

**TITLE**

TEMPORAL AND SPATIAL OCCLUSION OF ADVANCED VISUAL INFORMATION CONSTRAIN EMERGENT COORDINATION OF ONE-HANDED CATCHING BEHAVIOURS

**AUTHOR**

Stone, Joseph A.; Maynard, I. W.; North, Jamie S.; et al.

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# TEMPORAL AND SPATIAL OCCLUSION OF ADVANCED VISUAL INFORMATION CONSTRAIN COORDINATION TENDENCIES IN ONE-HANDED CATCHING BEHAVIOURS

Stone, J.A.1, Maynard I.W.1, North, J.S.2 Panchuk, D.3, Davids, K.1.

1: Sheffield Hallam University (UK), 2: St. Mary's University, Twickenham (UK) 3: Australian Institute of Sport (Australia),

## Introduction

Dynamic interceptive actions, like catching, are performed under severe spatial and temporal constraints. Here, we used novel, integrated technology in a spatial and temporal occlusion design, which provided insights on participant behavioural regulation when pre-release visual information of an actor's throwing action was manipulated.

## Methods

An integrated video and ball projection machine was used to create four temporal occlusion and five spatial occlusion conditions of an actor throwing a ball towards participants standing 7m away. Hand kinematics and gaze behaviours of 12 participants were recorded while attempting to catch a projected ball at 13.9 m/s that was synchronised with the video footage showing advanced kinematic information from the actor.

## Results

Analyses of the temporal occlusion manipulations revealed that when footage was occluded at earlier time points, catching performance decreased. Movement onset of the catching hand and initiation of visual tracking on the ball emerged earlier when footage of the thrower was occluded at a later time point in the throwing action. The spatial occlusion manipulation did not affect catching success, although movement onset emerged later when increased visual information of the actor was occluded. Later movement onset in both temporal and spatial occlusion conditions was countered by greater maximum velocity of the catching hand when moving it into a catching position. The final stages of the action (e.g., grasping) remained unchanged across both spatial and temporal conditions, highlighting their sensitivity and suggesting that the later phases of the action were organised using ball flight information.

## Discussion

Findings revealed how catching behaviours were continuously (re)organised and adapted as information became available in task performance, first by using kinematic information from images of a thrower's actions, and then with ball flight information. Results highlighted the importance of maintaining information-movement coupling during performance of interceptive actions, with these behavioural adaptations having important implications for research that assesses interceptive skills based solely on pre-ball flight information, as in many studies using current video-based simulation paradigms.

## Contact

[Joseph.stone@shu.ac.uk](mailto:Joseph.stone@shu.ac.uk)