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Designing Hybrid Human–Artificial Training Systems: Psychological and Physiological Interactions in VR-based Law Enforcement Scenarios

Abstract

The study investigates the interaction between stress coping, aggression, and simulator sickness in State Protection Agents trained with virtual reality (VR) shooting simulators. Conducted within the framework of hybrid human– artificial training systems, the research examines how individual psychological traits affect adaptation and collaboration in intelligent safety environments. Officers trained under four VR conditions with varying immersion levels and a livefire control. Standardized questionnaires measured aggression (BPAQ-SF), coping (CISS, mini-COPE), and simulator sickness (SSQ) before and after training. VR training elicited realistic stress responses comparable to live scenarios but also induced cybersickness consistent with prior findings. Post-training results showed reduced verbal and overall aggression ($p<0.05$) suggesting a moderating psychological effect. Maladaptive coping strategies, such as emotional focus and self-blame, correlated with stronger sickness symptoms (r up to 0.39, $p<0.01$), while anger and hostility were linked to post-training disorientation ($r\approx0.45$, $p<0.01$). The findings indicate that coping style and emotional regulation influence physiological comfort and effectiveness in VR-based training. Incorporating adaptive feedback and coping support within hybrid training systems can enhance resilience, safety, and human–machine collaboration.