

# Design Study of a Portable Driving Simulator through Co-design with Older Drivers

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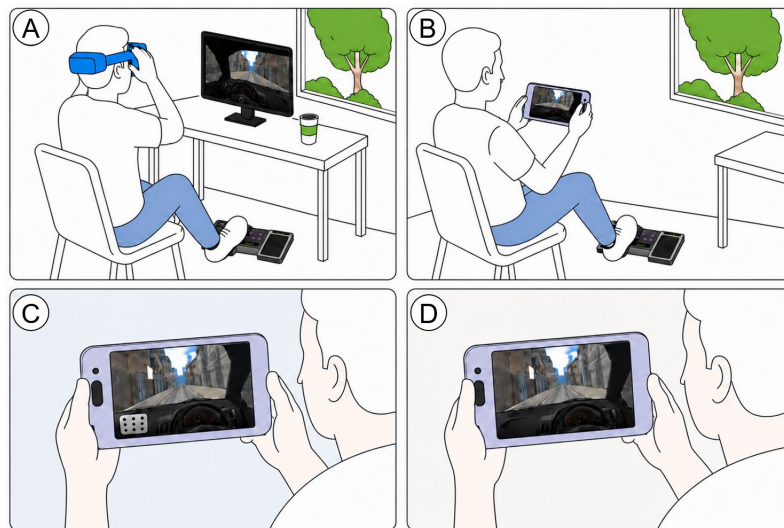


Fig. 1 Four portable driving-simulator designs (A–D).

**Introduction** Older-driver education requires a low-burden, repeatable environment for practicing routine safety behaviours (deceleration, stopping, and left/right checking) at stop-sign intersections. Large driving simulators provide immersion but are costly and difficult to use at home or in classes. Portable simulators are more deployable, yet simplifying the device may reduce visual realism, embodied operation, and transfer to real driving. Through a co-design workshop with older drivers, we examined how simplifying the human-machine interface (HMI) of a portable driving simulator affects subjective evaluation, perceived educational utility, and acceptability.

**Method** Six older drivers (mean age 69.2 years) experienced four portable-simulator designs (Fig. 1): (A) a head-mounted display (HMD) with physical pedals, (B) a non-HMD display with physical pedals, (C) a non-HMD display with an on-screen digital pedal, and (D) a non-HMD display without pedals (the most simplified). After experiencing all four, participants rated each design on a 7-point scale across seven aspects (screen visibility, information comprehension, ease of operation, speed control, left/right checking, real-driving fidelity, and physical burden), ranked them for use scenarios and educational utility, and shared views through affinity mapping and voting before and after discussion.

**Results** Design C (digital pedal) received the highest overall rating (4.57/7), driven by speed control and low physical burden, whereas design A (HMD with physical pedals) scored lowest overall (3.48), with low ratings for screen visibility, speed control, and real-driving fidelity. The rankings showed a split between perceived educational utility and preference. Designs with physical pedals were judged most useful for education, but preference concentrated on the simplest design (D), while the top-rated design C drew no educational-utility votes.

**Discussion** Adding physical controls did not guarantee the realism needed for driving behaviour learning, and perceived educational value was dissociated from usability and preference. Whether behaviours learned with a simplified HMI transfer to real-road routine safety behaviour (head-checking and foot braking) remains to be verified. The next stage will systematically vary the HMD, physical pedals, touch operation, and on-screen icons to test this transfer.