Preference effect on inter-individual variability of body angles during swim start for expert swimmers

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INTRODUCTION

- Most of the biomechanical studies of start time have used kinetic and kinematical analyses to compare the two main start techniques used in competition: the grab and the track starts.

GRAB START

TRACK START

- **TRACK START:**

  Swimmers tend to leave the block quicker (Ayalon et al., 1975)

  flatter flight trajectory due to higher horizontal velocity (Costill et al., 1992)

- **GRAB START:**

  Swimmers spend more time on the block (Issurin & Verbitsky, 2003)

➢ Many studies tried to observe which is the best starting technique to increase performance (**starting technique effect)**

- Studies that analyzed differences between start techniques and that take in consideration the **swimmers start preference** are scarce

(Vilas-Boas et al., 2003, Vantorre et al., 2011)

- The use of **preferential technique** may induce better performance (15m time), as well as other differences like a higher variability in some parts of the movement.

- Indeed, some studies showed that expert swimmers were able to exploit movement variability to achieve the dual-task goal of the swimming start:
  - dive as far as possible to minimize resistances
  - make a forward rotation to enter into the water properly

(Seifert et al., 2010; Vantorre et al., 2010a; Vantorre et al., 2010b)

- **The aim of this study** was to inter-individual variability on body angles and velocity between preferential and non-preferential start techniques during aerial phase of swim start

METHODS

Subjects:

Group	Number	Age (y)	Height (cm)	Weight (kg)	Skill Level (%)
Elite male front crawl sprinters	5	23.2±1.5	180±0.1	78.6±8.2	89.3±3

Protocol:

- Swimmers performed 3 times a 25-m front crawl at the 50m race pace each start technique (grab start is preferential technique for all the subjects).

- **<u>Kinematical variables:</u>**

- Kinematical analysis was processed using APAS (Ariel Performance Analysis System, Ariel Dynamics Inc., 2001).

- The spatial model was composed by 20 anatomical landmarks digitalized in each frame, defining 14 body segments model (De Leva, 1996).

  - Angle between arm and trunk (CG of arm-shoulder-hip)
  - Angle between leg and trunk (CG of leg-hip-shoulder)
  - Velocity of Center of Gravity

- **<u>Measurement was made at 4 key points:</u>**

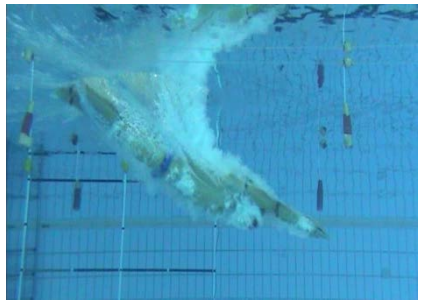
  (1) start signal

  (2) takeoff

  (3) hands entry into the water

  (4) entry of the foot into the water



- **Inter-individual variability :** (temporal dynamics of limbs angles and velocity)

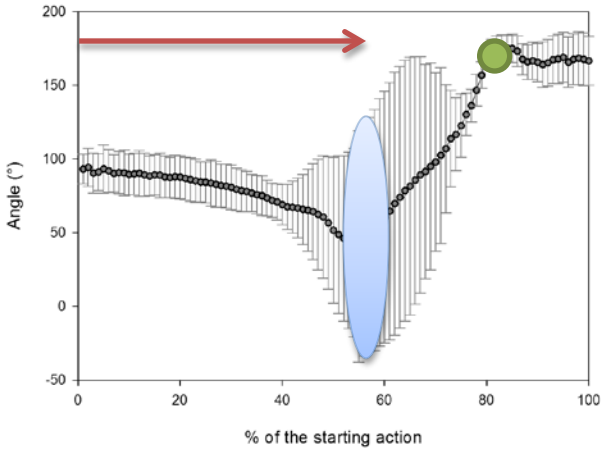
  - Duration was normalized in 100 points

  - Average standard deviation of each variable was calculated by averaging the 100 standard deviations calculated point by point by taking all the subjects

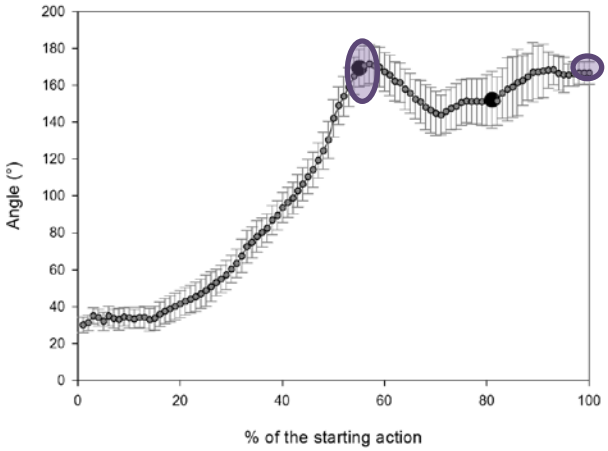
➢ This represented an overall indicator of the inter-individual variability

