2.5 vs 4.9, on a 7-point scale; $F(1, 155) = 195.83$, $MSE = 1.71$, $p < .01$; see Figure 2, left panel). They also believed that they had better understanding of the processes involved in hazard perception after the training, compared to before (2.6 vs 5, $F(1, 154) = 223.46$, $MSE = 1.43$, $p < .01$; see Figure 2, right panel).

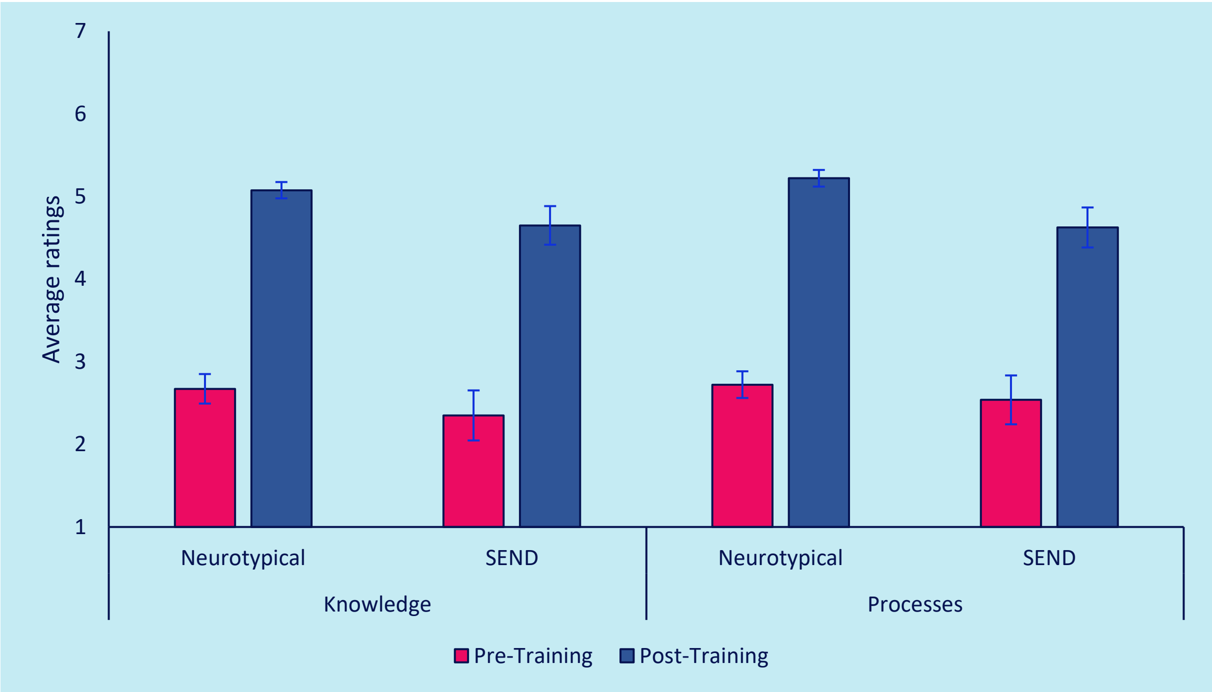

Figure 2. Left panel shows the average ratings of knowledge about the DVSA hazard perception test, before and after training, for both neurotypical and SEND participants. Right side show the average ratings of the processes of hazard perception, before and after training, for both neurotypical and SEND participants. Error bars represent standard error.

Regarding participants' belief in their hazard skill, there was also a significant main effect of rating time, (4.0 vs 5.0, $F(1, 154) = 52.44$, $MSE = 1.12$, $p < .01$), indicating that all participants believed they would be better at spotting hazards after training. However, this main effect was subsumed by an interaction between participant group and rating time, $F(1, 154) = 4.16$, $MSE = 1.43$, $p < .05$. Post hoc t-tests revealed that following training, neurotypical participants rated their anticipated hazards spotting skills as higher than SEND participants (5.3 vs. 4.7; see Figure 3).

