# A Wearable Inertial Sensor for Improved Measurement of Exploration Behaviour in Sport

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## Conclusions

**The inertial sensor provides a more sensitive, accurate and user friendly method for detecting head movements associated with exploration in sport than has previously been utilised.**

**Further development is needed to fully validate and implement these units to facilitate exploration behaviour research and applied measurement of exploration behaviour in situ.**

## Background

- Athletes must perceive their surroundings in order to prospectively control their actions. Additionally, athletes must act in order to perceive their surroundings (1)
- Exploration behaviour (movement of the eyes, head and/or body) is an action used by athletes in order to perceive their surroundings
- Coupling of perception and action is an integral part of effective decision making in team sport, as one cannot function without the other (1)
- Most current research is lab based (2) which greatly limits the ecological validity of findings due to perception-action decoupling
- A small amount of research has investigated exploration behaviour in representative situations (3) however the methodology used is time consuming and prone to errors (4)
- Inertial sensors may allow accurate and time efficient measurement of exploration behaviour in research with representative task designs

## Methods

The participant was asked to verbally identify the number of fingers presented by research assistants whilst being free to choose where and when to shift his gaze. After the number of fingers were identified, the research assistants would randomly change the number of fingers presented. Three data collection devices were used, each giving a different data source for analysis (Figure 1).

- An inertial sensor (IS), attached to the participants head
- A mobile eye tracking device (FPV)
- A tripod mounted video camera (TPV)

For each data source, the total number of head turns completed was the outcome measure. Each video data source was analysed independently by three researchers. The IS data was visually analysed by one researcher to obtain the total number of head turns completed.

