

## FIRST SECTION OF THE COURSE PERFORMANCE AS A CRITICAL ASPECT IN SKICROSS COMPETITION: 2010 OLYMPIC GAMES & WORLD CUP ANALYSIS

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Skicross (SX) is a winter sports discipline that consists of racing across an uneven track with jumps, banked turns and other obstacles. The 56 heats of the 2010 most important competitions were studied: Vancouver Olympic Winter Games (OWG) and Sierra Nevada World Cup Final (WCF). In both races we analyzed the skiers rank at each heat's first turn as well as their final rank at the finish. A great percentage of riders that were ahead at the first turn of the race, classified in the top two positions and reached the next round: OWG, (87,5%) ♂ and ♀; WCF, ♂ (81,25%) and ♀ (87,5%). These results suggest that a fast first section of the course can contribute to race success. Specific start training becomes necessary to compete at SX high level.

**KEY WORDS:** kinematics, start technique, freestyle ski,

**INTRODUCTION:** Skicross (SX) is a winter sports discipline that consists of racing across an uneven track with jumps, banked turns, changes of direction and other obstacles over a distance between 900 and 1200 metres lasting about 30 - 60 seconds.

All skiers individually participate in a timed qualifying run but only the fastest reach the final. The SX final is run according to a single knockout format – mainly, the best 16 ladies and the best 32 men (F.I.S. 2010). In each final's heat, the aim of the skiers is to reach the finish line in the best position possible, because just the first two competitors advance from round to round until the fastest group dispute the final. In any case, the race is started when a mechanized starting gate falls down.

A previous cinematic analysis carried out at the 2008 Sierra Nevada Skicross World Cup (de la Fuente, Martínez et al. 2008) tried to reveal if the rider's final time at the qualifying rounds was related to the time spent in covering the early meters of the race. In this study, a positive significant correlation was found between time at 7.5 m and final qualifying time ( $r=0.73$ ,  $r=0.47$ ,  $p<0.01$  in ladies and men group respectively).

Although the first meters performance could be important at the individual qualifying rounds, as this previous article suggests, the importance of reaching the first race positions could be more relevant for reaching the next round, when competing against other skiers as happens in the final heats.

The Skicross' start could be a crucial element for success, as happens in other disciplines with similar qualifying methods, such as BMX (Zabala, Sánchez - Muñoz et al. 2009). In these cases, it is very important for the rider to be at the front of the race from the very beginning of the competition. This allows the rider to choose the most appropriate path and to get certain advantage over the opponents behind, who should overtake the first positions riders (Gianikellis, Bote et al. 2004; Mateo and Zabala 2007).

The aim of the present study was to analyze the relevance of the first meters of the race at the knockout heats, trying to check if the first meters performance could determine reaching or not the next round.

**METHODS:** We studied the 56 final heats of the 2010 most important competitions: Vancouver Olympic Winter Games (OWG) and Sierra Nevada World Cup Final (WCF). In both events we analyzed the first section of the course considered from the start's ready position until the first turn of the course.

**Table 1**  
**Number of heats per race and championship**

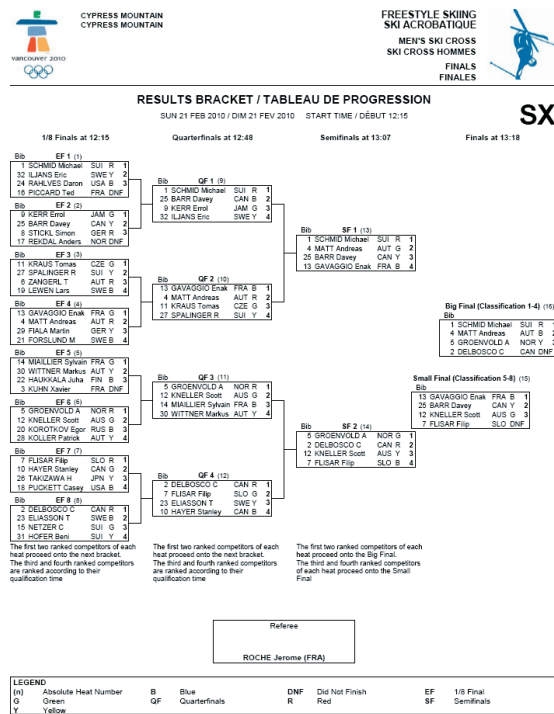
Gender	OWG	WCF
Male	16	16
Female	16	8

A video camera (50 Hz) was located at the first section of the race in a way that enables recording the mechanized starting gate and the moment the skiers performed the first turn of the race. The video was edited (Quintic Biomechanics™) for delimiting the end of the course first section. An imaginary line between the outside and inside gates of the first turn was drawn with this software.

The skiers ranking at each heat's first turn was registered through a systematic observation form, taking into account when any of the skis from each rider first crossed the imaginary line of the first turn above mentioned.

Meanwhile, the final official FIS results bracket results (Figure 1) were consulted to know the skiers final ranking in each of the heats and to determine which of the 4 skiers moved onto the next round.

Considering that only the top two skiers from each heat qualify for the next heat (F.I.S. 2010), the probability of success was calculated based on the first turn ranking.



**Figure 1: Vancouver 2010 Men's Final Results bracket**

**RESULTS:** After studying skicross competitions in recent seasons we found that skiers hardly ever spend more than 10 seconds to reach the first gate, as reveals the Olympic Winter Games and the World Cup Final Analysis. Considering the total course duration [35-60 seconds, (F.I.S. 2010)], our data suggest that skicross final results could be decided in

the first section of the race. Table 2 shows the percentage of skiers who got qualified from round to round based on the first turn ranking.

**Table 2**  
**Percentage of skiers who got qualified based on their course ranking at first gate.**

Gender	First gate course ranking	Vancouver OWG	Sierra Nevada WC
<b>MEN</b>	1 <sup>st</sup>	87,5%	81,25%
	2 <sup>nd</sup>	56,25%	81,25%
	3 <sup>rd</sup>	56,25%	18,75%
	4 <sup>th</sup>	0%	12,5%
<b>LADIES</b>	1 <sup>st</sup>	87,5%	87,5%
	2 <sup>nd</sup>	81,25%	50%
	3 <sup>rd</sup>	18,75%	37,5%
	4 <sup>th</sup>	12,5%	25%

From the results shown in Table 3 we can note an interesting relationship between the position at the first turn and the final result. Taking the first and last place in the first turn as a reference, we obtained the following average success rates at the finish line: ♂, 84,37% ± 4,41% and ♀, 87,5% ± 0% of the skiers ranked first at the first turn managed to qualify in the top two, while ♂, 6,25% ± 8,83% and ♀, 18,75% ± 8,83 of those finishing in last place at the first turn succeeded.

**DISCUSSION:** The results of this research confirm the start and the first section of the course as a critical part of the run, as occurs in similar sports studies (Sands, Smith et al. 2005; Zanoletti, La Torre et al. 2006; Bullock, Martin et al. 2008). The ability to accelerate quickly from the start gate to a maximum speed and the possibility to choose a better trajectory line than the opponents are therefore key aspects to consider in skicross. Depending on the circuit characteristics, it should be also considered the chosen position at the “drop down start gate” as another factor that can determine the performance in this first part of the race.

**CONCLUSION:** The results of this study suggest that a fast first section of the course can lead to greater chances of success at the finish line. Therefore, specific start training becomes necessary to compete at high level in skicross. Further studies are necessary to better understand the main factors involved in skicross start performance and the strategies to train them.

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