

Submission Title

Multiple revolutions of ballet dancers: Assessing balance, spotting, and orientation over time

Abstract Text

Purpose: In dance, multiple rotations about the vertical axis utilize an isolated head coordination, known as spotting. While head movements are known to play a key role in postural stability and orienting ambulatory turns, the relevance of head movements in continuous whole-body revolutions remains unclear. Therefore, the aim of the present study is to describe balance, spotting, and orientation over time during the continuous rotations of Fouette and à la Seconde turns.

Methods: To observe the natural progression of performance, eight professional ballet dancers performed one trial wherein they were instructed to perform as many consecutive rotations as possible. Full-body kinematics were recorded with a 3D motion-capture system. Participants provided informed consent prior to participation, and the study was approved by the ethics committee of the local Faculty of Human Sciences.

Balance was assessed by the use of compensatory mechanisms – specifically, moving the base of support under the center of mass, which was quantified as the normalized pathlength of the supporting foot. Three characteristics of spotting were highlighted: duration of head stabilization, degree of head-trunk isolation, and magnitude of head deceleration at spotting initiation. Finally, the orientation of both the head and the pelvis were examined. Correlation analysis was performed between each variable and the number of each consecutive revolution.

Results and Discussion: On average, dancers performed 33.5 ± 5.3 consecutive rotations. The final 20 rotations of each dancer were analyzed. In order to sustain verticality, dancers made greater compensations in the supporting foot, as indicated by an increase in the pathlength over time ($r = .56$, $p = .01$). In terms of spotting, dancers increased the duration of head stabilization towards their final revolutions ($r = .66$, $p < .01$). Changes in spotting dynamics and coordination were also observed, with dancers utilizing greater head-trunk isolation ($r = .63$, $p < .01$) and greater head declaration when initiating spotting in the final turns ($r = .60$, $p < .01$). Compared to the expected frontal orientation, dancers appeared to over rotate their body ($r = .74$, $p < .01$) while under rotating their head ($r = -.59$, $p < .01$) towards the end of their turns.

Conclusion: By observing continuous performance, this study reveals patterns in the characteristics of balance, spotting, and orientation during multiple rotations. Findings provide insights into strategies used in sustained performance.