# BASIC POSITION IN THE KICK START ON THE OSB 11 STARTING BLOCK IN SWIMMING

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**Abstract:**

Swimmers use the start to begin every swim race. The purpose of the review study was to highlight the basic position in the track start performed using the new OSB11 starting block in swimming. The efficiency of executing subsequent phases depends on the basic position on the starting block. The phases follow one another and their optimal execution is important particularly in sprint races, in which one hundredth of a second may decide the winner of a race. In our study, we point to the advantages of using the new OSB11 starting block in comparison with the previous starting block. The important factors include proper adjustment of the rear kick plate and the position of the body's center of gravity. The results of the study show that swimmer should adjust the rear kick plate to positions 4 or 5 or maybe to the position, which is one step further back from their preferred position and the body's center of gravity should be positioned neutrally or in the rear part of the starting block. These findings apply to elite swimmers only and to positions 3 to 5 of the rear kick plate. Therefore, we assume that future studies should deal with various age categories that demonstrate different levels of swimming performance and all positions of the rear kick plate on the OSB 11 starting block.

## INTRODUCTION

Swimming champions win over the rest of the field only by hundreds of a second, therefore, all factors that limit performance in the swimming race must be perfectly mastered. Every competitor aims to achieve the shortest time in a particular swimming race. This means that a swimmer must perform a start in the shortest time possible, swim in the race, execute turns and finish the race (the end of the race is completed by touching the touch pad).

Start dive is an integral part of every swimming race. Several studies [Cossor, Mason 2001; Okuno et al. 2002; Lyttle, Benjanuvatra 2005] have shown that start is defined as the time between the signal and the time when the swimmer reaches the distance of 15 m. There is a relationship between length of the race and factor loading. In sprint races, the race time depends on the start at a rate of 26.1%. However, in 1.500 m race, this rate declines to 0.08 %. The longer the race, the more important is the start.

Start dive consists of the following phases – block phase, grab phase, take-off, flight phase, water entry, glide phase, and first propulsive movements. Block phase, either from the kinematic or dynamic point of view, affects the following phases (flight, glide, etc.), therefore, it is important that every competitor perform an optimal start from the block [Mason, Alcock, Fowlie 2006].

The technique of starts in swimming has developed over years, with two basic types of start – grab start and track start, which differ from each other in the leg position on the starting block. With the grab start, swimmers place their feet on the front part of the block. With the track start, swimmer places one of his legs in the front and the other one in the rear part of the starting block. This position leads to a more effective recruitment of upper- and lower-body during the block phase [Breed, McElroy 2000; Benjanuvatra et al. 2004].

The results of a variety of studies [Shin, Groppel 1986; Juergens et al. 1999; Blanksbz, Nicholson , Elliott 2002; Benjanuvatra et al. 2004; Welcher, Hinrichs, George 2008] have not shown which of the start technique specified above is more effective. Despite inconsistent findings the track start is more popular with performance and world-class swimmers. This may be attributed to improved stability on the starting block, which reduces the risk of false start and subsequent disqualification [Breed, McElroy 2000; Vantorre et al. 2010].

## MATERIAL AND METHODOLOGY

Literary searches were conducted in the following databases: Web of Science, Elsevier, proceedings of international congresses and swimming databases. When searching for articles, the most frequently searched key words included plate, position, center of mass, start time, horizontal, take-off velocity, kick start. We also used Google scholar to find in particular articles in English language.

## NEW STARTING BLOCK OSB 11

Swimmers at elite swimming events all over the world and in Slovakia have used the new starting block, which was manufactured by the Omega company, with an adjustable kick plate since 2009. This plate is adjustable in the anteroposterior direction in the rear part of the starting block (5 degrees in the range of 0.2 m) at 30° angle (90° knee angle), which facilitates the take-off from the starting block [Omega 2016] (Fig. 1).