- **Local indicators** of inter-individual variability at the **four key points** Average of standard deviations was calculated based on the 5 values before and 5 values after each key point

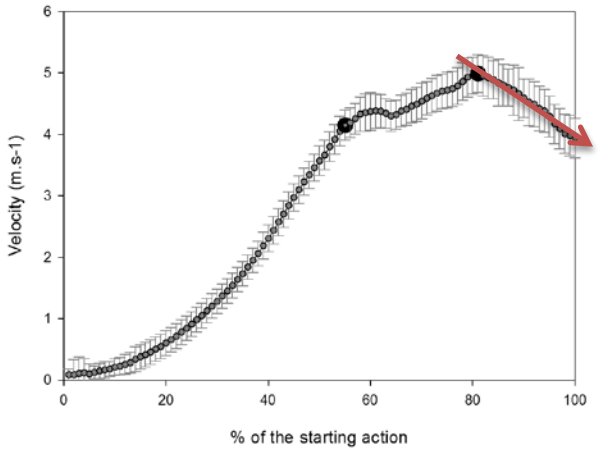
CG Arm-Trunk Preferential



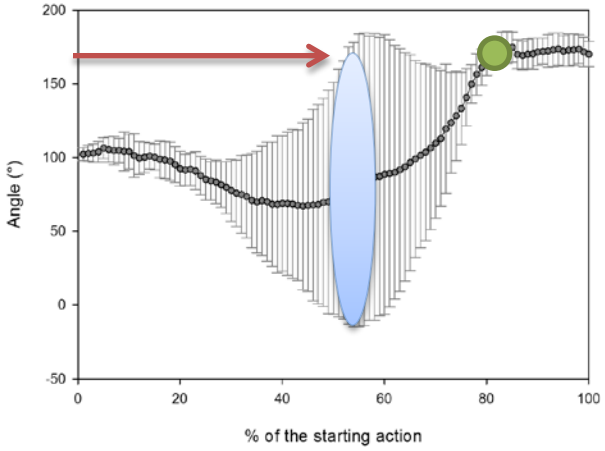
CG Leg-Trunk Prefrential



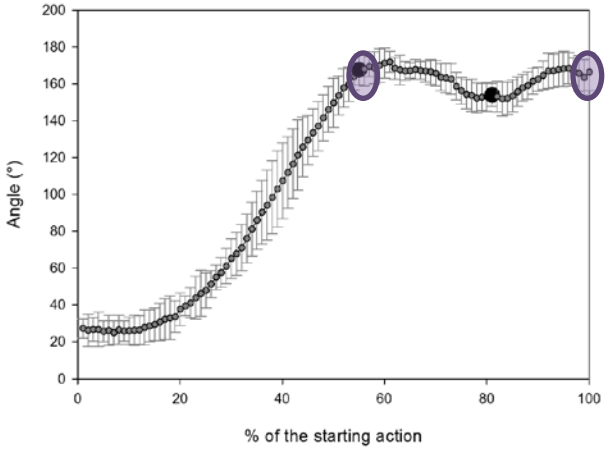
CG Velocity Preferential



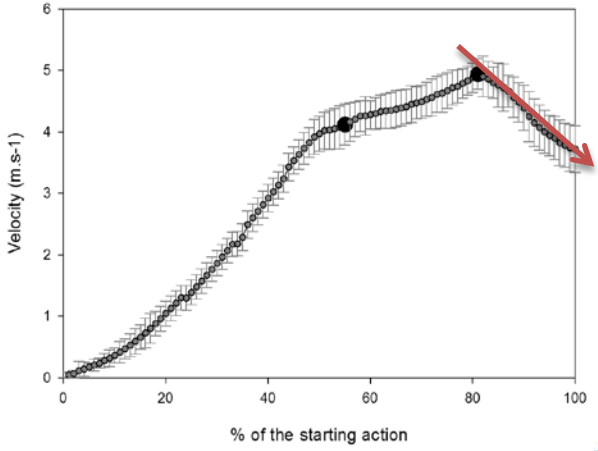
CG Arm-Trunk Non Preferential



CG Leg-Trunk Non Preferential



CG Velocity Non Preferential



- **Conclusion :**

- **Same technique** on a **traditional block** versus the **OSB11 starting block** (Honda et al., 2012)

- This study showed the importance of **the use of the variability as functional** for expert swimmers

- It must be interesting to see the **adaptation** of the swimmers on these new blocks and if the adaptation is different for expert and non-expert swimmers