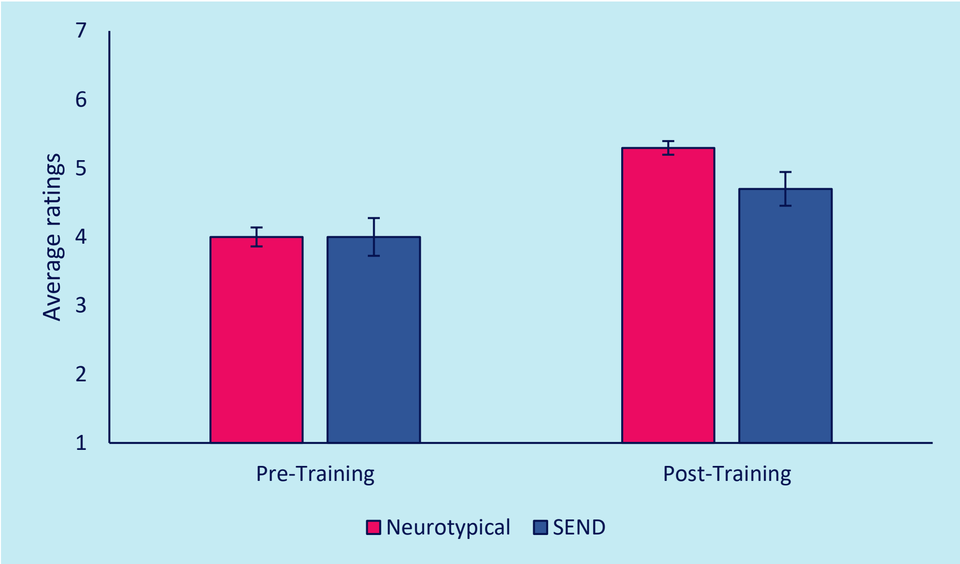

Figure 3. How good participants think they are at spotting hazards, before and after training, for both neurotypical and SEND participants.

3.2 Hazard Performance

Each participant saw 10 hazard prediction clips. Half were presented prior to the explicit training module (module 3) and half were presented at the end of the course after training. Five neurotypical participants were removed owing to only have partial or missing data. Participants' scores for pre- and post-training were analysed using a 2 × 2 mixed ANOVA, with participant type (neurotypical vs. SEND) as the between-subjects factor and rating time (pre- vs. post-training) as the within-subjects factor.

This analysis revealed a main effect of participant type, $F(1, 153) = 7.23$, $MSE = 1.88$, $p < .01$, demonstrating that regardless of testing time, SEND drivers performed significantly worse on the hazard prediction test than neurotypical drivers (2.3 vs 2.8; see Figure 4). There was no significant main effect of testing time, nor an interaction between the factors (all p's > .05).

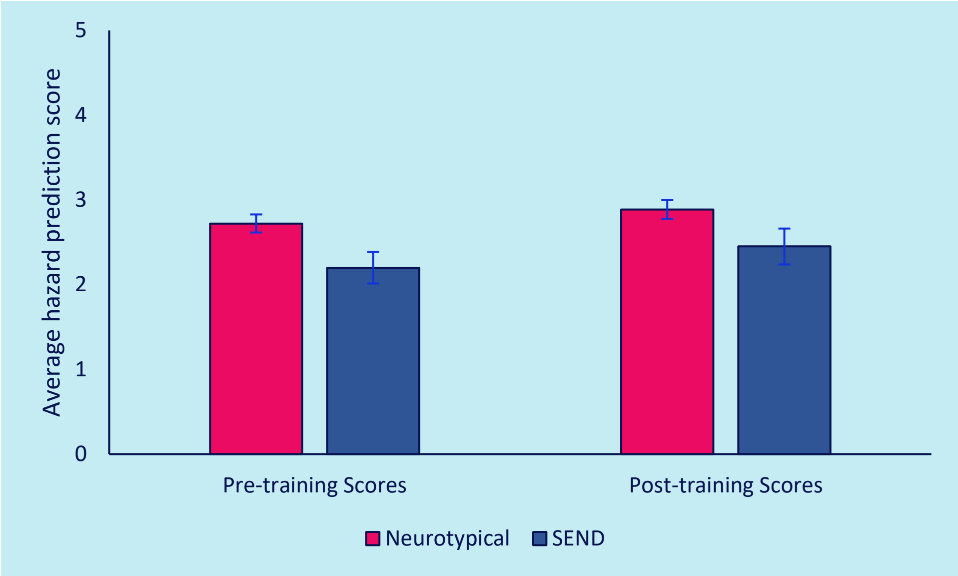

Figure 4. Average hazard prediction scores of neurotypical and SEND participants before and after training. Error bars represent standard error.

There is a possibility that the difference between neurotypical and SEND participants was influenced by there being a greater proportion of pre-drivers in the SEND group. To address this, the same analysis as above was conducted focusing solely on pre-drivers. This adjustment resulted in a total of 26 SEND participants and 83 neurotypical participants included in the analysis. The results replicated the initial analysis, with a significant main effect of participant group, $F(1, 107) = 7.23$, $MSE = 9.59$, $p < .05$, and no other effects. Thus, regardless of testing time and actual driving experience, SEND participants performed worse on our hazard test than neurotypical participants (2.2 vs. 2.7).

