Auto-REBA: Improving postural ergonomics using an automatic real-time REBA score in virtual reality

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Purpose This pilot system explores the integration of advanced technologies, including Virtual Reality (VR) and wearable devices, with the REBA (Rapid Entire Body Assessment) (Hignett & McAtamney, 2000) technique for real-time posture correction and ergonomic assessment. Aimed at mitigating musculoskeletal strain and enhancing ergonomic practices, the research investigates the effectiveness of immediate feedback mechanisms in dynamic and simulated work environments. The ultimate goal is to enable elderly individuals to remain in the workplace longer (Escorpizo, 2008). **Method** Utilizing a digital adaptation of the REBA method, we combined motion capture technology, VR, and wearable feedback systems to provide participants with real-time evaluations of their postural ergonomics in an exploratory study preliminary with younger adults (N=5, age 24-30). To create a synchronized ergonomic assessment from physical to virtual, an innovative plane method for Rapid Entire Body Assessment (REBA) scoring in VR was developed to measure body angles accurately, aiming to replicate traditional ergonomic assessments within a virtual context. Participants were subjected to tasks within a VR simulation designed to induce poor posture, with the study varying the feedback modalities (visual cues represented through a color-coded REBA score within the VR environment via HUD and tactile feedback via wearables) to assess their impact on posture correction. Quantitative measures, including task completion times, REBA scores, and perceived workload (NASA TLX), were employed to gauge the system's efficacy across different feedback conditions. **Results and Discussion** In the formative testing phase we found that real-time feedback aids participants in adjusting their posture towards safer ergonomics. The project demonstrated the potential of VR in ergonomic research, particularly through the successful integration of advanced technologies and the development of the plane method for REBA scoring. The study demonstrates the potential of combining VR and wearable technologies for a proactive approach to correcting postural habits and reducing ergonomic stress, thereby lowering the risk of long-term musculoskeletal disorders. The fusion of REBA with VR and wearable technologies offers a novel pathway for ergonomic intervention and education. We are currently enhancing our system by integrating tactile feedback at various body locations for a comprehensive prototype. Oagaz et al.(2022) highlighted VR and wearable technology's benefits for sports learning through real-time ergonomic feedback, indicating their potential to address workplace musculoskeletal disorders. Showcasing the effectiveness of such technologies in improving postural ergonomics offers valuable insights into their potential application in occupational health and safety.

References

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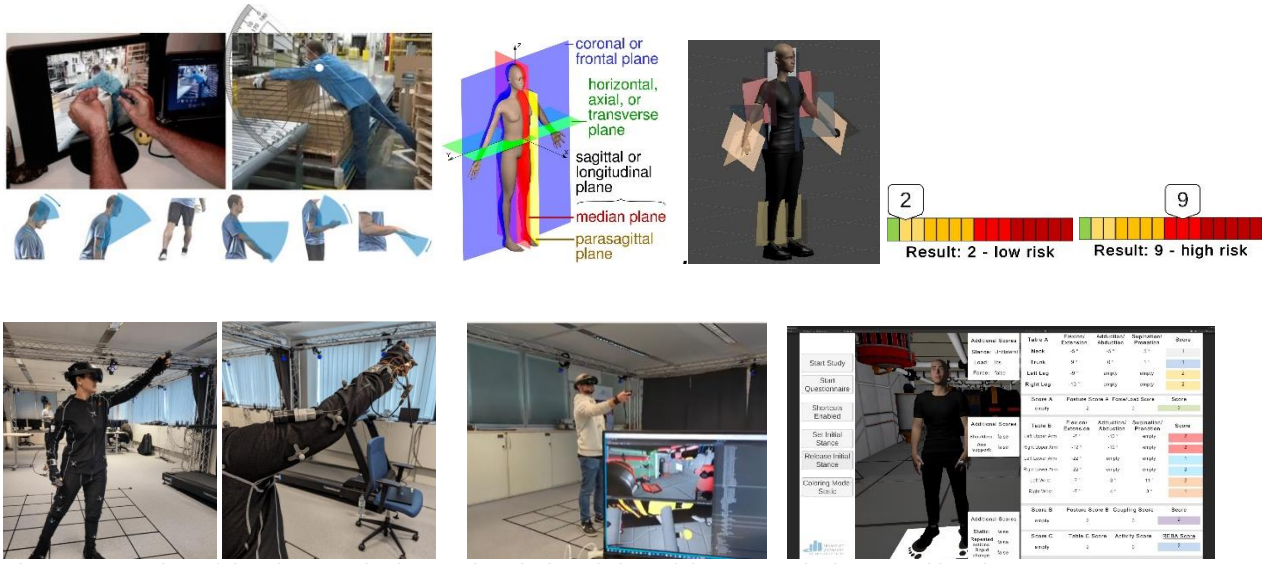

Figure 1. Overview of the plane method procedure (up) and view of the prototypical system (down)