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Research article

## Monocular And Binocular Vision In The Performance Of A Complex Skill

Thomas Heinen<sup>1</sup>,  Pia M. Vinken<sup>2</sup>Citations in  
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### ABSTRACT

The goal of this study was to investigate the role of binocular and monocular vision in 16 gymnasts as they perform a handspring on vault. In particular we reasoned, if binocular visual information is eliminated while experts and apprentices perform a handspring on vault, and their performance level changes or is maintained, then such information must or must not be necessary for their best performance. If the elimination of binocular vision leads to differences in gaze behavior in either experts or apprentices, this would answer the question of an adaptive gaze behavior, and thus if this is a function of expertise level or not. Gaze behavior was measured using a portable and wireless eye-tracking system in combination with a movement-analysis system. Results revealed that gaze behavior differed between experts and apprentices in the binocular and monocular conditions. In particular, apprentices showed less fixations of longer duration in the monocular condition as compared to experts and the binocular condition. Apprentices showed longer blink duration than experts in both, the monocular and binocular conditions. Eliminating binocular vision led to a shorter repulsion phase and a longer second flight phase in apprentices. Experts exhibited no differences in phase durations between binocular and monocular conditions. Findings suggest, that experts may not rely on binocular vision when performing handsprings, and movement performance maybe influenced in apprentices when eliminating binocular vision. We conclude that knowledge about gaze-movement relationships may be beneficial for coaches when teaching the handspring on vault in gymnastics.

**Key words:** Experts-novice paradigm, gaze behavior, gymnastics

## Key Points

- Skills in gymnastics are quite complex and the athlete has to meet temporal and spatial constraints to perform these skills adequately. Visual information pickup is thought to be integral in complex skill performance. However, there is no compelling evidence on the role of binocular vision in complex skill performance.
- The study reveals, that apprentices optimize their gaze behavior and their movement behavior when binocular vision is eliminated, whereas experts gaze behavior and movement behavior is uninfluenced by eliminating binocular vision.
- We state, that binocular vision is not necessary for experts to perform to their best. However, eliminating binocular vision could be part of an optimization strategy for apprentices, which could in turn be transferred to new training programs.

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