

Coaching Applications

The backstroke starting variants performed under the current swimming rules and block configuration

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Abstract

The backstroke start technique has evolved since last 10 years due to modifications on international rules and block configuration; however, no study has yet verified the combined effects of these changes on the backstroke start. Thus, this study aimed to identify the backstroke starting variants performed at elite swimming events considering the effects of the current FINA rules and the starting block handgrip actualizations. The video images recorded by FINA from individual backstroke events during the 2012 Olympic Games and 2013 Swimming World Championships were analyzed. The starting variants distribution was conducted by gender, event and classification. In the 100 and 200 m backstroke heats, semi-finals and finals, male and female swimmers used four and six different starting variants, respectively. Considering only the semi-finals and finals, males performed two variants at 50 and 100 m and three variants at 200 m event, respectively, while females used three variants at 50 and 200 m, and four variants at 100 m event, respectively. Independently of gender, event and classification, swimmers often performed one variant with feet parallel and partially submerged and hands grasping the highest horizontal handgrip and the other one with feet parallel and partially submerged and hands grasping the vertical handgrip. In order to complement these findings further studies are required to provide coaches and swimmers with biomechanical evidences of the different backstroke starting variants.

Introduction

Swimming performance is usually measured by the time taken on starting, stroking and turning. The 15 m starting performance is accepted as a measure, which might significantly influence short and middle distance swimming event times. For example, 15 m after the start, the second-placed swimmer at men's 100 m backstroke at Barcelona 2013 Swimming World Championships was 0.20 s slower than the winner, and the overall race time difference was 0.19 s.

Whereas starting techniques for ventral and dorsal events differ, little attention has been paid to the latter. This lack of knowledge might be explained by the greater number of events beginning from a standing position on the starting block rather than in water and by the previous lower number of starting variants permitted under the Federation Internationale de Natation (FINA) old rules. From the available studies, almost all have analyzed outdated or no longer legal backstroke starting variants.

From mid-2005, FINA has allowed backstroke swimmers to position their feet totally or partially submerged or entirely emerged. Recently, FINA also implemented the use of a starting block with different backstroke starting handgrips, allowing swimmers to perform different variants through the combination of arms and legs positioning. Despite the above-mentioned combinations might potentially affect the backstroke starting performance, no study has yet considered this starting block update.

A backstroke starting technique overview considering the changes at FINA rules and block facilities is imperative for the purpose of identifying the most popular variants and stimulating future research. Therefore, it was aimed to identify the most common starting variants used by elite swimmers after FINA's rule changes and the implementation of the new starting block. As swimmers have been advised to lift the body as high as possible out of water during the set positioning, it is suspected that most of the elite swimmers would perform variants with the feet positioned entirely or partially emerged and hands grasping the highest horizontal or vertical handgrip.

Methods

Participants

The sample comprised male and female swimmers who competed at 100 and 200 m backstroke heats, semi-finals and finals at 2012 Olympic Games and at 50, 100 and 200 m backstroke semi-finals and finals at 2013 Swimming World Championships. The swimmers competing more than once at the classification series (i.e., heats, semi-finals and finals) got in the sample procedure only once, since the variant performed was unchanged. Only swimmers in lanes five to eight were observed due to the camera view obstruction.

Data collection

The backstroke starts performed at individual 50, 100 and 200 m events were analyzed from FINA videos. Missing video images were noted in the Olympic Games at 5th women's 100 m backstroke heat, 1st women's 200 m backstroke heat and lanes six, seven and eight of 4th men's 200 m backstroke heat.

Data analysis

The backstroke start performed by each swimmer was classified according with different combinations of arms and legs positioning at the command of “take-your marks”. These combinations were defined based on the current FINA’s backstroke starting rules (SW 6.1), the starting block configuration (Omega, OSB11, Corgémont, Swiss Timing Ltd.) and on literature (Figure 1). From the swimmers who had been analyzed at 2013 Swimming World Championships, none used the recently authorized ledge device.