Conclusions

4

4.1 An overview of results

The aim of the current project was to prepare and evaluate a virtual reality (VR) training course specifically designed for young and novice drivers. The course was developed and presented to three groups of young and novice drivers at BRSP's MORE courses, including one group of SEND participants. We measured participants' hazard perception skill (using a hazard prediction test) both before and after the training module (module 3). Furthermore, at the very start of the course and at the end of the course, we recorded their self-rated knowledge of the DVSA hazard perception test (taught in module 1), their self-proclaimed understanding of processes involved in hazard perception (taught in module 2), and belief in their hazard perception skills (taught in module 3). The results showed that all participants rated their knowledge about the DVSA hazard perception test and their understanding of the processes involved, to have improved following the course. Interestingly, though both participant groups believed their hazard skills had improved following training neurotypical participants rated their ability to spot hazards in the future as higher than SEND participants. While there was no significant difference in participants' hazard prediction scores before and after module 3, SEND participants performed worse overall than neurotypical participants on the hazard test. The results suggest the course has been successful in imparting information that can assist our learners and pre-drivers in their future DVSA hazard test and have also improved their understanding and confidence in the hazard perception process.

4.2 SEND vs Neurotypical performance

Interestingly, the results demonstrated that neurotypical participants rated their anticipated hazards spotting skills as higher than SEND participants following training. This aligns with broader trends in self-efficacy research, which show that students with learning disabilities tend to have lower self-efficacy than their peers without disabilities (e.g., Clever et al., 1992; Baum & Owen, 1988). Decades of research have demonstrated that self-efficacy positively predicts performance in education and a wide variety of other domains. Therefore, neurotypical individuals may possess greater confidence in their cognitive and perceptual abilities, which could influence their self-assessments positively. Conversely, SEND participants might be more aware of challenges they face in processing information or responding to visual stimuli, leading to more conservative self-evaluations.

In addition, the lower overall hazard prediction scores observed in SEND participants suggest that these individuals may encounter specific barriers that impact their ability to detect and respond to road hazards effectively. These barriers could include slower information processing speeds, reduced attention spans, difficulty interpreting complex visual scenes, or a lower perception of their own efficacy in hazard detection, which might result in demotivation during the task. While the VR training was beneficial in increasing self-perceived hazard perception skills across all participants, these findings suggest that SEND participants may require additional support or tailored interventions. Specifically, adjustments that address the unique cognitive and perceptual challenges faced by SEND individuals may be necessary to ensure they can fully benefit from hazard training, leading to improvements in both their confidence and real-world skills.

4.3 Reflections on how the course was received

Esitu staff were present at all training sessions, with nearly half of the training sessions delivered by one of our traffic psychologists. The other courses were delivered by BSRP staff. Informal feedback from parents to our staff was positive, especially regarding the engagement and novelty of the approach. There was however variation in feedback according to whether the course was presented by Esitu or BSRP staff, which likely reflects the greater understanding that the former have for the material. While we provided BSRP staff with a train-the-trainer day, we recommend that additional train-the-trainer resources should be provided in the future (e.g., a video of an Esitu staff member delivering the course), and that any face-to-face train-the-trainer sessions occur closer in time to the planned delivery of the courses. Alternatively, Esitu staff could be used to deliver all courses.

The hardware and software solutions also posed some problems. BSRP used Class VR to deliver the VR components of the course. Unfortunately, several VR headsets crashed in every training session. This disruption was minimised by BSRP having additional headsets on standby that could be switched in, though for future courses we recommend investment in a more robust platform.

4.4 Strengths and limitations

The key strengths of this project rest with the undertaking of action-based research in a live training environment, across a range of young drivers and pre-drivers including SEND participants. This type of research allows young people to benefit from training while researchers gain insight at the same time, allowing future training courses to be iterated and improved.

Unfortunately, the practical limitations of action-based research can also raise problems. For instance, the lack of training benefits noted in the hazard scores is most likely due to the time constraints imposed on the training course. To ensure we gave the maximum training possible, we provided feedback training after each assessment clip. This meant that even after clip 1, our participants had received some training. Furthermore, between the first two clips and clips 3-5, our participants received the module detailing the processes of hazard perception. Thus, the distinction between the first five clips and the second set of five clips is only the presentation of module 3, which in truth only represents a portion of the total training provided.

Furthermore, a reliable assessment of baseline hazard skill requires more than five clips. For instance, the DVSA uses 14 clips containing 15 hazards in the national hazard perception test. Additionally, hazard clips should be randomised, and before-and-after assessments should be counterbalanced to avoid systematic bias related to the order of presentation. Randomisation was unfortunately not possible due to the software used by BSRP on their VR headsets.