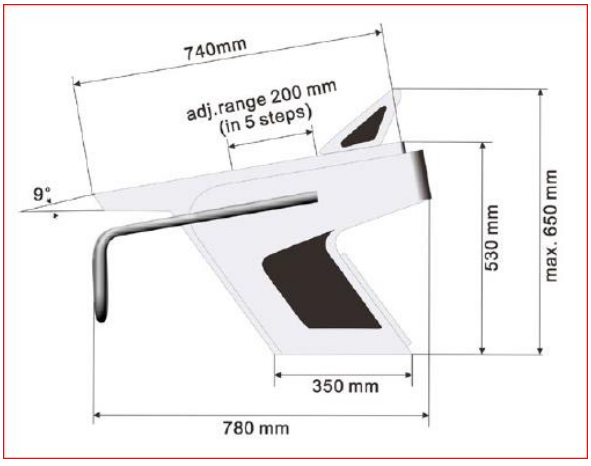


Figure 1 The OSB11 starting block

First studies compared the new starting block OSB 11 with the traditional starting block without the kick plate. For instance, the study by Biel, Fischer, Kibele [2010] showed that swimmers who performed starts from OSB 11 starting block showed significantly shorter starting times, higher horizontal take-off velocity and reduced starting performance by 0.2 s compared to swimmers who performed starts from the blocks without the kick plate. Also, Beretic, Durovic, Okicic [2012] found that swimmers who performed starts from OSB 11 showed a 11° smaller knee angle smaller, higher mean flight velocity, shorter reaction time (0.03 s) and the time at 10 m. Despite results similar to those reported by Biel, Fischer, Kibele [2010] who applied similar methods, Beretic, Durovic, Okicic [2012] did not use the OSB 11 starting platform, which could have influenced the results of the study. This makes the comparison of the studies considerably difficult. A similar study was conducted by Nomura, Takeda, Takagi [2010] the results of which showed that swimmers who performed a track start from OSB 11 starting block showed higher horizontal velocity and shorter time at 5 and 7.5 m. The study by Petryaev [2010] compared the World Cup in Moscow and European Championship in Istanbul in 2009. At the World Cup held in Moscow and European Championship in Instabul, swimmers started from the traditional starting block and from the OSB 11 starting block, respectively. The results showed that the same swimmers showed shorter times at 15 m after a start from the OSB 11 starting block. Despite these findings the performance of swimmers may have been influenced by training, recovery, and so forth, which the authors did not monitor from the completion of the first championship to the end of the second. However, these factors have effect on start performance.

The results of studies specified above [Biel, Fischer, Kibele 2010; Nomura, Takeda, Takagi 2010; Beretic, Durovic, Okicic 2012] showed that swimmers who started from the OSB 11 starting block showed higher take-off velocity and shorter time at 5, 7.5 and 15 m, respectively, and longer flight distance compared to the take-off from the blocks without the kick plate. The studies highlight the fact that when taking off from the OSB 11 starting block, swimmers showed faster reaction times and higher take-off velocity after the take-off from the OSB 11 starting block. This means that the force impulse for the OSB 11 starting block was higher than that for the traditional starting block. On the other hand, as reported by Nomura, Takeda, Takagi [2010], shorter start reaction may be influenced by the position of the center of mass from the front edge at the take-off from the starting block. Overall, we may conclude that the kick plate facilitates the take-off from the starting block, which leads to a more effective take-off.

## THE POSITION OF THE KICK PLATE ON THE OSB 11 STARTING BLOCK

The position of the rear kick plate on the OSB11 starting block determines the takeoff efficiency. The kick plate may be adjusted to five positions, which may be adjusted by swimmers according to their age, performance level, anthropometric parameters, etc. For instance, Takeda, Takagi, Tsubakimoto [2012] used a custom-built start platform with a kick plate to evaluate different kick plate angles and distances from the front edge. They examined three different positions of the kick plate at 0.29 m, 0.44 m, and 0.59 m from the front edge. While testing the different positions, they kept the kick plate angle at 45°. They found that at 0.44 m from the front edge, the swimmers had a significantly faster horizontal and resultant take-off velocity than the 0.29 m location. However, the 0.59 m distance was not significantly different than the 0.29 m in horizontal and resultant take-off velocity. This means that [Takeda, Takagi, Tsubakimoto 2012] assume that the distance of 0.44 m from the front edge

may be the optimal location for the kick plate, but their custom platform makes comparison to the OSB11 difficult. Also tested different inclinations of the kick plate with it located at 0.44 m from the front edge. The data showed that start performances were not significantly different from each other at different inclinations. The position of the kick plate during the take-off from the starting block was studied by Slawson et al. [2011] who only examined the furthest three positions that correspond to locations three, four and five on the OSB11. They report that when swimmers used positions four and five horizontal take-off velocity was significantly faster than in position three and peak forces were higher in the fifth position than in three or four. The highest values of peak force were found for position 5 of the kick plate. Similarly, Honda et al. [2010] examined preferred kick plate location of three possible locations by testing swimmers in three different kick plate positions as well: preferred and one above and one below. They showed a significant increase in horizontal take-off velocities when the kick plate is shifted back one position above the swimmers' preferred kick plate location.

