

Adapting the Posner paradigm to study 360° attention orienting in Virtual Reality

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Orienting attention in space is crucial to modulate perception and adapt behavior. The Posner paradigm has been widely used to understand the cognitive and neural mechanisms that shift attention across locations. However, most of the literature has focused in frontal space. Here we adopt immersive Virtual Reality (VR) and adapt the Posner paradigm to study the deployment of attention both in front and rear peripersonal space using both response times and eye movements. Twenty participants in a VR storage room had to search for and discriminate as quickly as possible between 2 targets in 4 possible locations arranged circularly around them. Targets were preceded by a spatialized sound cue whose validity was manipulated (80% Valid, 20% Invalid), and presented with varying distractors (None, One near the target, One far from the target, or Three), with the goal of validating the serial search effect in both front and rear space. Response times were comparable to the classical Posner paradigm when the target was presented both front and rear to the participant, with participants being significantly faster with Valid cues, compared to Invalid ones. Distractors also delayed significantly target detection. However, response times for rear conditions were significantly greater, possibly due to greater spatial exploration and body movements. Gaze data confirmed the impact of invalid cues and distractors on attention shifts, and were tightly correlated with response times for both front and rear space. We believe this is one of the first studies to quantify eye-tracking in 360° around the participant and validates VR as a powerful tool for quantifying attentional dynamics. Results show that orienting attention in front and rear space engages similar mechanisms of sensory competition, supporting an overlap or a continuity in space representation, while revealing how overt gaze strategies mediate performance.

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