Rotation Characteristics of Elite Divers During Dry Land Training

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Introduction

During the flight phase of diving the speed of whole body rotation is a key element to determine the performance outcome. Body positioning alters rotational inertia and determines whole body rotation speed. Athletes attempt to reach maximum speed to achieve the desired dive routine in the least possible time, and to enable sufficient time to achieve straight body positioning for maximal points on entry. Elite divers spend around 6 days/week performing dry land training to rehearse body rotation activities such as somersaults. It is unknown how athletes somersault technique differs in their attempt to perform this task, and the optimal movement pattern for dry land training is unclear. This project aims to measure rotation speed of elite divers during dry land training to profile individual techniques. This information may lead to improved approaches to training and methods of developing young talent.

Methods

During typical dry land training a 3D gyroscope (Minimax X, Catapult Sports, Mel, AUS), was fixed to the lower lumbar-sacrum region by double sided tape (Fig 1) of 4 senior and 6 junior elite divers (Talent Identification Squad; TID Squad). Sagittal plane data from the gyroscope was collected at 100Hz and analysed to determine individual rotation characteristics. Temporal alignment of time-series data was achieved by aligning a zero point associated with liftoff, this event coincided with a countermovement motion, see Figures 2, 4 & 5.

Figure 1 The Minimax unit is fixed to the lumbar region using sports tape.

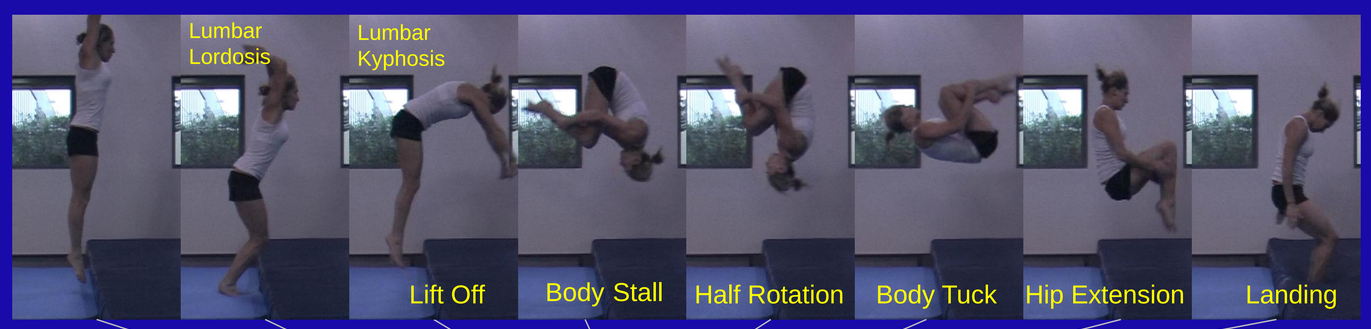
Results

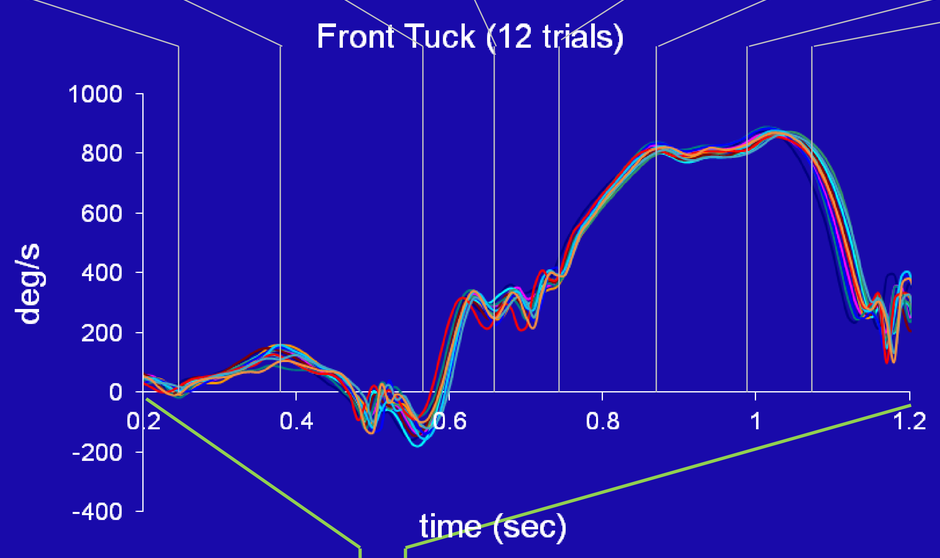
Analysis of time series data during Forward Tuck somersaults indicated low inter-trial variability for all athletes tested, Table 1. However, profiles for individual athletes were unique, Figure 4.

