

Basic reporting

The manuscript is very well presented.

Experimental design

Within the journal's scope and research question well defined. Methods well presented and clearly to a high standard.

Validity of the findings

Data provided and conclusions well stated.

Additional comments

Thank you for the opportunity to review "Enhancing speed skating performance: A comprehensive analysis of IMU-based motion phase identification reliability". I send our congratulations to the authors to conduct this study. The validation performed in this study is interesting and may lead to the proposal of effective measures for future analyzers involved in speed skating. However, some modifications are required to better understand and communicate the results to the reader.

○ The following information needs to be corrected.

Introduction

- L54

"out-edge" and "in-edge".

Please add an explanation of this term so that people who are unfamiliar with speed skating can understand it.

Materials & Methods

- L107-108, Figure 1

In the text, the terms "knee flexion angle" and "knee joint flexion angles" are used, while the caption of Figure 1 states "knee joint angle" and within Figure 1 "knee angle". L240 also uses the notation "knee-joint angle". If the meaning of each of these terms is the same, please ensure that the terms are consistent in other places. Please be careful to be consistent in the use of other words and phrases in the paper as well and check the entire text again.

- Figures 1, 2, and 3

For all graphical data, please provide the title, units, scale, and zero position of the vertical and horizontal axes.

Results

Tables 3 and 4

- Please explain "Rt" and "Lt" listed in the table.
- Please provide a definition of "Stroke duration" in the Materials & Methods section.
- Why is the stroke duration for curve skating not listed?
- What do the numbers in parentheses in the Stroke duration and d entries represent?

References

- Some papers list the authors using "et al.," while others list all authors. I think all authors should be listed without using "et al.,". Please read the submission rules carefully and make the correct entries. Also, all papers should be listed in a uniform manner.
- 5 : Yuda was the author of this study. Please check again with great care to ensure that other information, such as author information, title, and journal name, is listed correctly.
Yuda Jun et al. 2007. doi: 10.1123/jab.23.2.128

○The remarks listed below should be addressed if the author feels they are necessary. They do not necessarily need to be corrected.

Introduction

Much of what is discussed in the introduction of this paper overlaps with the introduction content of a previous study by the authors' group (Tomita et al., 2021). Introduction content would need to be improved to explain the original purpose and importance of this study. To this end, I suggest that the authors explain in more detail what kind of validation was conducted in their previous study (Tomita et al., 2021), what was clarified and what was not, etc., and clearly explain how it relates to this study and how they arrived at their objective.

- L51-52

"The stance phase, crucial for velocity generation..."

On what basis do you state that the stance phase is crucial for generating velocity?

If possible, we encourage you to explain this by citing prior research.

- L53

"Turn Back."

Is this terminology commonly used in the field of competition or in previous studies?

• L56-57

It is recommended to cite several previous studies that use multiple video cameras to capture skaters and the three-dimensional panning direct linear transformation (3D panning DLT) technique to calculate and analyze the coordinates.

• L66-67

There is a previous study (van der Kruk E. et al., 2018) that analyzed speed skating using IMU, but it is not cited here, which seems unnatural. The reader may wonder if the authors intentionally did not cite this paper to claim novelty. If the author feels it is necessary, please consider adding it to the citation.

van der Kruk E, Schwab AL, van der Helm FCT, Veeger HEJ. Getting in shape: Reconstructing three-dimensional long-track speed skating kinematics by comparing several body pose reconstruction techniques. *J Biomech*, 69: 103-112, 2018. doi: 10.1016/j.jbiomech.2018.01.002

• L75-77

I suggest that the authors explain in more detail what kind of validation was done in their previous study (Tomita et al., 2021), what was clarified and what was not clarified, etc., and explain in more detail the relationship to this study and how they arrived at their objectives. It would make the position of this study clearer and easier to understand.

Materials & Methods

• Table 1

It is recommended that age and personal best time information be broken down by gender and that mean and standard deviation values be given.

• Table 2

I suggest using photos or illustrations of skaters wearing IMUs to illustrate.

• L105-106

Did the skaters perform their skates on single-track or double-track? As Tokachi Oval is a C track type, the length of the straight section is 110.43m, the length of the inner lane curve is 83.25m, and the length of the outer lane curve is 95.82m. If exact information is not available, it is recommended to state "approximately 100m".

• L106

It is recommended that you define the term "stroke" to refer to the event to which event. Many of the papers listed below define "stroke" as the period from blade off to opposite blade off. They also define "one cycle" as a series of left and right strokes. Following these definitions, I think that the "cycle" is close to the section from the blade off to the next ipsilateral blade off, which is defined as a "stroke" in this paper. However, if the author thinks it is appropriate to use "stroke," then there is no problem. In this case, I recommend stating that one stroke is defined as the interval from the blade off to the next ipsilateral blade off.

Yuuki Masahiro et al., 1992 doi: 10.3951/biomechanisms.11.111

Yuda Jun et al., 2003. doi: 10.24776/jcoaching.16.1_1

Yuda Jun et al., 2007. doi: 10.1123/jab.23.2.128

Yuda Jun et al., 2009. doi:10.24776/jcoaching.22.2_63

van der Kruk E. et al., 2018. doi: 10.1016/j.jbiomech.2018.01.002

Yokozawa Toshiharu et al.,2020. doi: 10.32155/jissjhps.6.0_139

Kimura Yuya et al., 2020. doi: 10.32155/jissjhps.6.0_74

Kimura Yuya et al., 2022. doi: 10.5432/ijshs.202126

Kimura Yuya et al., 2024. doi: 10.3389/fspor.2024.1396219

• Figure 1

I suggest placing a series of photos or stick pictures of skaters skating along the horizontal axis of the graph.

• Figure 2

I think that the figure shown here is the data obtained during straight skating. To avoid confusion, I recommend that the data for the left lower limb of curve skating be shown in a separate figure.

• L119-120

Please explain "shank anterior-posterior (AP) acceleration." In addition, where on the graph are the data for shank anterior-posterior (AP) acceleration shown? If not, please consider this issue.

• L126-127

I suggest that the angle definitions of "knee flexion angle" and "roll angle of the Shank sensor" are shown in the figure. Please indicate the magnitude and positive/negative direction of each in the figure or text.

- L135-137

Since there is no "TB" for curve skating, it is recommended that this description be divided into two sentences, one for straight skating and one for curve skating.

Results

- L178

If possible, please provide the 500m time for the experimental race.

Discussion

- L246-255

Are not there any other limitations to this study?

For example, during an experimental race, were skaters able to skate at their best while wearing the IMU device? Is the data obtained from this experiment the true performance of a skater?

Is it possible to perform the same detection in the first 100 m of the 500 m?

The validity of onset-offset detection has already been verified in the authors' previous study (Tomita et al., 2021), has the validity of turn-back detection verified?