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The Effect of Task Demands on Decision Making in Dynamic, Sport-Like Virtual Environments

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OBJECTIVE
To determine if level of temporal pressure to arrive at a desired location explains decisions about passability of closing gaps between opponents encountered and how decisions change with task experience.

STUDY DESIGN AND SETTING
Participants were immersed in a sports field rendered in virtual reality in first person perspective and instructed to steer toward a visual waypoint. On the way, they had to decide whether they could fit through a shrinking gap between two virtual human opponents, which would enable the participant to take the shortest route to the waypoint or, conversely, whether they had to steer around the gap and take a longer route.

PARTICIPANTS
Thirty healthy, university undergraduate students participated and were randomly assigned to one of two groups. The control group (NPG) consisted of 15 participants (6 male, 9 female, \( M \) age = 20.53 ± 2.75) and the PG consisted of 15 participants (8 male, 7 female, \( M \) age = 20.93 ± 3.19).

INTERVENTION
Participants were instructed to always move through the gap when they perceived it was possible. The Pressure Group (PG) received instruction to navigate to the waypoint as fast as possible. The No Pressure Group (NPG) received no further instruction thus not subjected to temporal pressure to reach the waypoint.

MAIN OUTCOME MEASURE
Action Boundary representing action decisions to pass through or around closing gaps with respect to gaps’ passability. An action boundary of 1 indicates decisions, below 1 equates to going around passable gaps (inefficient decisions), and above 1 tendency to go through impassable gaps resulting in collision (risky decisions).

RESULTS
Mixed effect analysis was used to test the effect of Group (PG vs. NPG) and Block (1, 2, and 3) on Accuracy. The PG exhibited a consistently higher Action Boundary, \( F(1, 84) = 6.717, p = .011 \), and a two times higher rate of risky decisions compared to NPG, \( F(1,84) = 10.052, p < .001 \). The NPG began making accurate decisions but with experience became inefficient (action boundary <1). The PG started making risky decisions (>1) but by block 2 demonstrated accurate decision. With experience, both groups action boundary decreased but with lack of pressure the NPG became inefficient, while with pressure the PG became more accurate.

CONCLUSION
Results provide initial support to the idea that temporal demands experienced by athletes during competition could put them at risk for injury. Thus, they could benefit from interventions (in safe VR environments) designed to enhance perceptual-motor processes that support effective responses to local contextual constraints. The design of such interventions should take into account how the role of task pressure in safe environments may be a mechanism to promote safe, yet efficient decision making.

KEY WORDS: Collision Risk, Virtual Reality, Injury Prevention
REFERENCES


