A Virtual Reality Safety Training to Prevent Construction Workers' loss of Attention to Repeatedly Exposed Workplace Hazards

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Play

Backgrounds

"Loss of attention"

- Decrease in attention to repeatedly exposed hazards
- Key contributor of fatalities in construction sites

Limitations in Observing Loss of Attention


Classroom training


Survey


Direct observation

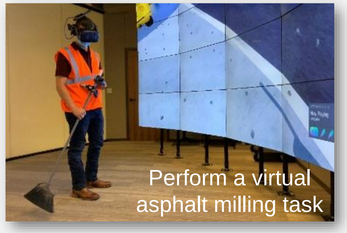
- Learning safety knowledge does not always lead to safe behaviors.
- Result of survey tend to be biased by workers' intention.
- Direct observation is the ideal way, but it is time and labor intensive.

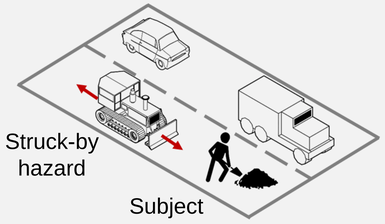
Research Objectives

- Investigate ***how workers' loss of attention can be measured*** in a VR environment
- Examine ***the effect of experiencing a VR accident*** on preventing loss of attention.

Virtual Reality Safety Training

❑ Virtual road construction environment

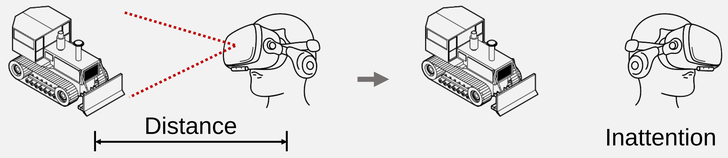




- Subjects were exposed to repeated struck-by hazards in the VR.

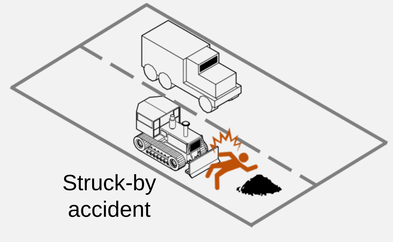
❑ Measure subjects' attention to approaching hazards

Hazard checking behavior **Inattentive behavior**



- Using **eye-tracking sensors**, subjects' *responses were measured*.
- When a subject exhibited hazard checking behaviors, the distance to the approaching hazard was recorded.
- If a subject ignored the approaching hazard, it was recorded as unsafe behavior.

❑ Demonstrate VR-simulated accidents

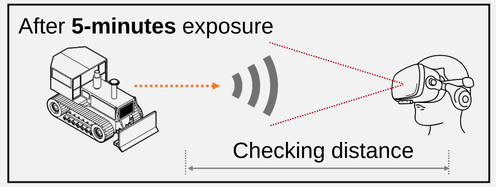


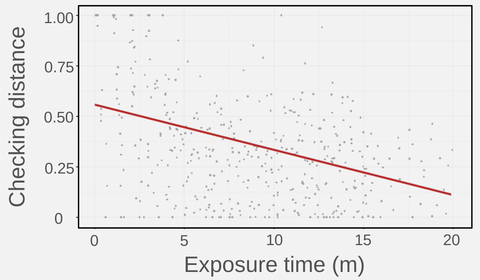
- The ***struck-by accident with a heavy equipment was triggered*** when a subject exhibited continuous inattention to the hazard.

Results

To investigate the effect of experiencing the VR-simulated accident, a total of ***32 subjects participated in two sessions*** separated by a week's interval.

❑ 1st session: The effect of repeated exposure to struck-by hazards

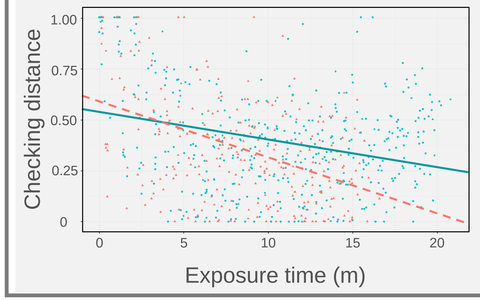


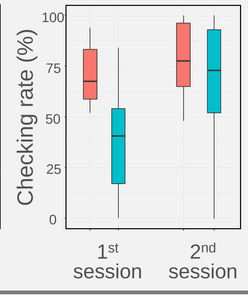


Subjects' ***checking distance decreased*** as exposure time increased. Then they started to ignore the approaching hazard.

❑ 2nd session: The effect of experiencing VR-simulated accidents

Accident experienced group in the 1st session No accident experienced group in the 1st session





$$\textit{Checking Rate} = \frac{\textit{Number of checking}}{\textit{Number of hazard exposure}}$$

Experiencing the VR accident ***increased checking rate*** and ***delayed loss of attention***

Conclusion

- ***Repeated exposure to hazards causes workers' loss of attention***, and it can be measured in the VR environment.
- Experiencing the VR-simulated accident could ***increase workers' attention to workplace hazards***.
- The results highlight the potential of using VR as a behavioral intervention tool to reduce fatalities and injuries in construction sites.