Honda et al. [2010], Slawson et al. [2011] and Takeda, Takagi, Tsubakimoto [2012] attempted to find the optimal position of the kick plate to achieve a more effective take-off from the starting block. Despite interesting findings in all three studies, these studies only examined three of the five possible kick plate locations on the OSB 11. However, they offer an incomplete perspective on the effects of different inclinations and positions on block performance. There are currently no studies on all kick plate locations during the take-off.

## THE POSITION OF THE CENTER OF MASS IN THE BASIC POSITION DURING THE TAKE-OFF FROM THE STARTING BLOCK

The basic position on the starting block is highly important because the subsequent phases of the start depend on the basic position. The location of the body's center of gravity in the basic position on the starting block plays a key role during the takeoff.

There are several studies dealing with body position that has been explored using a traditional starting platform. For example, Welcher, Hinrichs, George [2008] evaluated the difference in positions of the center of mass in both front- and rear-weighted positions using a track start. They noted that the front-weighted set position had a significantly faster block time than the rear-weighted. However, the rear-weighted start had a significantly greater take-off velocity and higher velocity at 5 m than the front-weighted configuration. Matúš [2016] found similar results as swimmers who used the rear-weighted track start showed highest velocities at 7.5m and 10 meters.

They concluded that swimmers should use the rear-weighted track start. At this time, some researchers have evaluated the front- or rear-weighted track start from the OSB11 platform [Barlow et al. 2014; Honda et al. 2010; Kibele, Biel, Fischer 2014]. The studies by Honda et al. [2010] and Kibele, Biel, Fischer [2014] have shown that swimmers in a front-weighted configuration produce a faster block time than in the rear-weighted position while swimmers had a faster horizontal take-off velocity using a rear-weighted starts. However, each experiment differentiated between front- and rear-weighted starts differently. Honda et al. [2010] defined them as the location of the shoulders relative to the hands. Kibele, Biel, Fischer [2014] determined the basic block position according to the hip position. Barlow et al. [2014] instructed swimmers about the individual modifications of the track start - to shift their weight to the front, evenly distribute, or shift their weight to the rear of the starting block. These shifts were based on the swimmers perceptions of their weight bearing. These findings suggest that swimmers maintained the designated position of the center of mass on the

starting block. Takeda, Takagi, Tsubakimoto [2012] found that the middle (0.44 m) of the three kick plate locations produced the greatest horizontal take-off velocity. Future studies should aim to determine how various positions of center of mass and the position of the kick plate affect the horizontal take-off velocity during the start from OSB 11. Despite the fact that a large number of studies dealt with track start from the OSB 11 starting block, there seems to be a lack of consensus regarding the optimal location of the center of mass relative to the front edge of the starting block.

In a more recent case study, using the OSB11 platform, Slawson et al. [2011] demonstrated that the swimmer had a greater flight distance when the right leg was placed at the front in the track start from the OSB 11 starting block. However, they did not identify which leg was the swimmers' dominant limb, nor was it clear if this was their preferred stance. However, similar to Hardt, Benjanuvatra, Blanksby [2009], they showed that there are differences in start performance depending on which foot is placed at the front. Slawson et al. [2011] also examined the width of the rear foot relative to the midline of the body. Narrower stance width (closer to the midline) was associated with faster block times, increased peak force and horizontal take-off velocity in male swimmers.

## CONCLUSION

The start forms a certain basis for a successful start in swim races, especially the short-distance ones. New starting block caused the change in the start during which swimmers use the rear kick plate of the starting block. The results of our systematic review study have shown that new starting block accelerates the start, which results in a more efficient takeoff. The studies conducted to date have dealt with three out of five position of the rear kick plate of the new starting block and the position of the center of gravity during the takeoff from the new starting block. All these variables that affect start performance were conducted on the samples of elite swimmers. We believe that studies should aim to assess performance-oriented swimmers and various age categories.

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