

CASE REPORT

ANALYSIS OF RUNNING

CONDUCTED BY: FLAVIO DI GIORGIO - 17/05/23
S&C COACH AT REDBULL ASP & MAGNITUDO TRAINING

Prepared by

Peter Lazou

peter.lazou@sportscientia.com

22 November 2023



Case Study

RUNNING ANALYSIS

INTRODUCTION

SportScientia is at the forefront of sports technology, pioneering the integration of advanced analytics within the athletic performance and rehabilitation sectors. The company's innovative approach involves embedding state-of-the-art sensor technology into sports equipment, such as footwear, allowing for the real-time collection of biomechanical data during training and competitive play. This technology captures a wide range of metrics, including gait parameters, limb velocity, ground contact times, and 3D movement patterns, which are crucial for assessing an athlete's performance and physical condition.

The relevance of SportScientia's technology lies in its ability to convert the wealth of data collected into actionable insights. By providing detailed, objective analysis, the technology enables sports medicine professionals, coaches, and athletes to make informed decisions regarding training loads, injury prevention strategies, rehabilitation protocols, and return-to-play readiness. SportScientia's commitment to enhancing the understanding of athletic movement and reducing injury risk has positioned its technology as an invaluable tool in the sports industry.

Within this case analysis, Flavio Di Giorgio not only authors the study but also serves as the subject, utilising his expertise to unravel the nuances of SportScientia's technology in enhancing understanding of running mechanics and injury prevention.

FLAVIO DI GIORGIO

[LinkedIn Profile](#)

[Facebook](#)

[Instagram](#)

Flavio Di Giorgio is an esteemed Strength and Conditioning Coach renowned for his contribution to sports science and the development of elite athletes. With a B.Sc. in Sport and Exercise Science from Swansea University, he's notably boosted athletes' performance in a variety of sports, demonstrating particular expertise in custom training regimens emphasising hypertrophy, strength, and power.

Flavio's work ethic is distinguished by his emphasis on safe, effective training methodologies and his astute attention to exercise execution. A champion of holistic training, he marries physical rigour with cognitive strategies to cultivate peak performance. He has notably served as the S&C Coach for Olympic



gold medallist Sofia Goggia, the Italian Women's Rugby Team, and athletics sensation Filippo Tortu, among others.

His career is punctuated with roles in top-tier teams and individual coaching, crafting bespoke programmes that reflect each athlete's unique challenges. Flavio's approach is not only about achieving immediate success but also ensuring enduring physical health and performance.

In summary, Flavio Di Giorgio stands out as a formidable S&C Coach, whose comprehensive approach and unwavering commitment to athlete development mark him as a respected figure in the domain of sports performance enhancement. His credentials, underscored by a track record of success with elite athletes and professional teams, affirm his profound impact on the world of strength and conditioning coaching.

OVERVIEW

Running is an intrinsic activity in sports yet is frequently misunderstood at a mechanical level. The nuanced insights afforded by SportScientia's technology are crucial for individualising performance optimisation strategies and reducing injury risks. This technology facilitates a level of detail that can revolutionise how athletes and coaches approach training by aligning it with precise biomechanical profiles.

CHALLENGE

Accurately analysing a runner's mechanics proves challenging, as conventional methods typically fail to recognise the distinctiveness of each athlete's style. Consequently, this results in standardised training and rehabilitation approaches that may not cater to individual nuances and could be ineffective or potentially injurious..

SOLUTION

SportScientia's technology bridges this gap by providing an in-depth analysis of running mechanics. The technology scrutinises variables such as force distribution and stride dynamics, as well as finer aspects like step roll and step pitch, thereby furnishing a tailored understanding and approach to each runner's technique.

OBSERVATIONS

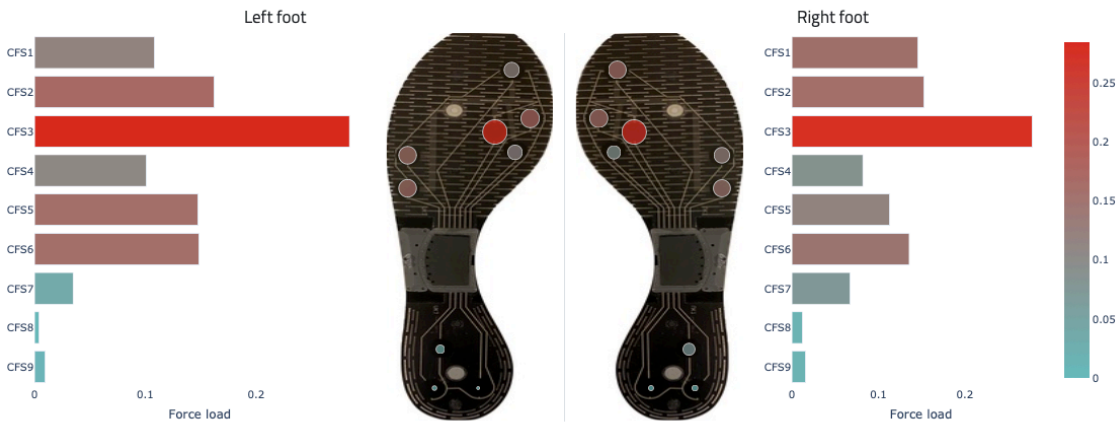
In the study conducted by Flavio Di Giorgio, several key observations were made:

FORCE DISTRIBUTION:



- SportScientia's analysis revealed that the majority of force during Di Giorgio's treadmill running was distributed along the medial aspect of the transverse arch—indicative of his background as an ex-rugby player accustomed to short bursts of speed. The graphics accompanying this section highlighted the pronounced force load on the inside edge, a pattern perhaps attributable to Di Giorgio's inexperience with endurance sports and a reflection of force distribution ingrained from his rugby days.