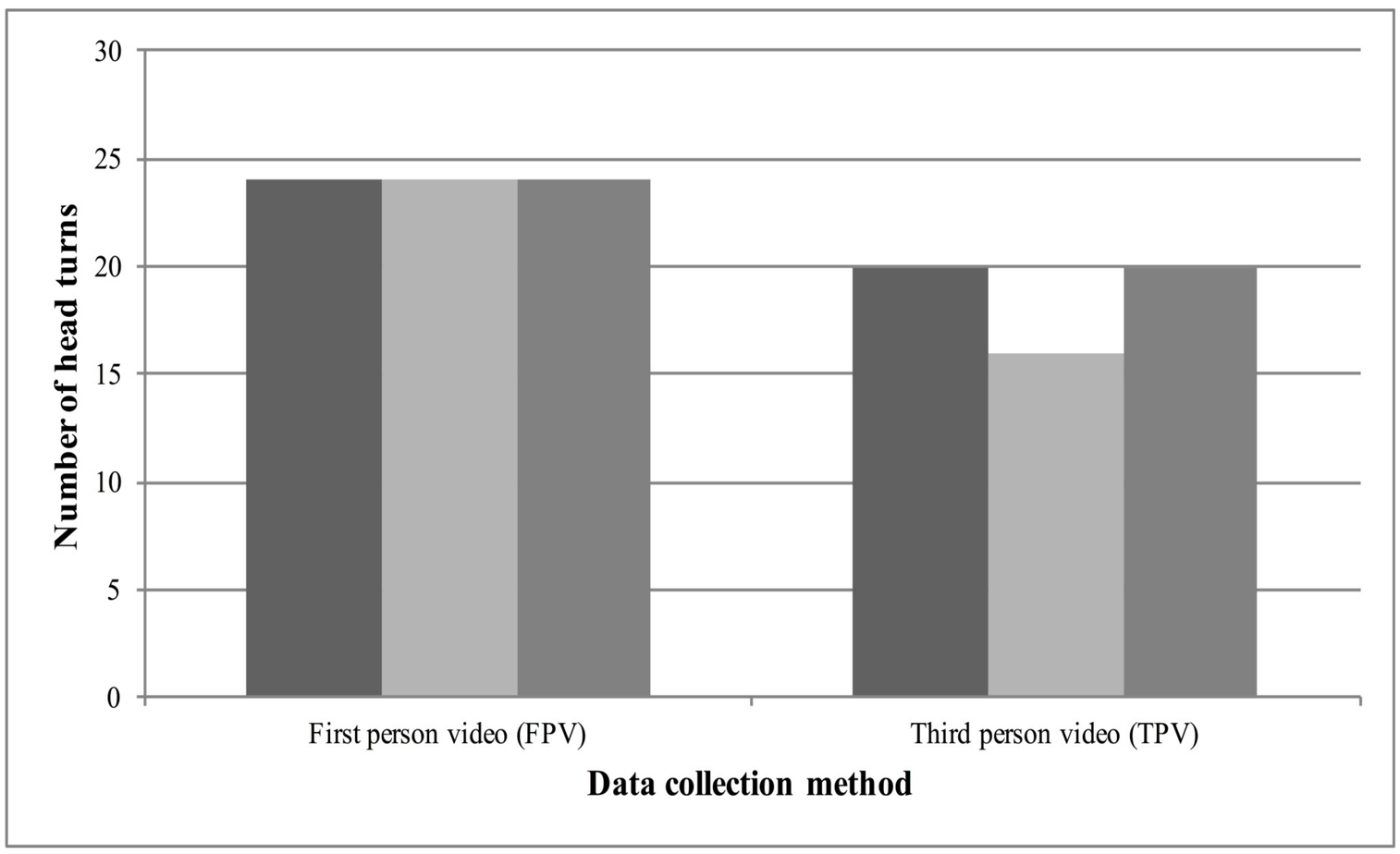


Figure 2. Total number of head turns captured by each researcher in the first person video and third person video conditions.

## Results

The IS was able to detect 25 head turns. The TPV detected the least number of head turns (M = 18.67, SD = 2.31), while the FPV showed one less head turn than the IS unit (M = 24, SD = 0)(Figure 2).

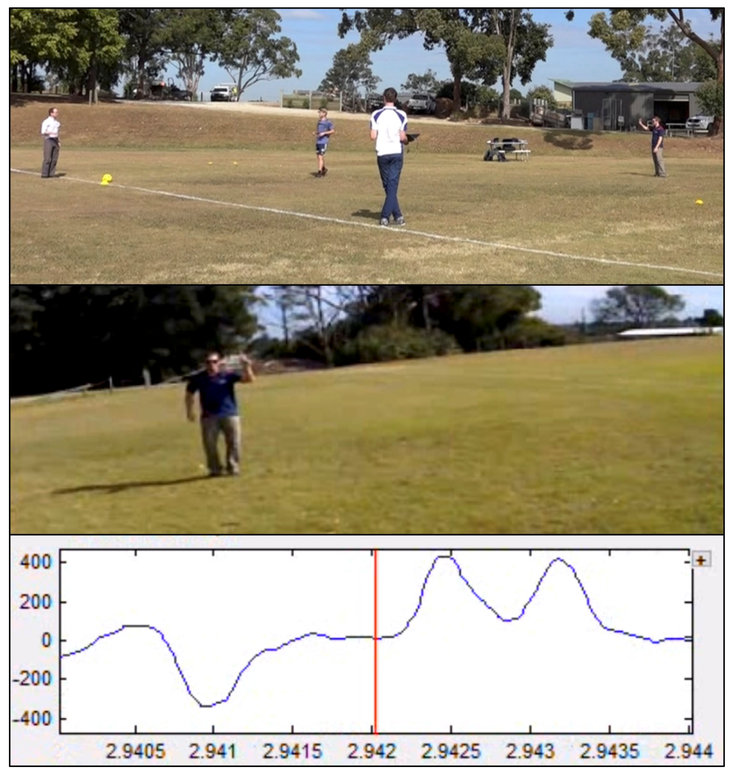


Figure 1. Screenshot of each data analysis source. From top to bottom: third person video, first person video, inertial sensor data plot.

## Discussion

- **With the goal of better understanding exploration behaviour in sport, this study compared inertial sensors to video footage for the measurement of exploration behaviour (head turns).**
- Of the three methods used, the IS provided the most sensitive measure
- There was a large amount of variability between researchers in the TPV condition. This is common with this type of analysis and may be due to the quality of video footage
- As the IS was more sensitive to movement, it was able to detect two head movements (Figure 1) while the FPV was only able to detect one head movement

## Practical Application

- Investigate/monitor the amount of exploration behaviour being utilised by athletes
- Investigate the performance outcomes of exploration behaviour
- Encourage and develop exploration behaviour in training contexts

## References

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