While the pragmatics of a live training session rarely match with an ideal research environment, it is worth noting what such an ideal situation would be. We would have preferred to have assessed initial hazard skills with a minimum of 12 clips, without providing any feedback, and then replicate this with 12 more clips at the end of the session. These clips would have been randomised across training sessions (impractical in BSRP's software setup) and counterbalanced across pre/post assessment. Unfortunately, a more robust approach to assessment would have taken up more than half the allocated time available for the course. We would also have preferred to have included more explicit training in hazard perception clues. These suggestions lead to the recommendation of a course with a duration of between 2-3 hours. If trainees are known in advance it would even be possible to send them an email link to an online hazard test that they could undertake a week before the training (removing the pre-assessment from the course duration). Following the course, the post-assessment could also be sent out online (possibly including a follow-up post-training evaluation several weeks later. Finally, though it does not impact on course delivery, a truly robust evaluation would benefit from a control group who sit both the pre- and post-intervention hazard assessments, but do not receive any classroom training.

4.5 Conclusions and recommendations

In conclusion, we have developed a one-hour course that has improved knowledge, understanding, and self-perceived skill in hazard perception. We also have a range of suggestions for advancing this work including:

- Investigating different VR platforms to ensure robust delivery
- Improved train-the-trainer resources
- Increasing the number of clips for pre/post assessment
- Removing pre/post assessment from the training package (i.e., removing feedback, and potentially providing pre/post assessments online prior to, and following, course delivery)
- Increasing the amount of explicit driver training in spotting hazard clues.

These improvements would most probably require a different delivery partner (with scope to accommodate a larger course) or setting up the course ourselves and recruiting the trainees directly.

We can also seek to engage with other road safety partnerships or approach schools directly to offer the course to young and novice drivers. Additionally, we have recently explored the potential of using such technologies for prisoners nearing release. Many of these individuals may hold a driving licence but have been unable to drive during their incarceration, to allow them to experience and practice their skills in a safe space.

References

Agrawal, R., Knodler, M., Fisher, D. L. & Samuel, S. (2018). Virtual Reality Headset Training: Can it be used to improve young drivers' latent hazard anticipation and mitigation skills. Transportation Research Record, 2672(33): 20–30.

Baum, S., & Owen, S. V. (1988). High ability/learning disabled students: How are they different? Gifted child quarterly, 32(3), 321-326.

Clever, A., Bear, G., & Juvonen, J. (1992). Discrepancies between competence and importance in self-perceptions of children in integrated classes. The Journal of Special Education, 26(2), 125-138.

Crundall, D., Goodge, T., Kroll, V., Vernon, M., Ventsislavova, P. (2022). A Comparison of Virtual Reality and Non-Virtual Reality Approaches to Hazard Perception Training & Testing Does a 360-Degree Environment Provide Tangible Benefits? RAC Foundation.

Deery, H. A. (1999). Hazard and risk perception among young novice drivers. Journal of safety research, 30(4), 225-236.

Fisher, D. L., Laurie, N. E., Glaser, R., Connerney, K., Pollatsek, A., Duffy, S. A. & Brock, J. (2002). Use of a Fixed-Base Driving Simulator to Evaluate the Effects of Experience and PC-Based Risk Awareness Training on Drivers' Decisions. Human Factors, 44(2): 287–302.

Horswill, M. S. (2016). Hazard perception in driving. Current Directions in Psychological Science, 25(6), 425-430.

Horswill, M. S., Marrington, S. A., McCullough, C. M., Wood, J., Pachana, N. A., McWilliam, J., & Raikos, M. K. (2008). The hazard perception ability of older drivers. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 63(4), P212-P218.

Pelz, D. C., & Krupat, E. (1974). Caution profile and driving record of undergraduate males. Accident Analysis & Prevention, 6(1), 45-58.

Pradhan, A. K., Pollatsek, A., Knodler, M. & Fisher, D. L. (2009). Can Younger Drivers Be Trained to Scan for Information that Will Reduce Their Risk in Roadway Traffic Scenarios that Are Hard to Identify as Hazardous? Ergonomics, 52(6): 657– 673.

Pradhan, A. K., Pollatsek, A., Knodler, M., & Fisher, D. L. (2009). Can younger drivers be trained to scan for information that will reduce their risk in roadway traffic scenarios that are hard to identify as hazardous?. Ergonomics, 52(6), 657-673.

Renge, K. (1998). Drivers' hazard and risk perception, confidence in safe driving, and choice of speed. IATSS research, 22(2), 103-110.

Wallis, T. S., & Horswill, M. S. (2007). Using fuzzy signal detection theory to determine why experienced and trained drivers respond faster than novices in a hazard perception test. Accident Analysis & Prevention, 39(6), 1177-1185.

Watts, G. R., & Quimby, A. R. (1979). Design and validation of a driving simulator for use in perceptual studies.

Wells, P., Tong, S., Sexton, B., Grayson, G., & Jones, E. (2008). Cohort II: a study of learner and new drivers. Volume 1—Main Report (Vol. 81). Road Safety Research Report.

Reed in Partnership

ESITU SOLUTIONS

reedinpartnership.co.uk