Athlete	Average Speed (deg/s)	SD	CV%	count
1	783	12.0	1.5	5
2	842	14.2	1.7	5
3	981	13.3	1.4	5
4	867	4.8	0.6	5

Table 1 Peak Forward Somersault Speed: Mean, SD & Coefficient of Variation (CV%) for 4 senior athletes who performed 5 trials.

Figure 2 Forward tuck profile of 12 trials from one Athlete.





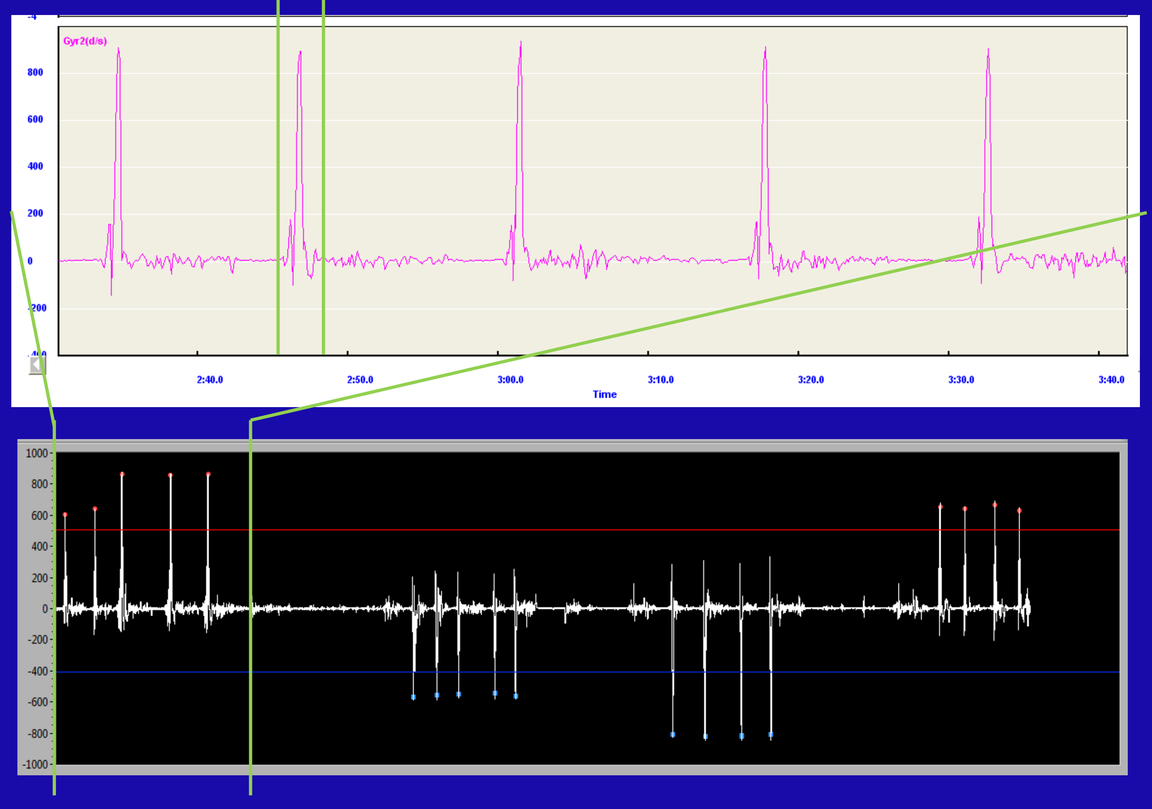


Figure 3 Forward Somersault: Sagittal plane gyroscope data for 5 forward somersaults from a normal session involving 4 sets x 4-5 somersaults.

