Title: Advance knowledge effects of one-handed catching

Authors: Pieter Tijtgat, Simon Bennett, Geert Savelsbergh, Dirk De Clercq, Matthieu Lenoir

In: Sport en Geneeskunde, 43 (1), 32-33, 2010

Advance knowledge effects on kinematics of one-handed catching

Pieter Tijtgat[1], Simon Bennett[2], Geert Savelsbergh[3], Dirk De Clercq[1] and Matthieu Lenoir[1]

[1]*Department of Movement and Sports Sciences, Ghent University*

[2]*Research Institute for Sport and Exercise Sciences, Liverpool John Moores University*

[3]*Institute for Biomedical Research into Human Movement and Health, Manchester Metropolitan University, and Research Institute MOVE, Faculty of Human Movement Sciences, VU Amsterdam*

Introduction: The impact of varying temporal constraints has revealed some interesting insights towards the control of interceptive behaviour (1, 2). However, these experiments were conducted with velocity-manipulations arranged in blocks of the same ball speed, thereby neglecting the possible effects of advance knowledge of ball speed. Therefore, the purpose of this experiment was to examine these advance knowledge effects on the kinematics of one-handed catching.

Methods: Balls were launched from a distance of 8.4 m by a ball-projection machine with adjustable launching speed. By projecting balls with different ball speeds from a fixed position, it was possible to modify the temporal constraints of the catching task. Fifteen skilled ball catchers caught 160 balls with their preferred hand under blocked-order or random-order conditions. The catching movement was tracked with a 3D motion capturing system (Qualisys, Sweden) at 240Hz.

Results: In both the blocked-order and random-order conditions, catching performance decreased with increasing temporal constraints. Analysis of successful trials indicated that this equal level of catching performance was achieved with different movement kinematics. Specifically, there was a change in movement time (MT), latency (LT), wrist velocity profile, and coefficient of straightness. Movement kinematics were scaled to ball speed in the blocked-order condition whereas in the random-order condition, participants exhibited a more default initial response (see Fig. 1). However, this latter mode of control was functional in that it increased the likelihood of success for the higher ball speeds while also providing participants with a larger temporal window to negotiate the unexpected temporal constraint on-line for the lowest ball speed.

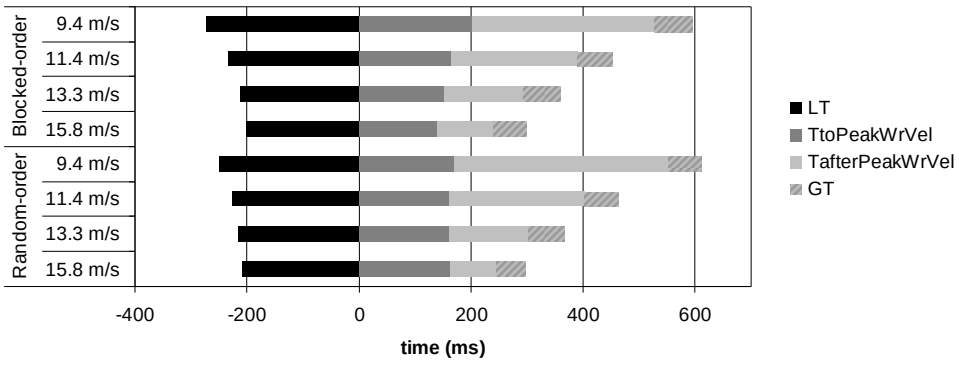

Fig. 1 Overview of the temporal structure of the catching movement at the four ball speeds for blocked-order condition and random-order condition. Zero-point is set at the moment of movement onset. LT is in black, grey shades reflect MT.

Conclusions:. The current experiment shows that advance knowledge of ball speed had an influence on movement kinematics, although catching performance remained the same. Trials that were presented in blocks of the same ball speed led to a better scaling of movement kinematics based on expectancy from previous trials.

References

1. Laurent M., Montagne G., Savelsbergh G.J.P. The Control and Coordination of One-Handed Catching - the Effect of Temporal Constraints. *Experimental Brain Research* 101: 314-322., 1994.
2. Mazyn L.I.N., Montagne G., Savelsbergh G.J.P., Lenoir M. Reorganization of catching coordination under varying temporal constraints. *Motor Control* 10: 143-159., 2006.