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🌐 Lab protocol for a realistic virtual reality application to analyse quick directional change in sport: Avatar cutting scenario with alterable parameters

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We use this collection and it is working

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Keywords: Virtual reality, Avatar, Arrows, Cutting, Quick directional change, Sport, Biomechanics, vr technology with biomechanical equipment, effects of the different visual cutting cue, virtual reality, vr environment, use of vr, different visual cutting cue, realistic virtual reality application, vr, vr application, spatiotemporal demands of the cutting task, vr avatar, integrating vr technology, cutting mechanics, analyse quick directional change in sport, cutting assessment, vr arrow, cutting manoeuvre, quick directional change in sport, real sporting scenario, cutting direction, cutting as these environment, cutting scenario, representative of real sporting scenario, sporting scenario, cutting analysis, cutting, cutting task, based biomechanical assessment, motion, biomechanical assessment, sport, physical world, vision of the physical world, motion capture system, kinetic data with participant, movement, avatar approach, biomechanical equipment, rehabilitation, vision, injury risk, movement of the headset user,

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Abstract

Quick directional change in sport (cutting) has high potential for injury. Cutting mechanics can be analysed to inform injury risk and return to sport. However, during research and rehabilitation, laboratory and clinical settings can make it difficult to assess cutting as these environments are not representative of real sporting scenarios. As a solution, virtual reality (VR) has been used to replicate sporting scenarios in a realistic way that can be standardised. The use of VR to improve the ecological validity of cutting analysis has been evolving for a number of years. The current research group designed and developed a VR environment that emulates the physical world and allows unanticipated-cutting manoeuvres to be analysed with: 1) VR arrows as a cue for cutting direction, and 2) a VR avatar-opponent blocking manoeuvre as a cue for cutting direction. The VR environment is highly realistic, avatar approach is instigated by the movement of the headset user, and simple input alters the avatar's movements and spatiotemporal demands of the cutting task. When implemented, this lab protocol assesses the effects of the different visual cutting cues on cutting mechanics. The lab protocol highlights how the testing protocol methodology is novel and addresses difficulties that have previously arisen when integrating VR technology with biomechanical equipment in cutting assessment. It explains how to access and implement the VR application alongside a motion capture system, as well as how to account for safety and feasibility when the participant's vision of the physical world is restricted. It also provides a protocol that can be used when collecting kinematic and kinetic data with participants. The step-by-step protocol provides an outline on how to implement the study proposed, and given the growing interest in improving ecological validity in laboratory-based biomechanical assessments, it can be used as reference in future research.

Safety warnings

- ❗ Prior to starting the study, all individuals were informed of the safety provisions. This included:
 - The role of the periphery foam on the floor.
 - That the primary researcher would monitor movement.
 - Individuals had a minimum of one additional visual 'spotter' (other than the primary researcher) who watched the participant when moving with a headset on.
 - Participants were told to emergency stop if the command 'Stop!' was yelled at any time.
 - Participants were to jog or run every recorded trial at their own 'safe maximum' (the maximum speed at which they felt safe). They were asked to continually monitor this. However, individuals were prompted to slow down if their speed became a safety risk.
 - Individuals rested for a minimum of 3 minutes every 8 trials. A resting seat, outside of the capture volume, was identified for their use and they were told to request a break, if needed, at any time.

Ethics statement

Liverpool John Moores University Research Ethics Committee reference: 22/ENR/004.

Participants provided written informed consent to take part in the study and to publish these case details. The research was conducted in accordance with the Declaration of Helsinki. The participants were medically screened, primarily ensuring no musculoskeletal complaints in 6 months, or issues with vision, or balance and neurological impairment.



Before start

The VR application can be downloaded from GitHub, in-line with the licence outlined on GitHub:

<https://github.com/HannahKTang/VR-for-movement-assessment-in-sport.git>

The VR application can be referenced with the following DOI:

<https://doi.org/10.5281/zenodo.15102390>

Files

 SEARCH

Protocol

NAME

Systems and setup

VERSION 1

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Protocol

NAME

Data collection protocol: Screening and motion trial preparation

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Protocol

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Data collection protocol: Motion trials

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Protocol references

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