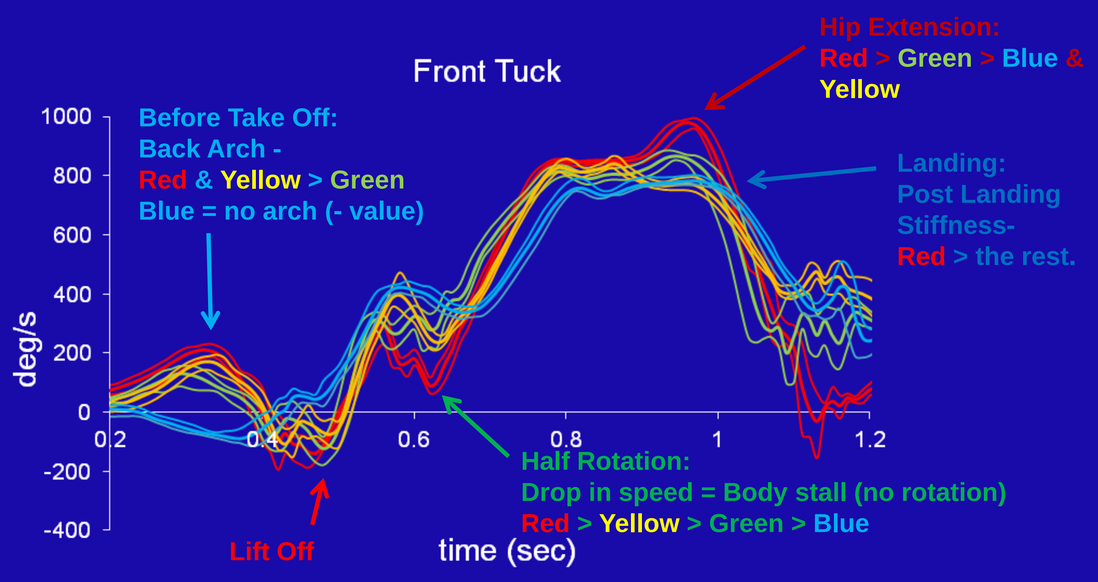


Figure 4 Forward tuck profile of 4 senior athletes (Mean, min, max).

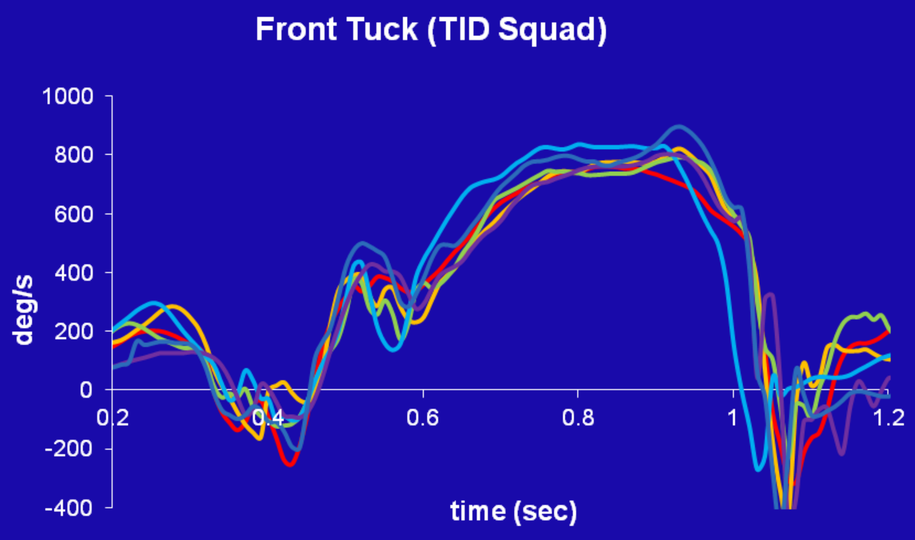


Figure 5 Forward tuck profile of 6 junior athletes (Mean).

Conclusion

Gyroscopes are useful for monitoring individual rotation profiles for elite athletes during dry land training. Data is repeatable allowing for individual profiles to be clearly identified. This method will allow for the assessment of individual techniques and monitoring athlete progression.

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