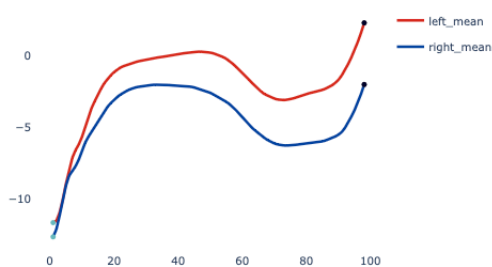
Foot force distribution ①



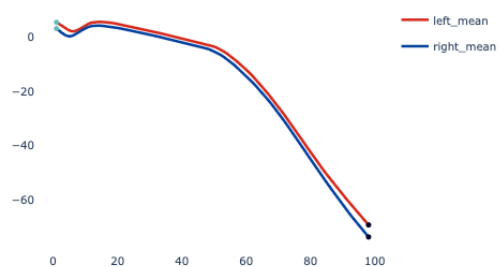
CORRELATION & DIFFERENCES BETWEEN STEP ROLL AND STEP PITCH

- The study also delved into the qualities and asymmetries of Di Giorgio's legs. His 'up leg' (left) is characterised by its hinging, fast-acting, springy nature, typically not yielding and often acting as a class two lever. In contrast, his 'down leg' (right) prefers squatting, extending ground contact, and yielding, transitioning from a class 1 to a class 2 lever.
- By scrutinising the corresponding graphs, Di Giorgio observed a significant difference in step roll and step pitch between his legs. His left leg (up leg) displayed a propensity for greater rolling motion rather than pitching due to its class two lever characteristics. Conversely, his right leg (down leg) demonstrated a greater pitching motion as it transitions from a class 1 to a class 2 lever.

Normalised step roll ①



Normalised step pitch ①



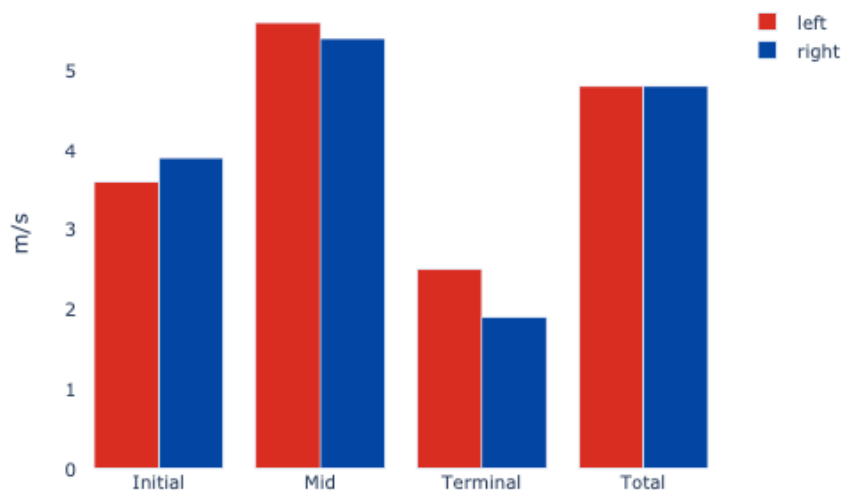
	session				baseline Δ ①			
	left	right	difference	direction	left	right	direction ①	
① pronation	-14.5	-12.3	2.2	left				
① supination	-0.5	-0.4	0.1	left				
① total	15.0	12.7	2.3	left				

	session				baseline Δ ①			
	left	right	difference	direction	left	right	direction ①	
① IC_pitch	6.2	3.9	2.3	left				
① TO_pitch	-72.6	-77.3	-4.7	right				
① total	78.8	81.2	-2.4	right				



- The accompanying graphics illustrated an average difference in pronation and supination of 2.3 degrees between left and right, with the left being greater. Similarly, the step pitch analysis showed an average angle difference of 2.4 degrees between initial contact and toe-off, with the right leg showing a greater degree due to its pitching strategy.

Swing phase average speeds ⓘ



LEG SPEED DIFFERENCES

- The analysis also found interesting variances in the average speed of Di Giorgio's legs. Despite a faster initial swing phase in his right leg, his left leg was able to catch up, showing greater speed during the mid and terminal phases. The study attributed this to the asymmetrical paradigms of the up-and-down legs, with the right leg generating more potential energy during the initial phase thanks to a slightly lower centre of mass and a more squared hip. As the phase progressed, the left leg's natural swiftness and its approach to lock the hip with the foot closer to the centre of mass allowed it to act as a sling, propelling it to greater speeds.

Contact time ⓘ

	left	right
0-2 m/s	0	0
2-4 m/s	339	344
4-6 m/s	243	257
6-8 m/s	0	0
8-10 m/s	0	0
10+ m/s	0	0

- The left foot's contact time is 4ms (1.21%) lower.
- This is a statistically significant difference with a p-value of 0.000
- This is a biologically small time difference





- The graphics showed the trends between left and right legs increasing as velocity increased, providing evidence that Di Giorgio's predominantly working leg with a class two lever function (left leg) would achieve faster contact times as speed increased compared to the other leg operating from a class 1 to 2 lever function.

OUTCOME

This level of detailed analysis, made possible by SportScientia's technology, has led to actionable insights for Di Giorgio, allowing him to see the empirical evidence behind the principles he has studied. The data clearly demonstrates how traditional misconceptions about running mechanics can be challenged and more accurately understood when viewed through the lens of advanced technology.

KEY TAKEAWAY

This case study illuminates the transformative power of SportScientia's technology in deconstructing and reconstructing the complexities of running mechanics. It evidences the need for a well-informed, data-driven approach to sports science, capable of dispelling myths and enhancing athletes' performance grounded on precise biomechanical analysis.