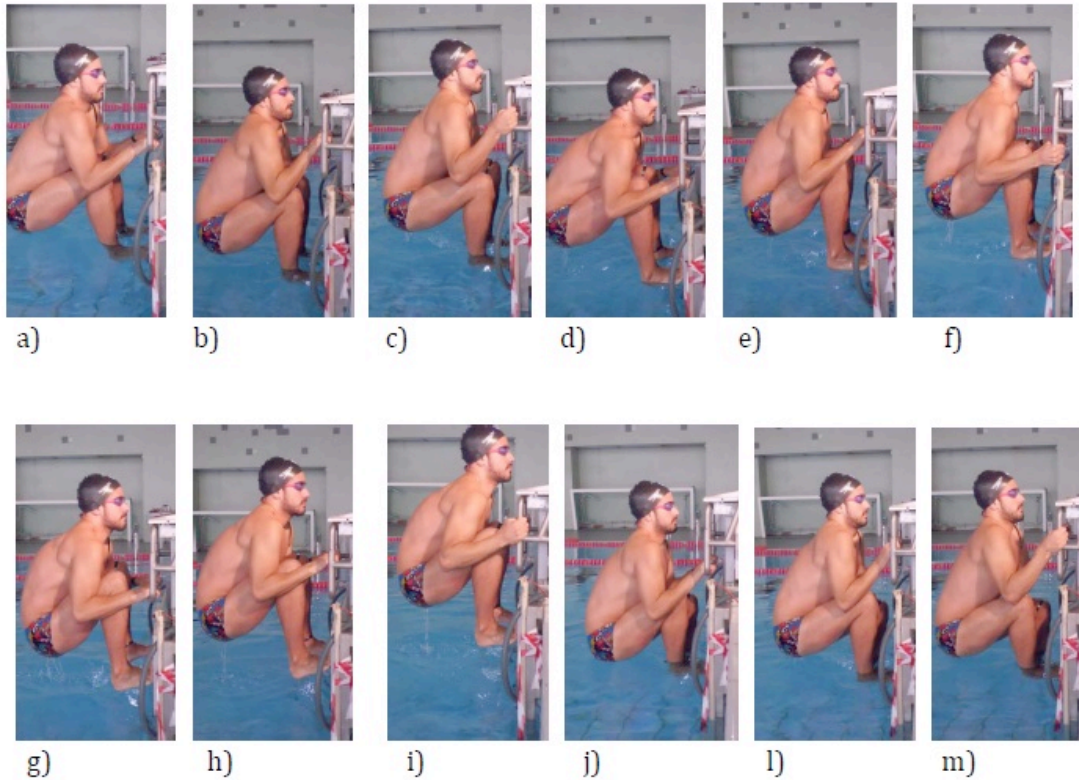


Figure 1. The backstroke starting variants, characterized by the combination of different arms and legs positioning. Feet immersed and lowest and highest horizontal, and vertical, handgrip (Panels a, b and c, respectively). Feet partially submerged and lowest and highest horizontal, and vertical, handgrip (Panels d, e and f, respectively). Feet entirely emerged and lowest and highest horizontal and vertical, handgrip (Panels g, h and i, respectively). Feet staggered and lowest and highest horizontal, and vertical, handgrip (Panels j, l and m, respectively).

Results

From the overall combinations of swimmer’s arms and legs positioning, seven starting variants were observed (Figure 1, Panels b, c, d, e, f, i, j). For the 100 and 200 m backstroke heats, semi-finals and finals at 2012 Olympic Games and semi-finals and finals at 2013 Swimming World Championships, males used four

different variants, with the most frequent one (with feet positioned parallel and partially submerged and hands on the vertical handgrip, Figure 1, Panel f) used in the 100 m event. Conversely, in the 200 m backstroke, males often used the variant with feet parallel and partially submerged and hands grasping the highest horizontal handgrip (Figure 1, Panel e). In the same events, females used six different variants. The variant with the feet parallel and partially submerged and the hands positioned on the highest horizontal handgrip was the most commonly used in both distances.

The semi-finalists and finalists of men's 50 m backstroke at 2013 Swimming World Championship and at men's 100 and 200 m backstroke in both competitions have often used two variants in 50 and 100 m and three variants in 200 m event. The variant with feet parallel and partially submerged and hands grasping the highest horizontal handgrip was the most used in 50 and 200 m backstroke, while the variant with the same feet positioning and hands grasping the vertical handgrip was the most used in 100 m backstroke. In the same events and classifications, females used three variants for 50, 200 m and four variants for 100 m backstroke, respectively. Concerning 50 m backstroke, females rather used the variant with feet parallel and partially submerged and hands grasping the vertical handgrip. Regarding 100 and 200 m backstroke, females commonly used the variant with feet parallel and partially submerged and hands grasping the highest horizontal handgrip.

Discussion

The backstroke start has evolved since the last FINA rules changes and starting block configuration, with swimmers being currently allowed to perform several variants (Figure 1). Considering the obvious importance of the starting phase and that most studies have dealt with obsolete backstroke start rules, or even have not yet considered the starting block changes, this study is pertinent once it describes the backstroke start technique and respective variants used in individual elite swimming events. A better understanding of the competition data might be crucial to establish specific training programs and to convey new researching areas. Regardless gender, event and classification, backstroke swimmers performed mainly two variants: with feet parallel and partially submerged and hands grasping the highest horizontal handgrip (Figure 1, Panel e), and with feet parallel and partially submerged and hands positioned on the vertical handgrip (Figure 1, Panel f).

In the men's 100 and 200 m backstroke heats, semi-finals and finals, males used fewer variants than females, which might be due to gender effects. In 100 m backstroke, most swimmers used the variant with feet positioned parallel and partially submerged and hands grasping the vertical handgrips. However, 200 m swimmers used frequently the feet positioned parallel and partially submerged and hands grasping the highest horizontal handgrip. The hands positioned on the vertical bar make it easier to pull the body out of water at the "take-your

marks” command due to the semi-prone arms position. In the same events, females commonly used the variant with feet parallel and partially submerged with hands grasping the highest horizontal handgrip. It could be speculated that females and males rather use the horizontal positioning on the highest handgrip to achieve better support and to generate great vertical force during the hands release. New biomechanical studies would be useful to verify the influence of different handgrips at backstroke start performed with feet parallel and partially submerged.

Male and female semi-finalists and finalists of 100 and 200 m backstroke in both competitions seemed to use fewer variants. This might indicate that some variants held common advantages, and that the best swimmers had discovered these. Males performing 50 and 200 m preferred the variant with feet partially submerged and hands grasping the highest horizontal handgrip, while 100 m swimmers used the same feet positioning, but with the hands vertically positioned. Since swimmers used similar variants at short and middle distance events, it might be speculated that the distance swam had not influenced the choice of the starting variant. Considering the same classifications, females used different handgrip positioning depending on the distance. At 50 m, swimmers used the hands positioned vertically, while at 100 and 200 m events, females used the hands positioned at the highest horizontal handgrips. Since this study evidences the common use of two starting variants by the most proficient male and female backstroke swimmers, biomechanists must look towards more holistic approaches and identify in detail how swimmers should coordinate movements during training to maximize each starting variant performance.

Conclusion

This study is a first step to examine the implications of the current FINA backstroke starting rule combined with the recent starting block configuration on the backstroke start. The two most common variants performed by males and females, independently of the events and classifications were: with feet parallel and partially submerged and hands grasping the highest horizontal handgrip, and with feet parallel and partially submerged and hands grasping the vertical handgrip. These two variants collectively accounted for an average 91.3% of all the male and female participants in the study. Notwithstanding originality and relevance of current data, it is acknowledged that camera view obstruction represents a significant limitation.

Future biomechanical studies should analyze each starting variant advantages and disadvantages, clarifying how swimmers should practice each one to achieve better performance. It is recommended that coaches and swimmers should spend time in adapting to the current FINA rules and the new block facilities before making a decision about which backstroke start variant to use.